O-001 MORPHOLOGY AND COMPUTATIONAL FLOW DYNAMICS SUPPORT A NOVEL CLASSIFICATION OF ISOLATED COMMON ILIAC ANEURYSMS, WITH IMPACT ON ANEURYSM PROGNO

ABDOMINAL AORTIC DISEASES

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Introduction - Isolated common iliac artery aneurysms (CIAA) are rare and quantifying the risk of CIAA progression and rupture is difficult, typically based on diameter. We hypothesised that morphology and hemodynamics will better correlate with outcome, and also provide new insights into aortoiliac remodeling.

Methods - A series of 25 isolated CIAAs (n = 15 intact, n = 10 ruptured) in 23 patients were reconstructed from computed tomography angiography (CTA) and analysed with computational fluid dynamics. The relationship between hemodynamics and morphology was assessed. Based on the patient-specific dimensions, a series of 24 aortoiliac geometries with varying iliac bifurcation angle and abdominal aorta deflection were simulated. A further 162 consecutive patients assessed with CTA prior to aortoiliac endovascular intervention were used for morphological studies only.

Results - There were three distinct isolated CIAA morphologies; saccular, fusiform and kinked CIAA. Kinked cases (in tortuous left CIA) had similar diameter to fusiform cases but less calcification and thrombus, a narrower aortic bifurcation and more favourable hemodynamics than fusiform cases. Saccular CIAAs were largest and usually ruptured (at sites of low and oscillatory shear). CIAA and associated hemodynamic disturbances were associated with lateral shifting of the infrarenal aorta towards the CIAA side.

Conclusion - A new morphological categorisation, predictive of the clinical course, of isolated CIAAs is suggested, with CIAAs in tortuous vessels being relatively benign. Patient and hemodynamic modelling data support the hypothesis that flow disturbances in the common iliac artery are causative for aortic remodelling.

O-002 THE BANANA TECHNIQUE IN THE MANAGEMENT OF COMPLEX AORTO-ILIAC ANEURYMS IS RELIABLE IN THE SHORT AND LONG RUN

ABDOMINAL AORTIC DISEASES

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Introduction - Endovascular treatment for aorto-iliac aneurysms is still challenging, especially in emergency setting. One crucial point is the preservation of hypogastric perfusion. In case of aneurysmal extension to a common iliac artery without distal neck, the BANANA technique is an option that consists in a hybrid treatment combining a covered stent launched from the external to the internal iliac artery, combined with an aorto uni contralateral iliac endograft and a femoro femoral bypass. To date, very few examples of this technique have been reported.

Methods - All the patients operated on with the BANANA technique in our centre, from January 1, 2008 to December 31, 2017 were included, in a prospectively managed database. Analysis criteria were technical success, post-operative mortality rate, endoleaks, gluteal claudication, reinterventions, banana patency rates, and death during follow-up. Surveillance consisted in CT-scan and duplex ultrasound at 1 month, 6 months and annually hereafter.

Results - In this 10-year period, 17 male patients received the banana technique with a mean age of 73 ± 7 years, operated on for 14 aorto-iliac aneurysms and 3 isolated common iliac aneurysms. One aneurysm was ruptured, 3 others were symptomatic. Two patients had already had an endovascular aortic repair. Aortic and iliac aneurysms mean diameters were respectively 53 and 34mm. Angle between external and internal iliac before catheterization was 77 ± 28°. External and internal iliac neck lengths were respectively 93 ± 21mm and 32 ± 10mm. External and internal iliac neck diameters were respectively 10 ± 2 mm and 9 ± 2 mm. Nine bananas were reinforced with a short balloon-expandable stent, to avoid kinking. Contralateral internal iliac were preserved in 14 patients. Technical success and survival at 30 days were 100%. Mean follow-up was 44 ± 29 months. Complications were: banana thrombosis (n=2), sural and gluteal claudication due to external iliac stenosis treated by stenting (n=3), aneurysm fissuration due to type IA endoleak treated by open repair (n=1), type II endoleak without aneurismal sac growth (n=2). Eight patients died during follow-up, unrelated to their aneurysmal disease.

Conclusion - The banana technique selected in case of favourable morphological criteria, is a reliable and sustainable alternative to preserve hypogastric perfusion when treating aorto-iliac aneurysms. It is of particular interest in an emergent setting.

O-003 - CHIMNEY WITH THE USE OF NELLIX DEVICE: AN ALTERNATIVE SOLUTION FOR TYPE I ENDOLEAK TREATMENT

ABDOMINAL AORTIC DISEASES

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Introduction - Endovascular aortic repair with chimney technique (Ch-EVAR) is commonly used in the treatment of type I endoleak when the patient is unsuitable for conversion to open surgery or custom made endograft implantation. Main issue with chimney technique is related to gutter endoleak; this risk may be reduced with the use of a Nellix device (Ch-EVAS), that could fill the gutter and reduce the incidence of type I endoleak.

Methods - Sixteen consecutive patients (mean age 80.7 ± 7.0 years; 94% men) with prior EVAR were treated with ChEVAS between August 2015 and March 2018 in a single center.
Indication for treatment was proximal type I endoleak in all patients, with associated neck dilation in 5 patients and migration in 5.
The median diameter of residual aneurismal sac was 79.1 ± 2.4 mm
The median time between original procedure and ChEVAS was 92.7±5.3 (range 1-148) months.
Prior EVARs included different endografts (5 Zenith, 3 Endurant, 4 Talent, 1 Anaconda, 1 Fortron and 2 Nellix).
In 12 patients (75%) preoperative CT scan showed the presence of suprarenal stent at the level of the visceral vessels.
Two patients needed one chimney, ten patients needed double chimney and four patients needed three chimneys for a total of 34 target vessel overstented.
In 30 visceral vessels a balloon expandable stent (Advanta atrium or Bentley BeGraft) was implanted, in the remaining 4 vessels a self-expandable stent (Viabahn Gore) was delivered.
The Nellix endograft was implanted by bilateral percutaneous femoral approach in 11 patients

Results - Technical success was achieved in 100% of the patients by completion angiography at the end of the procedure.
No perioperative mortality was observed, one patient experienced non disabling posterior stroke at the end of the procedure.
CT scan performed 1 month after the procedure showed sealing of 15/16 (94%) of type I endoleak , the remaining patient with residual proximal endoleak underwent a successful Onyx embolization one month later.
At median follow-up of 13 months no recurrent endoleaks were recorded. All target vessel stented were patent with no need of reintervention.

Conclusion - ChEVAS may serve as alternative treatment option in patients with type I endoleak where the implantation of fEVAR/brEVAR is hampered by the presence of previous endograt in site. Further follow-up and a multicenter study are needed to corroborate these preliminary results

O-004 RETROPERITONEAL REPAIR OF JUXTA-RENAL AORTIC ANEURYSMS - A SINGLE CENTRE EXPERIENCE OVER 5 YEARS

ABDOMINAL AORTIC DISEASES

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Introduction - Open repair of juxta- and supra-renal abdominal aortic aneurysms (AAA) can be challenging. A recent increase in the use of a retroperitoneal (RP) approach, within our institution, prompted an audit into our outcomes.

Methods - Retrospective analysis was performed of all patients undergoing elective open RP repair of a juxta-renal AAA in a single centre during a 5 year period commencing September 2012. Demographic, operative, radiological and biochemical data were collected. The primary outcome measure was 30-day mortality: Secondary outcomes included the incidence of post-operative chest infection, acute kidney injury (AKI) and length of stay (LOS). Concurrent data was also collected for open elective repair of juxta-renal AAA via a transperitoneal (TP) to provide context. All patients included in either group received aortic clamping at a level above at least one main renal artery.

Results - Forty patients underwent an open AAA repair of a juxta-renal aneurysm via a RP approach with a mean age of 70.6 years and median maximal aortic diameter of 65mm. The aortic clamp level occurred at the supra-renal level in 35% (n=14) of patients and supra-mesenteric or supra-coeliac in the remaining 65% (n=26). The 30-day mortality was 15%. Secondary outcomes were: 27.5% incidence of chest infection; a 45% incidence of AKI (none requiring long term dialysis); a 10% return to theatre rate within 30 days of surgery, and a median LOS of 10.5 days (range 5-34 days). By comparison forty-one patients underwent open juxta-renal aneurysm repair via a transperitoneal (TP) approach, 88% (n=36) with supra-renal clamping and the remaining 12% (n=5) with either supra-mesenteric or supra-coeliac clamps. The 30-day mortality was similar to the RP group at 14.6%. Secondary outcomes were: 29.3% incidence of chest infection, 53.7% incidence of AKI, 7.3% return to theatre rate, and a median LOS of 9 days (range 4-52 days). The rate of supra mesenteric clamping was significantly higher in the RP group than the TP group ($p<0.01$ Chi Squared).

Conclusion - Open repair of juxta-renal aneurysms caries a significant 30-day mortality via both the RP and TP approaches. With these data in mind, patients with juxta-renal aneurysms should be considered for fenestrated endovascular repair; however, patient and anatomical factors may favor open surgery. This study has demonstrated that RP repair facilitates more complex proximal clamp zones but with similar perioperative morbidity and mortality compared with TP cases utilizing more distal clamping.
We believe growing experience of the RP technique, dual consultant operating, careful patient selection and reducing the occurrence of common complications such as post-operative bleeding will be key factors in reducing post-operative mortality.

O-005 DURABILITY AND INFECTION RESISTANCE OF CRYOPRESERVED FEMORAL VEIN ALLOGRAFTS IN SUPRAINGUINAL POSITION. A SINGLE CENTER STUDY

ABDOMINAL AORTIC DISEASES

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Introduction - There is no consensus about the best treatment method of aortic graft infections (AGI) and primary arterial infections in aorto-iliac area. Cryopreserved arterial allografts have proved to be infection-resistant, but long-term durability is altered by late graft thrombosis and degeneration [1,2]. However, cryopreserved big caliber venous allografts' performance in aorto-iliac position is unknown.

The aim of current study was to evaluate cryopreserved femoral vein allografts' (CVA) safety, infection resistance and durability in suprainguinal setting in infectious conditions and compare their performance with cryopreserved arterial allografts (CAA) from the same homograftbank.

Methods - Patients treated from February 2012 to March 2018 with cryopreserved allografts' reconstruction due to infection encompassing suprainguinal area in a tertiary level hospital were retrospectively reviewed. Preoperative characteristics, indication for operation, operative details, early postoperative morbidity and mortality, late mortality, re-infections and graft re-interventions during the follow-up were recorded. Univariable analysis was done using crosstabs method, survival calculated with Kaplan-Meier method.

Results - 31 patients underwent cryopreserved venous (femoral vein, n=21; cava vein, n=2) or arterial (superficial femoral artery, n=6; aorta, n=1; iliac artery, n=1) allograft reconstruction due to infection in aorto-iliac area. Indications for treatment were AGI in 14 (45%), mycotic aneurysm in 5 (16%), extra-anatomical prosthetic infection in 5 (16%), secondary arterial infection with rupture in 2 (6%), anastomotic pseudoaneurysm in 2 (6%) and aortic thrombosis with intestinal spillage in 1 (3%) case. 30-day and overall treatment-related mortality was 4 (13%). During the median follow-up of 15 month, two CAAs were treated due to thrombosis, two CVAs due to anastosmotic dilatation and one CVA due to re-infection and subsequent rupture making re-intervention incidence 16% (n=5). None of the grafts were lost and there were no amputations. At the end of follow-up 22 (71%) patients were alive. Kaplan-Meier estimation of survival was 87% (95% confidence interval, 81% to 93%) at 1 year and 63% (52% to 74%) at 2 years. Univariable analysis revealed no risk factors significantly associated with 30-day mortality, however cerebrovascular disease (p=0,028) was associated with treatment-related mortality and renal insufficiency (p=0,004) with overall total mortality. Due to small number of patients statistical analysis comparing CAA and CVA were unreliable, but two acute arterial occlusions call for caution and further research.

Conclusion: Cryopreserved venous allografts appear safe, infection-resistant and durable reconstruction material in aorto-iliac axis based on single center experience and mid-term analysis. Further research is needed to compare their performance to cryopreserved arterial allografts and other biological reconstruction material.

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O-006 ENDOVASCULAR ANEURYSM SEALING FOR INTACT, INFRARENAL ABDOMINAL AORTIC ANEURYSM – RESULTS FROM THE FIRST 199 CASES AT A SINGLE INSTITUTION

ABDOMINAL AORTIC DISEASES

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Introduction - Endovascular aneurysm sealing (EVAS) was conceived as a new paradigm in the treatment of abdominal aortic aneurysm (AAA). Two aortic stent grafts are surrounded by polymer-filled endobags, creating a sealing zone in the aortic neck and common iliac arteries, thus providing anatomical fixation within the aortic sac.

Methods - Pre-, intra- and postoperative data were collected and analysed for all patients undergoing EVAS at a single institution for unruptured, infrarenal AAA, since between March 2013 and December 2017.

Results - 199 patients (87.3% male) with a mean age of 75.2 years were studied. Two thirds of patients were graded ASA 4 (American Society of Anesthesiologists). The average aortic diameter was 64 mm. 45.7% of cases adhered to the original instructions for use (IFU) and 17.1% adhered to the revised IFU of 2016. 21.6% of cases have required reintervention. Type 1a endoleak was seen in 17.6% of cases, type 1b in 4.0% and type 2 in 2.0%. Migration of the aortic stent was seen in 15.6% of cases

and rupture in 6.0%. Aneurysm-related and all-cause mortality are 5.0% and 26.1% respectively. Adherence to IFU is associated with significantly fewer cases of type 1a endoleak (P=0.003) and aneurysm-related death (P=0.023).

Conclusion - Results with this device have not borne out the initial optimism regarding near-universal morphological applicability. Experience has shown that morphological considerations remain of great importance, as evidenced by the better results when adherent to IFU. This device has allowed the treatment of patients who may not have been treatable using conventional devices.

O-007 EARLY AND LONG-TERM EFFICACY OF FENESTRATED ENDOGRAFTING IN THE TREATMENT OF JUXTA-RENAL AORTIC ANEURYSMS

ABDOMINAL AORTIC DISEASES

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Introduction - Juxta-renal aneurysms (j-AAAs) are increasingly repaired by endovascular means with fenestrated endografts (FEVAR) worldwide, however long-term data are presently lacking. Aim of our study was therefore to evaluate late outcome of FEVAR in j-AAAs

Methods - Between 2008 and 2017, all consecutive patients undergoing endovascular repair for j-AAAs (neck length ≤5mm) by FEVAR (Cook-Zenith platform) were prospectively collected. Preoperative clinical and morphological features, together with procedural and postoperative data were analyzed. Early endpoints were: technical success (TS: patency of target visceral vessels; TVVs, absence of type I-III endoleak; iliac leg stenosis/occlusion and 24-hour survival), renal function worsening (reduction of baseline GFR ≥30%) and 30-day mortality. Late endpoints were: survival, freedom from re-intervention (FFR), TVV-patency, j-AAA shrinkage (≥ 5mm) and renal function worsening.

Results - During the study period, overall 181 cases underwent FB-EVAR repair. Sixty-six patients with j-AAA (M: 94%; age: 72±6years; ASA 3/4: 79/21%) were enrolled. The mean j-AAA diameter was 58±6mm. Endograft with 1, 2, 3 and 4 fenestrations were planned in 2 (3%), 22 (33%), 27 (41%) and 15 (23%) cases, respectively. Overall, 236 TVVs were treated by fenestrations and scallops (3.6±1 TVV/patient). Technical success was achieved in 65 cases (99%). The only failure occurred for a type III endoleak requiring renal artery relining on postoperative day 32. No TVVs were lost. Cardio and pulmonary morbidities were 5% and 6%, respectively. There were no cases of acute splanchnic ischemia. Renal function worsening occurred in 7 cases (10%): 4 returned to baseline within 30-day; 1 required hemodialysis and died within 30-day (1.5%). This was the only case of 30-day mortality. The mean follow-up was 46±32 months. Aneurysm sac shrinkage or stability was observed in 42 (64%) and 22 (33%) cases, respectively. Two patients (3%) with persistent type II endoleak had sac enlargement and required re-interventions (sac embolization by trans-limb approach). Freedom from re-interventions at 1, 3 and 5 years was 97%, 93% and 88%, respectively. An asymptomatic celiac trunk occlusion occurred at 36-month in a case with asevere pre-operative stenosis - accommodated by a scallop. No late renal arteries occlusions or type I-III endoleaks occurred. Overall, renal function worsening was reported in 5 patients (8%) during follow-up (2 persisted from post-operative period and 3 with new onset). Survival at 1, 3 and 5 years was 92%, 86% and 67%, respectively, with no j-AAA related mortality. At the univariate analysis, COPD (p:.006), BMI ≥31 (p:.048), preoperative chronic renal failure (p:0.44) and late renal function worsening (p:.050) were risk factors for mortality. COPD was the only independent predictor for mortality at the multivariate analysis (p:.021; OR:5.3; 95%CI, 1.3-21.9)

Conclusion - FEVAR for j-AAAs is safe and effective at early and long-term follow-up. According with the results of this series, FEVAR could be proposed as the first line treatment for j-AAAs in anatomically fit cases if performed in high volume centers. Long term survival is reduced in the presence of pre-operative COPD. The results of the present series should be taken in consideration when considering alternative open surgery technique in the treatment of J-AAAs

Abdominal Aortic Diseases

O-008 THE EFFECT OF COMPLIANCE VERSUS NON-COMPLIANCE TO STANDARD IMAGING AFTER ENDOVASCULAR ANEURYSM REPAIR ON RE-INTERVENTION RATE AND MORTALITY: A SYSTEMATIC REVIEW AND META-ANALYSIS

ABDOMINAL AORTIC DISEASES

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Introduction - Yearly imaging surveillance is recommended for patients who have undergone endovascular aortic repair (EVAR) for infrarenal abdominal aortic aneurysms to detect complications requiring reintervention. However, this is also a burden to patients and the healthcare system. It is yet unknown whether yearly imaging surveillance actually detects additional complications requiring reintervention and decreases the mortality rate. We aimed to study the effect of imaging surveillance after EVAR on reintervention rate and mortality. Also, what percentage of complications requiring reinterventions is detected via imaging surveillance compared to patients presenting with symptoms.

Methods - Systematic review of cohort studies that compared complications in patients compliant to imaging surveillance with non-compliant patients. Two review authors independently performed the inclusions, quality assessment and data extraction. Risk differences as to reintervention and mortality rates between compliant and non-compliant patients were meta-analysed. Results were presented as absolute risk differences (ARD) with 95% confidence intervals (CI). A Mantel&Haenszel fixed effect model was used, if statistical heterogeneity was limited, i.e. having an I^2 <50,. A Dersimonian&Laird random effects model was used, if statistical heterogeneity was present, i.e. an I^2 >50%,

Results - We included 11 relevant publications. Studies differed in imaging surveillance protocols and definitions for compliance subgroup. Pooled absolute risk difference (ARD) for reintervention rate was 4% (95%CI[1 to 7%]) in favour of imperfect/non-compliance (NNT 25; 95%CI[14 to100]), while mortality showed a non-significant ARD of 12% (95%CI[-2 to 26%]) in favour of imperfect/non-compliance. Two studies reported that complications requiring reintervention detected via imaging surveillance ranged between 41% and 53%, compared to patients presenting with symptoms.

Conclusion - Patients who are compliant to imaging surveillance undergo more reinterventions than those who are imperfectly or non-compliant. However, this does not necessarily protect against mortality. This suggests that the recommended yearly imaging surveillance may not be beneficial for all EVAR-patients.

O-009 IMPACT OF SEX HORMONES, POSTMENOPAUSAL HORMONE THERAPY AND RISK FACTORS ON DEVELOPMENT OF ABDOMINAL AORTIC ANEURYSM IN WOMEN: A POPULATION-BASED PROSPECTIVE STUDY IN NORWAY: A HUNT STUDY

ABDOMINAL AORTIC DISEASES

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Introduction - Women develop abdominal aortic aneurysms (AAA) five to ten years later than men (1,2). The delay in AAA development may be secondary to a protection from estrogens (3,4). The aim of the present study was to evaluate the impact of

risk factors associated with AAA development in women, including postmenopausal hormone therapy. This has previously been investigated in small cohorts with limited information.

Methods - In a total cohort of 106,000 individuals from the Norwegian Nord-Trøndelag Health Study (HUNT), 20,024 postmenopausal women were identified, of which 201 developed AAAs during a median follow-up of 18 years (1995-2014, i.e. 295,554 person-years). The data is based on questionnaires, physical measurements, medical records and blood samples. A multivariable Cox regression model was constructed, where the final adjusted model included the following variables: smoking (current, past, never), body mass index, coronary heart disease, diabetes, hypertension and postmenopausal hormone therapy. Multiple imputation was performed for missing data (n=50 data sets). Serum estradiol concentrations were compared between women who later did or did not develop AAAs. Median time from blood sample collection to AAA diagnosis was seven years.

Results - Mean age at AAA diagnosis was 77 (59 -100) years. 28% of the cohort reported ever use of postmenopausal hormone therapy. In the multivariable analysis, a notable Hazard ratio (HR) of 0.58 was observed for current use of hormone therapy, but the result was not statistically significant (95% CI 0.29-1.16, p=0.12). Women who reported current smoking had a more than ten-fold risk for developing AAA during follow-up (HR 10.9 (7.4-16.1)). Positive associations were also found for hypertension (HR 2.0 (1.4-3.0)) and coronary heart disease (HR 2.2 (1.6-3.2)). There was no substantial difference in estradiol concentrations between women with and without AAA (p=0.06).

Conclusion - Postmenopausal hormone therapy is of less clinical importance compared to the strong associations observed between smoking, hypertension coronary heart disease and AAA development in women. These findings were supported by measured estradiol concentrations.

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O-010 IMPACT OF SUPRARENAL FIXATION ON LONG TERM RENAL FUNCTION POST-EVAR

ABDOMINAL AORTIC DISEASES

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Introduction - The aim of this study is to evaluate de impact on renal function after the use of endografts with suprarenal (SR) fixation versus infrarenal (IR) fixation in the treatment of abdominal aortic aneurysms (AAA)
Some studies show no difference between the two types I, but others 2 suggest that there might be a long-term worsening on renal function in patients with a SR endograft. The second objective of this work is to study the morphology of how do the metal bars of the free-flow stent get disposed in front of the ostium of the renal arteries, and with that information to define patterns of coverage and analyse if there is a difference between the patterns and renal function.

Methods - Retrospective study of AAA treated with EVAR in our institution between September 2009 and December 2019, excluding symptomatic aneurysms, b-EVAR, f-EVAR y ch-EVAR.
We evaluated comorbidities, type of endograft, postoperative complications, survival and renal function after surgery: 1 month, 6 months and annually.

Using OsiriX software, we defined 4 patterns according to the disposition that the free-flow stent (in SR) or the covered stent (in SR and IR) acquires in relation of the ostium of the renal arteries: W pattern (control group – 2 renal with non covered ostium), X pattern (1 renal ostium covered with metal of the free-flow stent), Y pattern (2 renal ostiums with metal) and Z pattern (1 or 2 renal ostiums partially surpassed by the covered stent of the graft).
Kaplan-Meier curves and T – Student were used for the analysis.

Results - 195 patients were included in the study. Median age 75 years old. 96,9% man. 111 EVAR SR were implanted (56,9%) and 84 IR (43.1%).
The pattern distribution was: W pattern = 77 patients (control group), X= 43 patients, Y=31 patients and Z= 20 patients. The median follow up was 28.4 months.
We detected a non-significant tendency of Creatinin increase in the SR group versus the IR group (p:0,076) and in the patterns X+Y+Z versus the control pattern W (p=0,053).
The group with 2 renal ostiums (Y pattern) and the group with 1 renal ostium partially covered with the covered stent of the graft (Z) had a statistically-significant long term increase in Creatinin versus the control group (p=0.028 y p=0.001 respectively).

Conclusion - The presence of the free-flow stent covering the 2 renal ostiums had an impact on long term renal function, as well as the presence of the covered stent of the graft partially covering 1 renal ostium.
Furthermore, a tendency of higher rates of renal function deterioration was observed in the suprarenal endografts versus infrarenal ones

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O-011 INCREASED RISK OF ABDOMINAL AORTIC ANEURYSMS IN INDIVIDUALS WITH DEPRESSIVE SYMPTOMS: A POPULATION-BASED PROSPECTIVE STUDY IN NORWAY: A HUNT STUDY

ABDOMINAL AORTIC DISEASES

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Introduction - Depression has been associated with earlier onset of cardiovascular disease and increased cardiovascular morbidity and mortality [1-3]. Individuals with a Hospital Anxiety Depression Score (HADS) ≥ 8 have been found to more often present with depressive symptoms, such as feelings of hopelessness and fatigue [5]. The aim of this study was to investigate if a HADS score ≥8 is associated with development of abdominal aortic aneurysm (AAA), which recently has been stated as a possibility [4].

Methods - The study population comprised 50,930 participants who had complete HADS-data on at least one follow-up. They were part of the prospective, population-based Nord-Trøndelag health study (HUNT) in Norway. The Chi-square test was used for comparing incidence proportions of AAA between individuals with and without depressive symptoms, as measured by a HADS ≥8, and < 8 respectively. The hazard of AAA was assessed in unadjusted and adjusted Cox regression models. Attained age was defined as the time scale (entry at age ≥50), whereas HADS (<8 vs. ≥8), gender, smoking, coronary heart disease, hypertension, body mass index and diabetes were included in the model as categorical risk factors.

Results - A total of 6203 individuals (12%) had a HADS ≥8, and 735 individuals (201 women) developed an AAA during a median follow-up of 16.5 years (age 50-100 years). The incidence proportion of AAA was significantly higher in individuals with a HADS ≥8 (18% vs. 12%, p<0.001). In the unadjusted Cox regression model, individuals with a HADS ≥8 had approximately 50% higher risk of AAA than individuals with a HADS <8 (hazard ratio (HR) 1.51; 95% CI 1.24-1.84). The association remained significant in

the adjusted analyses (HR 1.36 (1.1-1.7)). Current smoking (HR 8.4 (6.3-11.3)), past smoking (HR 3.6 (2.6-4.8)), male gender (HR 2.2 (1.9-2.7)), coronary heart disease (HR 2.3 (1.9-2.8)) and hypertension (HR 1.45 (1.2-1.8)) were also significantly associated with development of AAA.

Conclusion - Individuals with elevated HADS as a sign of depressive symptoms have an increased risk of AAA development.

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O-012 SCRUTINIZING THE GENERAL APPLICABILITY OF THE CE APPROVED CHIMNEY PROCEDURE FOR SHORT NECK AND JUXTARENAL AORTIC PATHOLOGIES – 109 FENESTRATED ENDOVASCULAR ANEURYSM REPAIR CASES REVISITED

ABDOMINAL AORTIC DISEASES

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Introduction - Chimney procedures or parallel grafts (ChEVAR) have been described over the last years as an alternative for fenestrated endovascular aneurysm repair (FEVAR) to treat juxtarenal aortic aneurysms. So far, ChEVAR was an outside instruction for use (IFU) application with different visceral and aortic grafts, often used in emergency situations. Recently, an aortic stentgraft system alongside a visceral stentgraft has received CE approval to treat juxtarenal aneurysms and aneurysms with short necks. Thus, this appears to be an appealing of the shelf alternative for short neck aneurysms. The aim of this study was to revisit our FEVAR procedures performed with one device – the fenestrated ANACONDA system - at our institution and to assess their aortic morphology for applicability of ChEVAR according to the IFU of the above mentioned system.

Methods - From April 2013 to February 2017 109 patients were treated with a fenestrated Anaconda at our institution, 91 were male, 18 were female, their mean age was 74+/- 6 years. For all patients in the fenestrated programme at our institution, preoperative CT scans which were used for FEVAR graft planning were measured in all diameters and angles according to the IFU for the Medtronic Endurant stentgraft system. Patients included in the study were treated for aortic aneurysm with short necks, juxtarenal aneurysms, thoraco-abdominal aneurysms and dissections as well as Penetrating Atherosclerotic Ulcers (PAU).
Results - Of 109 patients included in the study, 15 patients had a short (<15 mm) and/or diseased neck, 68 had a juxtarenal aneurysm treated. 11 patients had a thoraco-abdominal pathology with an additional thoracic stent to generate a healthy landing zone for the FEVAR and 15 patients were re-do cases after failed EVAR (mid and long term failure). Of these 109 patients, 20 (18.3) met the IFU of Medtronic Endurant Chimey inclusion criteria: 1 patient with a short neck, 3 patients with a diseased neck, 11 patients with a pararenal aneurysm and 5 patients needing a re-do after a failed EVAR.

Conclusion - The CE approved Medtronic Endurant ChEVAR does not appear to be broadly applicable for patients needing a FEVAR to treat their aortic pathologies. Only 18.3% of all patients in our series were eligible for both methods.

O-013 LESSONS LEARNED FROM THE INCREASING OCCURRENCE OF LATE RUPTURE FOLLOWING EVAR

ABDOMINAL AORTIC DISEASES

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Introduction - Late aneurysm rupture following EVAR (rEVAR) represents failure not only of the primary endovascular treatment but also of secondary interventions and follow-up. Unfortunately the incidence of this complication is largely increasing as a consequence of the widespread utilization of EVAR.
The aim of this study was to analyze a cohort of patients admitted for rEVAR in order to report the incidence, identify the causes and evaluate the management and the outcome of this severe complication.

Methods - All patients admitted to our Institution for rEVAR, from December 2009 to December 2016, were retrospectively included in this cohort study. Demographics data were collected as well as detail of index EVAR and rEVAR. The main outcome was in hospital mortality.

Results - Over a total of 99 patients admitted for ruptured abdominal aortic aneurysms (rAAA) 16 (81% male, mean age 78.4 yo) already underwent EVAR. The rate of rEVAR/rAAA increased from 6.7% in 2012 to 31.5% in 2016. At time of the index EVAR 37.5% of patients were anatomically unfit for EVAR. Mean delay between last control and rEVAR was 23.6 months. At time of rupture, mean sac diameter was 92.5 mm and a type Ia endoleak was identified in 68.7% of Computed Tomography Angiogram (CTA). Three patients were not operated, 9 received an endovascular rescue and 4 an open repair. In-hospital mortality for the 16 admitted and the 13 operated patients was 43.7% and 30.7% respectively.

Conclusion - The occurrence of rEVAR increased significantly in our recent practice. Vascular Surgery units should prevent this high-mortality situation respecting instructions for users (IFU) of endovascular devices in selecting patients and establishing strict follow-up program.

O-014 PATIENTS WITH A RUPTURED ABDOMINAL AORTIC ANEURYSM ARE BETTER OFF IN HOSPITALS WITH A 'EVAR-PREFERRED' STRATEGY

ABDOMINAL AORTIC DISEASES

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Introduction - Observational studies showed a lower postoperative mortality in patients with a ruptured abdominal aortic aneurysm (RAAA) receiving EVAR, compared to patients receiving open surgical repair (OSR). Also after adjustment for known confounders. However, randomized controlled trials could not prove the superiority of EVAR in patients with a RAAA, compared to OSR. A problem with observational studies is selection bias of the included patients and the adjustment of known confounders can be incomplete. In contrast, trials contain a selected, homogeneous, patient population, which can negatively influence the external validity. Instrumental Variable analysis, which also correct for unobserved confounders, might give the answer.[1] By using national data of a consecutive, unselected, group of patients and correcting for both observed and unobserved confounders, we investigate whether RAAA-patients have better survival after EVAR compared to OSR.

Methods - All RAAA-patients, registered in the nationwide compulsory Dutch Surgical Aneurysm Audit (DSAA) between 2013-2016, were included and analyzed for postoperative mortality (30-days and/or in-hospital). Patients were grouped in OSR and EVAR, based on intention to treat. The risk difference between both groups in postoperative mortality was determined and compared in 3 ways: a linear model unadjusted for confounders (univariable analysis), a propensity score, i.e. the probability of

getting a certain treatment, using multivariable logistic regression analysis for co-variable adjustment, and an instrumental variable analysis to adjust for unobserved confounders using a two-stage least square regression, with the variation in percentage of EVAR per hospital as the instrument.

Results - 1956 patients (1239 OSR, 717 EVAR) were included. The crude unadjusted postoperative mortality after OSR was 34% (N= 419) and 22% (N=159) after EVAR (Risk difference 11.6, with a 95% confidence interval (CI) of 7.5-16%). We adjusted for observed confounders using a propensity score analysis. The risk difference with propensity score analysis was 11.2% (95% CI 6.8-15.6%) in favor of EVAR. To adjust also for unobserved confounders, we used the variation in percentage of EVAR per hospital as an instrumental variable (partial F statistic >10). The risk difference estimated using the instrumental variable analysis was 11.2% (95% CI 1-21%) in favor of EVAR.

Conclusion - Using statistical analysis, which adjusted for observed and unobserved confounders, a clear survival benefit for RAAA patients undergoing EVAR could been demonstrated, compared to OSR. However, the confidence limits are broad. A strategy with a preference for EVAR in RAAA-patients seems to result in lower postoperative mortality.

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O-015 ESTABLISHMENT OF THE FIRST MOBILE TELEMEDICINE FOR AORTIC EMERGENCIES IN JAPAN

ABDOMINAL AORTIC DISEASES

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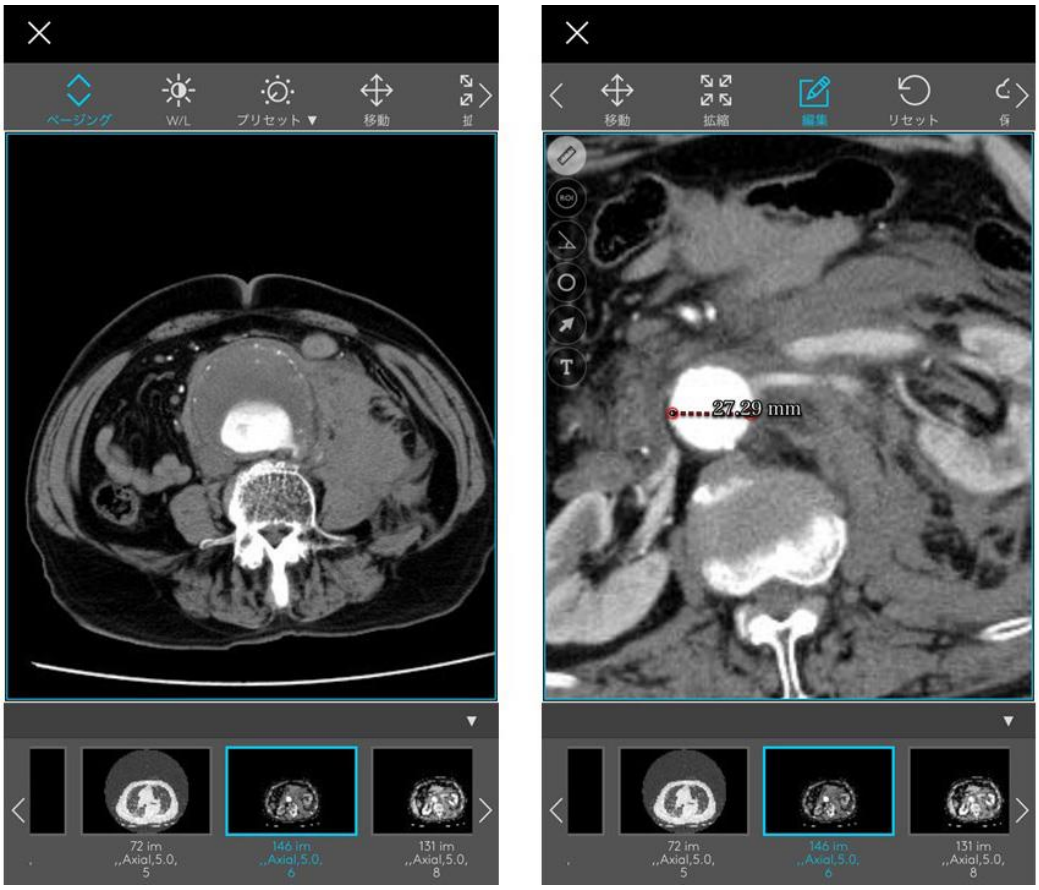
Introduction - Quick and adequate decision-making is crucial to save patients with aortic emergencies including aortic dissection and aneurysm rupture. Preparing the devices to adapt to each patient's anatomy is another crucial componet in the era of endovascular treatment. Surgical teams for aortic emergencies and special facilities, such as a hybrid operation room, are limited resources in rural areas. Telemedicine with high-resolution graphic data is thought to play significant roles in emergency medicine for cardiovascular emergencies, especially acute aortic syndrome

.

Methods - Asahikawa Medical University Hospital, which is locates in the centre of Hokkaido, introduced a mobile telemedicine system named JOIN, and created a cloud network of telemedicine that connects 6 local core hospitals, covering a 150 km range from Asahikawa. The JOIN application can transmit PACS (picture archiving and communication system) images such as CT scan and MRI as high-definition graphic data. Users can magnify an interesting area of the images and measure the length or angle of subjects appearing on users' smartphones or tablet devices(Figure). We have been testing this mobile telemedicine system for acute cardiovascular emergency since October 2016.

Results - Over 18 months, we have performed 63 consultations using this JOIN system, including 15 acute aortic dissections, 7 impending ruptures of thoracic aortic aneurysms, 4 ruptured abdominal aortic aneurysms(AAAs), 7 impending ruptures of AAAs, 5 cases of acute limb ischaemia, 3 cases of thrombosis or dissection of superior mesenteric artery, and other conditions. Among the 63 cases, 32 cases underwent emergency treatment and 16 cases were treated by endovascular treatment or hybrid therapy. Focusing on ruptured AAA, all four patients in the telemedicine system (TM group) were treated by endovascular aneurysm repair (EVAR), whereas 83% of the 18 AAA ruptures patients who were admitted without use of telemedicine (non-TM group; years 2011 Jan~2018 March) were treated by EVAR. The door to operation time was 6~70 min (median 11 min) in the TM group and 39~211 min (median 88 min) in the non-TM group ($p<0.05$). The hospital death rate in the TM and non-TM groups were 0% and 16.7%, respectively. The questionnaire completed by medical staff revealed that communications among surgeons, anaesthesiologists, clinical engineers, and nurses have improved.

Image -



Conclusion - Preliminary results suggest the following benefits: 1) This telemedicine system can create time not only to prepare the devices and operating room but also to discuss and decide the treatment strategy before patient arrival. 2) This telemedicine system reduces the door to operation time, which may contribute to improved clinical outcomes. 3) The communication among medical staff is improving through the use of this system, which positively impacts the surgeon' education and medical safety.

O-016 RECURRENT ENDOVASCULAR ILIAC ANEURYSM REPAIR AFTER AORTO-BISILIAC RECONSTRUCTION: ILIAC SIDE BRANCH VIA TRANS-AXILLARY APPROACH

ABDOMINAL AORTIC DISEASES

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Introduction - Recurrent iliac aneurysm is one of the leading cause of reintervention after previous endovascular or surgical aorto-iliac aneurysm correction. Open surgical approach implies technical issues and high perioperative risk while the need of preserving the internal iliac artery patency demands advanced endovascular procedures.
Aim of the present study is to evaluate feasibility and efficacy of trans-axillary access for iliac branched endograft implantation.

Methods - Consecutive patients with previous surgical or endovascular AAA repair electively treated with iliac side branch in a single centre were reviewed. All the procedures were conducted in general anesthesia via ipsilateral femoral and trans-axillary or

brachial access. Safety of the procedure was evaluated in terms of perioperative complication, late freedom from reintervention, conversion and aneurysm growth.

Results - Between march 2009 and april 2018 nineteen patients were treated; 3 previously underwent aorto-bisiliac by pass, the others had received endovascular aortic correction; mean time elapsed between abdominal aortic correction to iliac branch positioning was 63 ± 43 months.
Axillary access was obtained percutaneously with ultrasound-guided puncture in four cases while a surgical exposure was performed in the other patients.
Technical success was achieved in 100%. There was no axillary access related complication as well as no perioperative death. No late re-interventions were needed at a maximum follow up time of 59 months (mean 17 months). Freedom from aneurysm growth was 100%. No late internal iliac artery occlusions occurred.

Conclusion - When contralateral approach is not feasible for hypogastric cannulation, trans-axillary access represents a concrete and effective solution with low perioperative complication and comparable late results against conventional surgery

O-017 THE INFLAMMATORY SYSTEMIC RESPONSE AND CYTOKINES RELEASE IN OPEN ABDOMINAL AORTIC SURGERY WITH FAST-TRACK VERSUS CONVENTIONAL PERIOPERATIVE MANAGEMENT. A PROSPECTIVE RANDOMIZED STUDY

ABDOMINAL AORTIC DISEASES

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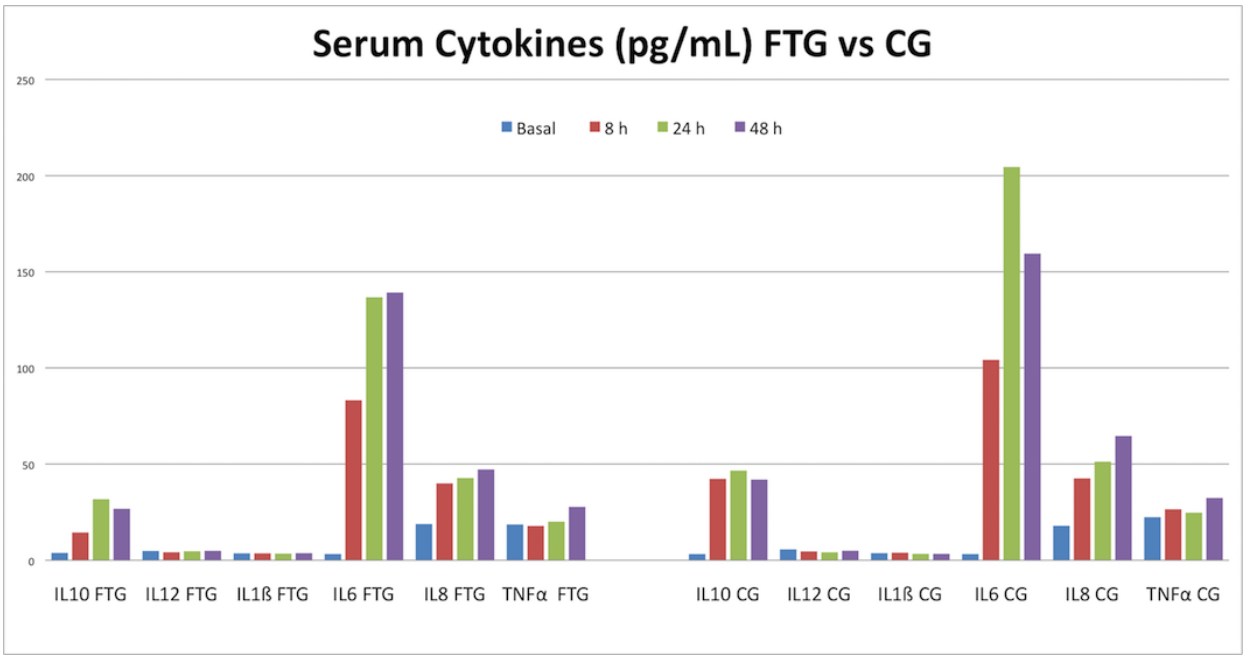
Introduction - After open aortic surgery, serum cytokines have a key role in the systemic inflammatory response syndrome (SIRS) and could be a biomarker for patient outcome. The aim of this study is to evaluate SIRS and the cytokines release in patients after open abdominal aortic surgery who undergo fast-track in comparison with conventional perioperative management.

Methods - Prospective unicentric randomized study from October 2015 to November 2017. We included consecutive patients undergoing open abdominal aortic surgery. We established two groups: fast-track group (FTG) and conventional group (CG) depending on the perioperative management. FTG perioperative management consisted in: no intestinal preparation, fasting reduction, carbohydrate drink intake 2h preoperative, analgesia through preperitoneal elastomer during 48 hours, mobilization and early diet. CG followed the conventional perioperative management.
We collected main demographic and perioperative variables. The incidence of SIRS and the levels of serum cytokines (TNFα, IL-1ß, IL-6, IL-8, IL-10 and IL-12p70) were analyzed at baseline, at 8, 24 and 48h postoperatively. 30-day mortality and complications rate (wound infection, arrhythmia or acute coronary syndrome, urinary infection, respiratory infection or acute renal failure) were registered.
Results - We included 49 patients (FTG: 26, CG: 23) with a mean age of 67.8 +/- 8.6 years, 91.8% men. Both groups were comparable in demographic and perioperative variables, except in terms of preoperative body mass index: FTG: 25.67±3,07 vs CG: 29.29± 4,66 (p=0.008) and total clamping time: FTG: 52.4±12,63 vs CG: 63.91±14,34 min (p=0.005).
The incidence of SIRS in FTG vs CG were 38.5% vs 45.5%, 38.5% 45.5 vs %, 23.1% vs 26.1%, 15.4% vs 19% (p>0.05) at 8, 24, 48 and 72 hours postoperatively respectively.
Regarding serum cytokines, no significant differences were found at baseline between the two groups and IL-1ß and IL-12p70 levels were not raised after surgery. The image shows higher release of IL-6, IL-8, IL-10 and TNFα in CG compared to the FTG group.
At 8 hours, IL-6 reached a statistical significant increase respect to baseline in CG (p=0.045). At 24 hours, the IL-10 increase respect baseline, was statistically higher in CG group compared to FTG (p=0.024).
Relating 30-day complications, 6 patients in the CG group presented transient acute renal failure and one patient in the FTG group (p=0.041).

Image -



Conclusion - Open abdominal aortic surgery entailed a high incidence of postoperative SIRS despite the perioperative management. Although we found IL-6, IL-8, IL-10 and TNFα serum increases after open abdominal aortic surgery in both groups, fast track perioperative management seemed to modulate only IL-6 and IL-8 release. More studies are required to evaluate serum cytokine as biomarkers for outcome after open abdominal aortic surgery.

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O-018 FAST-TRACK AND ENHANCED RECOVERY AFTER SURGERY (ERAS) IN OPEN AORTIC SURGERY IMPROVE CLINICAL OUTCOMES: A SINGLE CENTER EXPERIENCE ON 471 CONSECUTIVE PATIENTS

ABDOMINAL AORTIC DISEASES

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Introduction - The adoption of Enhanced recovery after surgery (ERAS) and fast-track surgery has produced optimal results in terms of post-operative outcomes in many different specialities. Limited evidence suggests that fast-track surgery can also lead to improvements in recovery time, morbidity and mortality in vascular aortic surgery. We are now well within the endovascular era of aortic surgery and despite the long-term benefits of open surgery the differences in peri-operative morbidity are still remarkably different. We wanted to investigate the safety and effect on length of stay using full ERAS principles compared to traditional and fast-track aortic surgery in a high-volume teaching hospital.

Methods - Three consecutive study groups formed from 471 patients undergoing aortic surgery at our institution between September 2007 and March 2018 were retrospectively analysed using electronic health records and clinical notes. The first group (from 2007 to 2009) consisted of 94 patients that underwent traditional aortic surgery with no fast-track elements. The second study group (from 2009 to 2015) consisted of 271 patients that had elements of a fast-track treatment plan such as opioid avoidance, early mobilization and multi-modal analgesia. The third study group (from 2015 to 2018) consisted of 106 patients that underwent a complete ERAS care plan including preoperative, intra-operative and postoperative elements.

Results -The three study groups did not statistically differ in terms of patient demographics (age, sex) or patient co-morbidities (Hypertension, Diabetes, COPD, Chronic Renal Failure). The average duration of surgery was similar between the three groups (160, 156 and 158 minutes respectively). First day of recorded bowel canalization was earlier in the two fast-track groups (day 2 compared to day 3 (p-value <0.001)). Median day of discharge differed dramatically between the groups (p-value <0.001) with the median length of stay being 6 days for group 1, 5 days for group 2 and less than 3 days for group 3. Mortality was highest in the partial fast-track group with two deaths compared to zero in group 1 and 3 (p-value 0.477). Complication rates were the lowest in the ERAS group (p-value 0.030).

Conclusion - Long term benefits of open repair for AAA are well established; peri-operative outcome and cost-effectiveness of the procedure can be improved furthermore following a strictly ERAS protocol.

O-019 INDIVIDUAL ESTIMATION OF NORMAL ABDOMINAL AORTIC DIAMETER RELATED TO GENDER, ANTHROPOMETRIC FEATURES AND CARDIOVASCULAR RISK FACTORS

ABDOMINAL AORTIC DISEASES

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Introduction - Infrarenal aortic diameter (AD) is considered normal if <= 20mm, therefore we diagnose abdominal aortic aneurysm (AAA) if AD> 30mm (> 50% of normal AD) in a standard way to all the population, without having into account individual characteristics. Screening studies have detected a progressive decrease in the prevalence of aneurysm, as well as a decrease of normal AD. Our objective is to define the current AD in our population and describe differences related to gender and individual anthropometric features.

Methods - Cross-sectional analytical and observational study of 65-year-old men and women from a health reference area in the context of a pilot AAA screening program. The AD was analyzed with respect to body mass index (BMI), body surface area (BSA), cardiovascular risk factors (CVRF) and previous vascular morbidity. The Pearson correlation coefficient (R) was analyzed and multiple linear regression analysis was performed to establish predictive variables of a greater AD.

Results - We recruited 1433 subjects (64.1% men). Mean AD was 17.1mm (sd 3.6), with significant differences between sexes: 18.1mm in men (sd 3.7) and 15.4mm (sd 2.6) in women (p <0.001). BSA and BMI were independent predictors of a greater AD in both sexes, being the BSA the measure with the highest correlation (R= 0.371, P <0.001). Among the CVRF, in the multivariate analysis, only tobacco was an independent predictor outcome in men, but not in women. We adjusted the AD (mm) by the BSA (m2), obtaining a new variable called indexed aortic size (IAS, mm/m2). Measuring the IAS in both, men and women, gender related differences disappeared, being the average IAS in men 9.3 mm/m2 (sd 0.2) and 9.3 mm/m2 (sd 0.2) in women (p=0.7).

Conclusion - The average DA in our population was 17.1mm, with very significant differences between sexes. These differences disappear when adjusting the absolute diameter by BSA, therefore we consider that this index could be a more accurate measure to determine the individual normal AD and, in addition, to determine the individualized diagnostic of AAA.

O-020 CAN ENDOANCHORS BE USED IN ANY ENDOVASCULAR AORTIC PROCEDURE? LESSONS LEARNED AFTER 674 ENDOANCHORS IN 109 PATIENTS IN A TWO-CENTRE EXPERIENCE

ABDOMINAL AORTIC DISEASES

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Introduction - Endovascular aortic aneurysm repair (EVAR) for thoracic, thoracoabdominal, pararenal, juxtarenal and abdominal aortic aneurysms has been troubled by complications during follow-up, mainly related to loss of seal and graft migration causing endoleaks and sac expansion. Different techniques have been applied ranging in grade of complexity, such as branched, fenestrated, chimney/periscope or standard EVAR/TEVAR or even hybrid surgery including arch/visceral debranching. The role

and safety of EndoAnchors (Aptus Heli-FX, Medtronic, Minnesota, USA) as an adjunctive technique for supplementing fixation and seal in standard and complex EVAR/TEVAR needs to be addressed.

Methods - We report on a two academic vascular centre experience with high volume of endovascular procedures with the use of EndoAnchors in different aortic anatomies and sectors. The number of total EndoAnchors deployed is described. Primary outcome is description of the safety of EndoAnchor deployments. Recommendations related to secondary outcomes such as complications, limitations and inadequate use are also described

Results - 109 high-risk patients (male 81.7%, female 18.3%; ages 73.92 ± 10.9 years) were treated during the study period (2013-2018) with adjunctive EndoAnchors, 79 in centre A and 30 in centre B. Sixteen were treated with TEVAR (zone 1, n=4 (3 open debranching and 1 combined open/endo-debranching; zone 3, n=3; zone 4, n=12; 3 patients across 2 zones) 3 with Ch-EVAR (1 chimney each) and 90 with EVAR. All were considered complex due to anatomical constraints. 674 EndoAnchors were placed, 87 in TEVAR, 587 for EVAR/Ch-EVAR (2 in a bell-bottom iliac endograft) and a mean of 6.18 ± 2.2 per case. Ninety-eight were prophylactic (44 conical, 31 hyper-angulated > 60°, 30 short and 14 'bubble' necks) and the remaining 11 were revision/type Ia endoleaks. Issues related to endoanchoring procedure were found in 17 (15.6%) cases. Thirteen (76%) occurred during the initial half of centres' experience. Of the 17 cases we found 4 mal-deployment (0.5%), 4 fractures (0.5%, without clinical relevance), 3 (27.3%) type Ia endoleak persistence after endostapling (1 undersized diameter of endograft, 2 ruptured AAA unsuccessfully treated with cuff plus EndoAnchors - 1 solved with aortic banding, the other died due to unstability/3 patients with delayed type Ia sealing), 3 catheter ruptures/twisting (0.4%) and 3 (0.4%) losses (2 were retrieved and one caged by a sandwich technique using an aortic cuff). Eight (7.3%) patients received less than 4 endoanchors. Six (75%) occurred during the first half of centres experience. Four received only one EndoAnchor, two of these due to rupture of the catheter, in one other case further deployments were not possible due to severe sheath twists causing inability to pass the applicator and the remaining one due only iliac by-pass access limited manoeuvrability. Two received 2 EndoAnchors, due to extreme angulation and impossibility to get correct position, and remaining 2 patients received 3 endoanchors due to a loss during procedure

Conclusion - Endovascular approach of complex aortic aneurysms with adjunctive use of EndoAnchors seems to be a safe ancillary procedure. Appropriate use of the device, including choice of adequate access, proper catheter manoeuvring, anatomical patient selection and increased expertise for technically demanding cases remain the most important issues to avoid misuse of the device or failure in the endovascular technique

O-021 THE LEVEL OF THE QUALITATIVE AND THE QUANTITATIVE MALNUTRITION IN PATIENTS SUFFERING FROM THE CRITICAL LIMB ISCHEMIA IN A SINGLE CENTER STUDY

PERIPHERAL ARTERIAL DISEASES

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Introduction - The malnutrition is commonly known risk factor in patients requiring surgical treatment. Pain, insomnia, loss of appetite, and overdosing of the self-administrated analgesics leads the gradual physical and psychological exhaustion in patients with the CLI. Moreover the malnutrition is the direct cause of the coagulation, immunity and wound healing disorders also influences the distribution of the administrated drugs.

Methods - This work aims to validate the incidence of the malnutrition and the identification of the most commonly occurring nutritional deficiencies in CLI patients III and IV according to the Fountetine classification
In the current study data of a 100 patients in age between 50 and 85 with CLI was carefully analyzed. The nutritional status was evaluated based on the standardized questionnaire (MNA, NRS), BMI as well as results of the laboratory test, especially the blood count, total protein level, albumins, D3 and B12 vitamins and iron.

Results - The qualitative and the quantitative malnutrition were diagnosed in the majority of the examined patients. The most frequently identified deficiencies were total protein, albumins and B12 serum level.

Conclusion - According to generally accepted criteria in surgical treatment the majority of the CLI patients required either the enteral or the parenteral nutrition before the planned surgical intervention. The data presented here shows tremendous importance of the nutritional treatment in the holistic treatment of the CLI patients.

O-022 COST-EFFECTIVENESS OF REVASCULARISATION IN PATIENTS WITH INTERMITTENT CLAUDICATION ON BEST MEDICAL TREATMENT AND UNSUPERVISED TRAINING IN A RANDOMISED CONTROLLED TRIAL

PERIPHERAL ARTERIAL DISEASES

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Introduction - Invasive vascular procedures are an integral part of intermittent claudication (IC) treatment, despite the relative lack of evidence to support its long-term benefits and cost-effectiveness. We wanted to compare the cost-effectiveness of revascularisation together with best medical therapy (BMT) with that of BMT alone in patients with IC.

Methods - In this prospective, randomised controlled trial, consecutive patients with mild-to-severe IC due to aortoiliac or femoropoliteal disease were allocated either to BMT alone (including a structured, non-supervised exercise programme) or to revascularisation together with BMT. In-patient and out-patient costs were obtained prospectively over 24 months of follow-up. Mean improvement in quality-adjusted life years (QALYs) was calculated using the EuroQol 5D-3L questionnaire, and the cost-effectiveness was assessed as the cost per QALY gained.

Results - The mean cost per patient in the BMT group was €1 901 whereas it was €8 280 in the group treated with revascularisation in addition to BMT (difference in cost: $p < 0.01$). Revascularisation in addition to BMT resulted in a mean gain in QALYs of 0.16 per patient ($p < 0.01$), giving an incremental cost-effectiveness ratio of €42 881 per QALY.

Conclusion - The costs associated with revascularisation together with BMT in patients with IC were about four times higher than for BMT alone. However, since health-related quality of life also improved, the incremental cost-effectiveness ratio of revascularisation was within the accepted threshold for public willingness to pay according to the Swedish national guidelines, but exceeded that in the British National Institute for Health and Care Excellence guidelines.

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O-023 ELEVATED PREOPERATIVE NEUTROPHIL-LYMPHOCYTE RATIO IS ASOCIATED WITH POOR PATENCY AND MAJOR ADVERSE LIMB EVENTS AFTER INFRAINGUINAL BYPASS SURGERY REVASCULARIZATION

PERIPHERAL ARTERIAL DISEASES

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Introduction: High neutrophyl-lympochyte ratio (NLR) is associated with the pro-inflammatory status that surrounds atherosclerosis. NLR has also been related to the clinical severity and prognosis of peripheral arterial disease. Our aim is to analyse the influence of this pro-atherosclerotic marker on infrainguinal bypass surgery patency and clinical outcomes.

Methods: Retrospective analysis of 150 infrainguinal bypasses. The clinical indication was critical limb ischemia in n=100 (66'7%) procedures. A preoperative blood sample of each patient was obtained 24 hours before the procedure was performed. These samples were used to calculate NLR. Our cohort was stratified in 4 group according to NLR interquartile ranges. (Quartile 1 [Q1] n=37; Quartile 2 [Q2] n=38; Quartile 3 [Q3] n=38: Quartile 4 [Q4] n=37). Patency and amputation rates at 30 days were compared between groups using the Chi-Square test. Patency, limb salvage and overall survival at 24 months were calculated by means of Kaplan-Meier test. Freedom from "major adverse limb events" (MALE) and from "major adverse cardiovascular events" (MACE) at 24 months were also analysed. Comparisons between groups were performed using Log-Rank test for a $P < .05$ in 2-tailed test.

Results: Patency and amputation rate at 30 days were similar between the studied groups. Primary patency of the Q4 group at 24 months was inferior to the primary patency observed in the rest of the cohort (47% vs. 67%; p=0.01). We also found a tendency towards a lower assisted-primary patency at 24 months in the Q4 group (62% vs. 75%; p=0.08). Limb salvage (70% vs. 85%; p=.03) and freedom from MALE (62% vs. 79%; p=0.01) at 24 months were inferior in the Q4 group. Freedom from MACE and overall survival rates were similar between groups.

Conclusion: Preoperative NLR is associated with major adverse limb events and lower long term patency rates after infrainguinal bypass surgery revascularization. Future prospective studies are required to determine its clinical utility.

O-024 COULD SUPERVISED EXERCISE THERAPY REDUCE COSTS TO TREAT INTERMITTENT CLAUDICATION?

PERIPHERAL ARTERIAL DISEASES

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Introduction - Supervised Exercise Therapy (SET) has been shown to be both effective at improving symptoms and quality of life in patients with intermittent claudication. Although being proven to be cost effective, safe and recommended in many national guidelines, uptake within the UK remains poor. The Netherlands has implemented a successful outpatient management strategy for SET in patients with intermittent claudication. We aimed to review the treatment of patients with claudication at a tertiary referral centre, establish potential cost savings by modelling the implementation of a SET programme and attempt to emulate current successful SET programmes.

Methods - We identified 353 patients with intermittent claudication referred from primary care to a vascular outpatient clinic at a tertiary centre over a 12-month period. Their demographics, the investigations they underwent and the proportion undergoing angioplasty were recorded. The cost of SET was taken from NICE guidelines, and costs of treatment from the national tariff. A SET programme was drafted to be established alongside the current cardio-pulmonary rehabilitation services at our trust.

Results - Of the 353 patients identified, 71% were male, with a mean age of 68.8 years. 14.4% of these patients underwent angioplasty with a median wait of three months; 3.68% directly from clinic, 10.76% underwent additional investigations and clinic reviews. The cost of treating these patients was £139,593. The use of a SET programme could potentially save £93,513, whilst freeing up resources needed for urgent angioplasties.

Conclusion - Access to Supervised Exercise Therapy (SET) programmes remains poor across the UK. The median wait for angioplasty of 3 months demonstrates that a SET programme would not be prolonging access to treatment if required. Greater

use of SET could reduce the need to perform angioplasty in intermittent claudication, increase opportunities to ensure best medical therapy and lead to improved quality of life, all while reducing costs for treating patients with intermittent claudication.

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O-025 OUTCOMES ANALYSIS OF 677 CASES FROM THE MULTICENTER ITALIAN REGISTRY ON PRIMARY ENDOVASCULAR TREATMENT OF ILIAC AND AORTO-ILIAC ARTERIES OBSTRUCTIVE DISEASE (ILIACS REGISTRY)

PERIPHERAL ARTERIAL DISEASES

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Introduction - Endovascular revascularization has become the first-line strategy for iliac obstructive lesions (IOL), and also used increasingly as an alternative to conventional surgery for complex aorto-iliac obstructive disease (AIOD). Owing to the good results resembling those of open surgery, an endovascular-first strategy have been considered for complex AIOD even in the most recent guidelines if done by an experienced team and if it does not compromise subsequent surgical options. The aim of this study was to analyze the results of the endovascular treatment of IOL and AIOD in a multicenter Italian registry.

Methods - Over a 3-year period, ending in December 2017, 677 treatments were performed for IOL and AIOD in eleven Italian hospitals and collected into a dedicated registry database. Intermittent claudication was an indication in 376 (55.5%) patients, whereas critical limb threatening ischemia in 298 (44.0%). Postoperative anti-thrombotic therapy was left at center's discretion: follow-up evaluation was performed at 1, 6 and 12 months after the intervention. Early (<30 days) major end-points were mortality and major complications; late major end-point was freedom from reintervention. Early results were compared with the Chi-square test and the Wilcoxon's signed rank test; follow-up results were analyzed with Kaplan-Meier survival estimates andcompared with log-rank test. Univariate and multivariate (forward Cox regression) analysis was used to identify potentially significantpredictors of need for reintervention.

Results - We treated 511 (75.4%) males. Overall, mean age was 68 ± 10 (range, 22-96; IQR, 62-76). Accordingly to the TASC II classification we treated 98 (14.5%) type A, 163 (24.1%) type B, 164 (24.2%) type C, and 248 (36.6%) type D lesions: stenoses were 370 (56.2%) and occlusions were 288 (43.8%). We used a totally percutaneous approach in 473 (69.9%): hybrid intervention was carried out in 204 (30.1%) patients, mostly with femoral endarterectomy plus patch plasty. A covered stent was implanted in 207 (30.6%) cases. Overall, a kissing-stent configuration was performed in 243 (36.1%) lesions. Primary technical success was obtained in 671 (99.3%) cases: earl mortality occurred in 3 (0.4%) cases, and postoperative complication was observed in 51 (7.5%) patients. Mean ankle-brachial index improved significantly from preoperative to postoperative period (0.5 ± 0.2 vs. 0.9 ± 0.1, $P < 0.001$). Median hospitalization was 5 days (IQR, 2-7). Early thrombosis, major amputation, and mortality was observed in 10 (1.5%), 3 (0.5%), and 4 (0.6%) cases, respectively. During the follow-up 21 (3.1%) died: the estimated survival was 96.3% at 12 months (95%CI: 93.8-97.8) and 90.2% at 36 months (95%CI: 82.7-94.7). Follow-up thrombosis occurred in 17 (2.5%) cases. Estimated primary patency and freedom from reintervention was 96% (IC95%: 93.3-97.7) and 97.2% (95%CI: 94.5-98.6) at 12 months, and 95% (95%CI: 89.0-97.6) for both outcomes at 36 months. At Cox regression analysis, no pre/intra/or-postoperative parameters independently predicted loss of primary patency and need for reintervention.

Conclusion - In this "real world" registry experience, endovascular revascularization showed to be safe and effective. No independent predictors were found to be associated with the need of reintervention thus indicating that endovascular revascularization for IOL and AOID can be an effective and durable first-line alternative even for the treatment of complex AOID.

O-026 SYSTEMATIC MULTI-STAGED ENDOVASCULAR REPAIR OF THORACOABDOMINAL ANEURYSMS WITH FENESTRATED AND BRANCHED ENDOGRAFTS (STEAR STUDY)

THORACIC & THORACO-ABDOMINAL DISEASES

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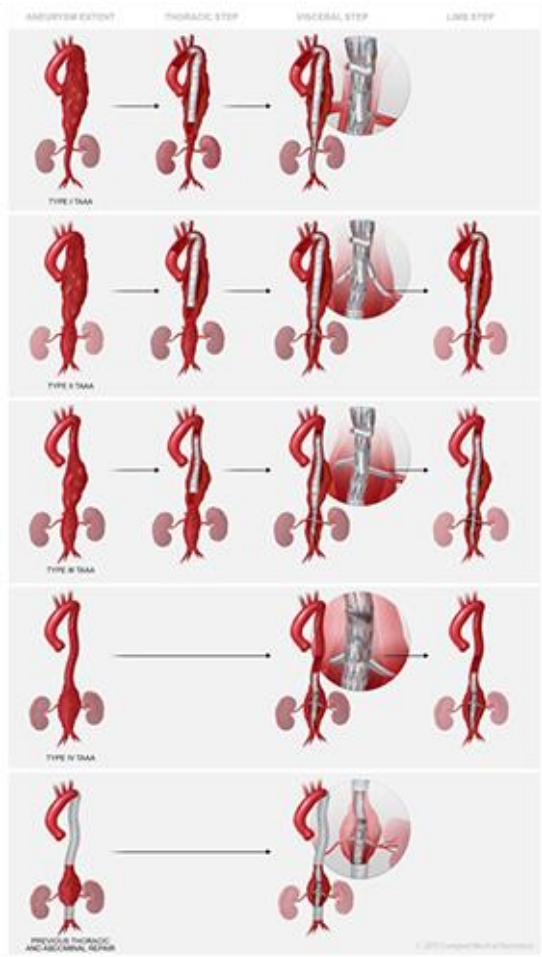
Introduction - Staging of complex endovascular procedure for thoracoabdominal pathology has been associated with a reduced risk of spinal cord ischemia, however, the series published are heterogeneous and the methods employed are not standardized.

The aim of this study is to analyze the results of a systematic multi-staged protocol for endovascular repair of thoracoabdominal aneurysms with fenestrated and branched endografts.

Methods - Between 2013 and 2017, 54 high-risk surgical patients received a fenestrated or branched endovascular treatment (F/BEVAR) for thoracoabdominal aneurysms (TAAAs). All elective cases (1 emergency excluded) were treated with a systematic multi-staged approach (thoracic, visceral and limb step) and enrolled in an ambispective (11 cases prospective) single-center study called STEAR (STaged Endovascular Aortic Repair - clinicaltrials.gov: NCT03342755). According to aneurysm extent, the previous aortic surgeries and the planning, the staging strategy varied as described in Figure 1. Preoperative risk factors and anatomical characteristics were recorded as risk factors. Single step mortality and the different systemic complications (renal, cardiac, pulmonary, bowel, cerebrovascular and spinal cord) with a grade $\geq$1 were recorded as endpoints. All patients received CT scan within the first months and were subsequently evaluated with the same imaging at 6 and 12 months and yearly thereafter. Statistical analysis of risk factors and endpoints was conducted and data were entered into a multivariate analysis if they had a univariate p-value of less than 0.05.

Results - The previous aortic interventions (at least one surgery in 39 cases=72.2%) combined to the different TAAAs extents resulted in different staging planning: 25 patients (46%) had their procedure split on 2 steps and 19 patients (35%) in 3 steps. The overall mortality was 3 cases (6%) with one case of intersurgical rupture and the overall 30-day clinical success was 43 cases (80%). The overall rate of grade 2 or 3 (including death) systemic complications was 10 cases (19%). Seven spinal cord ischemia events were observed in the different steps in 5 patients and resulted in one case (1.9%) of permanent impairment. The multivariate analysis identified one significative association: Any systemic complication (grade $\geq$1) was associated with a previous open or endovascular aortic surgeries in both abdominal and thoracic or thoraco-addominal region (OR 7.27; 95%CI 1.01-51.9, p=.048). At short-term (6-month), 6 endovascular reintervention were performed to seal four type IIIC endoleaks and two type IC endoleak. None of the patients with a delayed aneurysm sealing experienced spinal cord ischemia. The overall short-term clinical success was achieved in 49 cases (91%). At mid-term (within 5-year) and with a mean follow-up of 11.7 $\pm$10.4 months, the overall survival was 48 patients (89%).

Image -



Conclusion - The preliminary results of the STEAR study demonstrated that a multi-staged approached with a systematic three-stage approach of extensive TAAAs is technically feasible and safe with an associated low incidence of permanent spinal cord ischemia, however, the risk of intersurgical rupture should be balanced against the advantages of staging. Previous open or endovascular surgeries in the abdominal and thoracic region are associated with a higher incidence of systemic complications.

O-027 MID-TERM RESULTS OF FENESTRATED/BRANCHED STENTGRAFTING TO TREAT POST-DISSECTION THORACO-ABDOMINAL ANEURYSMS

THORACIC & THORACO-ABDOMINAL DISEASES

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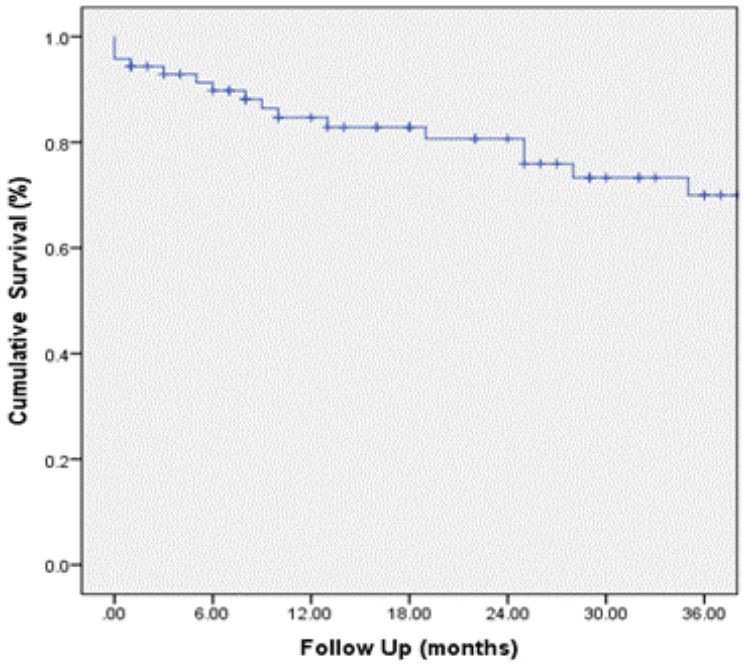
Introduction - Patients surviving an acute aortic dissection are at risk for developing a thoracoabdominal aortic aneurysm (TAAA) during follow-up, regardless of the type of treatment in the acute setting. Open surgical repair to treat post-dissection TAAA carries a high surgical mortality and morbidity and is prohibited in a large proportion of patients. Fenestrated and branched stent-grafting (F/B-TEVAR) has been used with success to treat post-dissection TAAA[1,2]. Our aim was to report mid-term results of a total cohort of 71 patients treated, following a previous report on 31 patients with shorter follow-up

Methods - We analyzed a prospectively maintained database including all patients with post-dissection TAAAs that underwent F/Br-TEVAR within the period January 2010 - April 2017 in two vascular institutions experienced in endovascular techniques.

Results - A total of 71 patients (56 male, mean age 63.8 ± 10.6 years) were treated. Technical success was achieved in 67/71 (94.4%) patients. In-hospital mortality was four patients (5.6%). Perioperative morbidity was 19.6%. Three (4.2%) patients developed severe spinal cord ischemia, one of these patients 12 months postoperatively, following spontaneous occlusion of a type II endoleak. Mean follow-up (FU) was 25.3 months (1-77 months). Cumulative survival rates at 12, 24 and 36 months were 84.7 ± 4.5%, 80.7 ± 5.1%, 70.0 ± 6.7%, respectively. Estimated freedom from reintervention at 12, 24 and 36 months was 80.7 ± 5.3%, 63.0 ± 6.9%, 52.6 ± 8.0%, respectively. Main reasons for reintervention were target vessel endoleak and iliac endoleak requiring extension. Target Vessel occlusions occurred in 8/261 (3.1%) vessels (renal arteries: n=4; SMA: n=2; CA: n=2). Mean aneurysm sac regression during FU was 9.2 ± 8.8mm, with a false lumen thrombosis rate of 85.4% for patients with a FU longer than 12 months. No ruptures occurred during follow-up.

Image -



Time (months)	6	12	24	36
Number at risk	58	46	34	21
Standard Error	0,037	0,048	0,051	0,067

Conclusion - F/Br-TEVAR for post-dissection TAAA is feasible and associated with low perioperative mortality and acceptable perioperative morbidity. Mid-term results demonstrate a high rate of complete false lumen thrombosis and aneurysm regression. Rigorous follow-up is however required due to the significant reintervention rate. Longer bridging stent-grafts should be used in post-dissection aneurysms.

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O-028 COMPARISON OF IN SITU FENESTRATION AND PHYSICIAN-MODIFIED FENESTRATION FOR LEFT SUBCLAVIAN ARTERY REVASCULARIZATION DURING THORACIC ENDOVASCULAR AORTIC REPAIR

THORACIC & THORACO-ABDOMINAL DISEASES

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Introduction - Left subclavian artery (LSA) revascularization is required due to inadequate proximal landing zone during thoracic endovascular aortic repair (TEVAR) in high-risk patients of proximal descending aortic pathologies and distal arch pathology. The aim of this study was to evaluate perioperative and short-term outcomes of different patterns of fenestration for LSA revascularization in single center.

Methods -From January 2017 to December 2017, 59 patients (38 men and 21 women; 57±17 years; range, 36–79 years; acute type B aortic dissection in 27 patients, penetrating aortic ulcer in 29 patients and thoracic aortic aneurysm in 3 patients) who received LSA revascularization by fenestration during TEVAR were included, patients who received innominate artery and left common carotid artery revascularization (including chimney, fenestration, debranching), or with aberrant subclavian artery/left vertebral artery were excluded in this retrospective study. Among them, in situ fenestration (ISF) was achieved with balloon-assisted puncture needle, followed by covered stent insertion via fenestration; physician-modified fenestration (PMF) was performed with cautery pen in vitro on partial deployed stent-graft, with or without target vessel stenting via fenestration after deployment. Computed tomography surveillance was performed at one-month, six-month and yearly after procedure. Perioperative and follow-up outcomes, procedure-related complications of these two groups were compared.

Results - 10 patients were included in ISF group and 49 patients in PMF group, the distribution of types of pathologies did not differ between two groups, whereas 85.7%(42/49) pathologies located in lesser curvature of arch in PMF group and 80%(8/10) in greater curvature of arch in ISF group. No 30-day mortality in both two groups. The technical success of LSA revascularization was achieved in 95.9%(47/49) of PMF and all patients of ISF group, respectively. Misalignment of fenestration and orifice of LSA occurred in two cases of PMF group, and thereafter, received bailout chimney stent insertion through branchial artery. The operative time in ISF group was 103.3±57.9 minutes vs. 67.9±34.0 minutes in PMF group (P=.03), the contrast medium use was 82.8±30.4ml in ISF group vs. 75.6±15.4ml in PMF group(P=.08). Eight patients of PMF group received target vessel stenting because of contrast delayed in LSA after aortic stent-graft deployment. Completion angiogram of PMF group showed higher incident rate of endoleak than ISF group (5/49 vs. 1/10, P=.007), one patient in PMF group suffered from retrograde dissection which underwent aortic arch and ascending aortic replacement. During post-operative follow-up (8.5±3.6 months, [4-15]), all target vessels were patent in ISF group while patency rate of LSA in PMF was 91.8%(45/49), one case of ischemic stroke occurred in PMF group.

Conclusion - Fenestration technique is effective and safe for LSA reconstruction during thoracic endovascular aortic repair. In situ fenestration and physician-modified fenestration have similar short-term results, while the incident rate of endoleak in situ fenestration group is lower. Long-term follow-up and larger sample size researches are needed to investigate the outcomes of the two methods.

O-029 OUTCOME AFTER ENDOVASCULAR REPAIR OF RUPTURED THORACIC AORTIC ANEURYSM: A NATIONAL MULTICENTER STUDY

THORACIC & THORACO-ABDOMINAL DISEASES

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Introduction - Ruptured descending thoracic aortic aneurysm (rDTAA) is an acute condition with high mortality requiring urgent treatment. The purpose of this multicenter study was to analyze the outcome of thoracic endovascular aortic repair (TEVAR) in patients with rDTAA.

Methods - This is a nationwide retrospective study including all patients who underwent TEVAR for rDTAA at six major vascular university centers in Sweden between January 2000 and December 2015. Data from local hospital records and the Swedish vascular registry at the participating centres were reviewed. Outcome measures were analysed using Kaplan-Meier estimator and multivariable Cox-regression.

Results - There were 140 patients (mean age 74.1±SD 8.8 [range: 34-91] years; 56% men), with rDTAA. The mean descending aortic aneurysm size was 64.8±19 mm. Hemothorax was present in 64% (89/139) of patients at admission.
The median stent graft length was 218 mm (range: 30-800 mm) and the median number of stentgrafts used was 2.0 (range: 1-6). In 53 patients (37.9%), the left subclavian artery was covered to extend the proximal landing zone. Twenty-five patients (17.9%) required proximal revascularization; chimney left carotid artery (n=14), chimney left subclavian artery (n=7), carotid-carotid-subclavian bypass (n=2), and left carotid-subclavian bypass (n=2). The celiac trunc was covered in 15 cases (10.7%) to achieve adequate distal landing zone. A chimney was placed in the SMA in six cases (4.3%) and in the celiac trunc in one case (0.7%). In two patients a multi branched stent graft was used.
In total, 61/136 patients (45%) had a major complication within 30-day post TEVAR. Stroke (n=20; 14.7 %) was the most common complication followed by paraplegia (n=13; 9.6%) and major bleeding (n=13; 9.6 %). There were no association between stent graft length or subclavian coverage and paraplegia (OR 1.00, 95% CI 0.998-1.01; P=0.32, and OR 0.56, 95% CI 0.14-2.31; P=0.42; respectively) or subclavian coverage and stroke (OR 1.40, 95% CI 0.46-4.31; P=0.56).
Reinterventions were required in 27/137 patients (19.7%). Postoperative bleeding was the only major complication associated with reintervention (OR 3.39, 95% CI 1.05-11.0; P=0.042). Median follow-up time was 18.5 months (range: 0-132 months).
The Kaplan-Meier estimated survival was 79.1% at 1 month, 70.8% at 3 months, 64.5% at 1 year, 45.0% at 3 years, and 30.9% at 5 years. Age (HR 1.04; 95 % CI 1.00-1.07; P=0.044), previous stroke (HR 2.31; 95 % CI 1.17-4.55; P=0.016), previous aortic surgery (HR 2.17; 95 % CI 1.18-3.99; P=0.012) as well as postoperative major bleeding (HR 4.29; 95 % CI 2.14-8.60; P=0.001), postoperative stroke (HR 2.73; 95 % CI 1.43-5.22; P=0.002), and renal failure (HR 7.82; 95 % CI 2.53-24.19; P=0.001) were all associated with mortality.

Conclusion - This nationwide multicenter study of patients with rDTAA undergoing TEVAR showed acceptable short-term survival but the long-term survival is rather poor. The postoperative complication rate is high and reinterventions are required in one fifth of patients. Patient selection and optimization are of utmost importance to improve outcome.

O-030 HEMODYNAMIC AND METABOLIC DETERMINANTS OF END-ORGAN PERFUSION AND MICROCIRCULATION IN AN ANIMAL MODEL OF THORACOABDOMINAL AORTIC REPAIR

THORACIC & THORACO-ABDOMINAL DISEASES

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Introduction - Open repair of thoracoabdominal aorta (TAA) requires prolonged aortic crossclamping and extracorporeal circulation. Hybrid repair with proximal endovascular graft fixation can reduce ischemic time and eliminate the need for the pump. We measured the effects of hybrid approach on intraoperative and recovery hemodynamics in an experimental pig model.

Methods - Four approaches were compared; group 1: open surgical TAA repair, group 2: 1st generation SPIDER graft, group 3: 2nd generation SPIDER with loop graft for implantation of lumbar arteries, and group 4: 3rd generation SPIDER graft with volume-based resuscitation. Hemodynamic variables, tissue perfusion, branch vessel flow, and clinical laboratory values were measured at baseline, at end-operation and at six hours (6H) postoperatively. Organ microperfusion was measured by gold-standard fluorescent microsphere (MS) technique. Data were analyzed by hierarchical linear mixed models to account for multilevel repeated measurements.

Results - 27 pigs (75-85 kg) were studied. Total ischemic times were significantly longer for open grafts than SPIDER grafts for all branch vessels ($p<0.0001$). Branch vessel flows were not present in the OSR group during crossclamping, but recovered at clamp release and 6H postoperatively. Perfusion of the visceral organs measured by fluorescent microsphere varied significantly between baseline, post-implant and 6H postoperatively in all groups ($p<0.0001$). Between graft types, highly significant time-by-group interactions were observed for liver and bowel (all $p<0.015$). Hierarchical modeling demonstrated significant multilevel correlational influence of macro-hemodynamic changes (celiac or SMA flow and ischemic time) on microcirculation (end-organ perfusion) of hepatic and mesenteric beds (multilevel R2 0.61). Lactate levels were strongly correlated with bowel but not liver perfusion.

Conclusion - Hybrid grafts significantly reduce intraoperative ischemia, end-organ perfusion abnormalities and metabolic derangements during thoracoabdominal aortic repair.

O-031 AORTIC CURVATURE REMODELING AFTER TEVAR: ASSESSING CTAG ENDOGRAFT CONFORMABILITY USING IMAGE VECTOR ANALYSIS

THORACIC & THORACO-ABDOMINAL DISEASES

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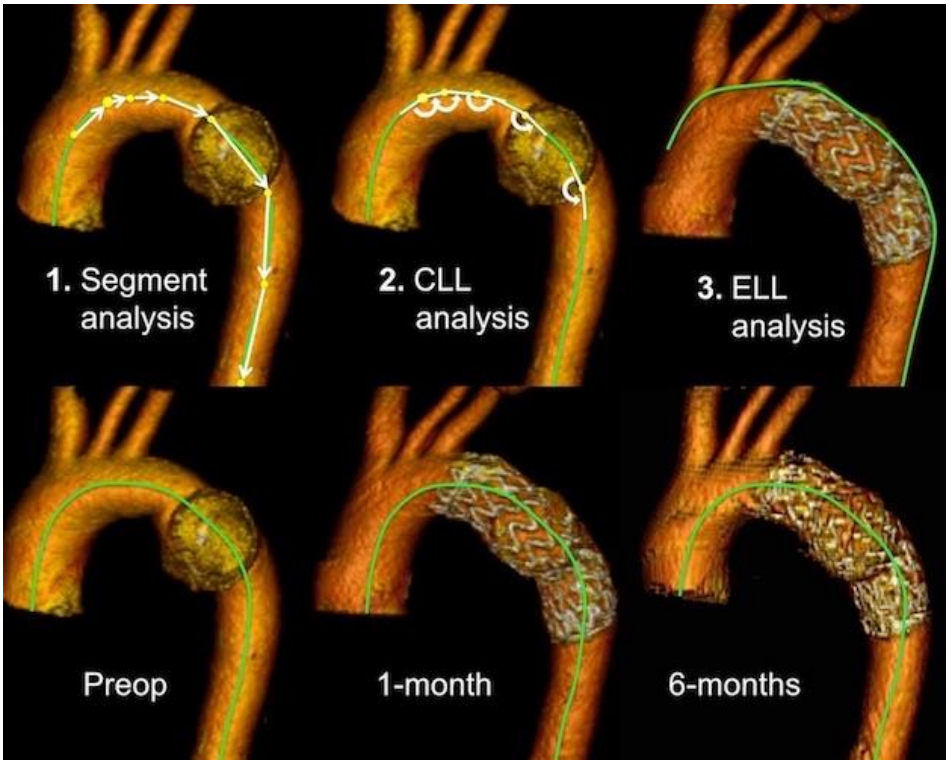
Introduction - Previous published articles pointed how some endografts can modify the aortic arch curvature, by increasing longitudinal stiffness and softening its bending. However, different measurement methods with different follow-up have been published, and these changes can vary between different endografts. The aim of this study is to corroborate, for the first time, the conformability of the CTAG thoracic endograft (Gore&Associates, Flagstaff, AZ, USA) into the aortic arch, analyzing different image vector analysis.

Methods -We retrospectively analyze patients primarily treated for thoracic aortic aneurysms and blunt traumatic aortic injuries by means of a thoracic CTAG endograft proximally sealed into the aortic arch (zones Z1-Z3) in 5 different Spanish centers, between 2008-2017. The preoperative, 1-month and 6-months postoperative control computed tomography angiography (CTA) have been

obtained, creating accurate 3D center-lumen-line and external-lumen-line from the aortic valve to the renal arteries. Three different image analysis methods have been used to compare changes of the aortic curvature: 1st-Segment analysis (angulations of the center-lumen-line when divided in 8 precise segments or vectors, analyzing anterior-posterior, right-left and cranial-caudal displacement), 2nd-Center-lumen-line analysis (bending of the center-lumen-line itself in 5 definite points of the aortic arch) and 3rd-Expected behavior (length of the endograft in the external-lumen-line). Two independent observers performed a blind analysis of all CTA, obtaining intra and inter-observer agreements (interclass correlation coefficient). Changes between preoperative and postoperative CTA at 1 and 6 months are compared (Wilcoxon-signed ranks test for paired samples), and differences are looked between cases sealed into the proximal (zones Z1-Z2) and distal (Z3) aortic arch (Mann-Whitney U test).

Results - 37 cases are analyzed (5 blunt traumatic lesions and 32 aneurysms, mean age 66.3 years, ±14.2, 62.2% of them with type I arch, mean implant of 1.6 endografts per patient). Very good intra and inter-observer measurement agreements have been obtained (1.000 and 0.998, P<0.001 for both). After placement of a CTAG endograft into the aortic arch (proximally sealed in Z1-Z2 in 12 cases) at one and six months follow-up, minimal changes occurred in 1st-segment analysis (only a slight decrease of -2.0º in the XY plane at 10cm from braquiocephalic trunk at 6-months follow-up was significant, P=0.027, without changes in the Z longitudinal axis during time). 2nd-Center-lumen-line analysis again only showed minimal angulation change in aortic curvature bending at the same point (+3.5º lumen bending softening at 10cm from braquicephalic trunk at 1 month, P=0.006, disappearing at 6-months follow-up, without any other significant change). Finally, good device length predictability has been shown (interclass correlation coefficient between external lumen endograft length and manufacturers references: 0.995 and 0.994 at 1 and 6 months, P<0.001). No differences have been seen between cases proximally sealed into the proximal and distal aortic arch.

Image -



Conclusion - CTAG thoracic endograft showed a good conformability into the aortic arch and proximal thoracic aorta, with minimal changes in the aortic curvature after endograft placement in the short-term follow-up (up to 6 months). In addition, final endograft length into outer aortic curvature is highly predictable.

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O-032 HOSPITAL INCIDENCE AND IN-HOSPITAL MORTALITY OF SURGICALLY TREATED AORTIC DISSECTIONS IN GERMANY

THORACIC & THORACO-ABDOMINAL DISEASES

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Introduction - Little is known about the population based incidence and mortality of patients suffering from aortic dissections (AD). To determine the hospital incidence and in-hospital mortality of patients treated surgically for type A (TAAD) and type B (TBAD) AD in Germany, a secondary data analysis on a nationwide basis was performed.

Methods - For this population based retrospective cohort study, the nationwide diagnosis-related group (DRG) statistics collected by the German Federal Statistical Office were analysed for patients treated surgically for AD between 2006 and 2014. All in-patient cases were identified by the International Classification of Diseases, 10th Revision diagnosis codes – German modification (ICD-10-GM) I71.00–I71.07 in combination with the specific codes for open, endovascular, or hybrid (endovascular plus open surgery) procedures. This allowed a distinction between TAAD and TBAD.
For standardization, the hospital incidence was adjusted for sex and age, whereas the in-hospital mortality was additionally adjusted for medical risk using the Elixhauser Comorbidity Score. A trend analysis was done by using the Mann–Kendall trend test (incidence) as well as the chi-squared test for trend in proportions (mortality, use of endovascular therapy). A multilevel logistic regression model was performed to investigate for risk factors associated with in-hospital mortality.

Results - 20,533 cases (median age 65 years, Q1–Q3 53–73 years) have been treated surgically within the 9-year study period, consisting of 14,911 TAAD (72.6%, median age 64 years, Q1–Q3 53–73 years) and 5,622 TBAD (27.4%, 66 years, Q1–Q3 56–74 years). The standardized hospital incidence of all surgically treated AD was 2.7/100,000/year, which was composed of 2.0/100,000/year for TAAD and 0.7/100,000/year for TBAD. The hospital incidence of both types of AD increased significantly between 2006 and 2014 (for TAAD from 1.6 to 2.4/100,000/year and for TBAD from 0.5 to 1.1/100,000/year, both $p<0.001$).
TAAD were treated by open and hybrid repair in 94.3% and 5.7% repectively. TBAD were treated by endovascular therapy in 92.3%, open repair in 6.4% and hybid repair in 1.3%. Since 2006 endovascular therapy (TEVAR and hybrid repair) increased significantly in TBAD from 88.5% to 96.9% ($p<0.001$).
In-hospital mortality was 19.5% and 9.3% in TAAD and TBAD, respectively. The in-hospital mortality increased significantly over time in TAAD (from 18.2% to 20.4% $p=0.031$). In TBAD the increase was statistically not significant (8.6% to 10.1%, $p=0.241$).
The multilevel multivariable analysis revealed that, age (per 5-year increase, Odds Ratio, OR, 1.14; 95% confidence interval, CI, 1.11–1.16; $p<0.001$) and the Elixhauser Comorbidity Score (OR 1.03, 95% CI 1.02–1.04, $p<0.001$) were significantly associated with a higher mortality risk in TAAD. In TBAD this was only true for the Elixhauser Comorbidity Score (OR 1.08, 95% CI 1.07–1.10, $p<0.001$). Sex was not significantly associated with mortality in TAAD and TBAD.

Conclusion - This is the first nation-wide analysis on hospital incidence and mortality for surgically treated TAAD and TBAD in Germany. Overall, hospital incidence and mortality of both types of AD increased over time. The in-hospital mortality was independently associated with the severity and amount of co-morbidities (assessed by the Elixhauser Score) for TAAD as well as TBAD. For TAAD, in-hospital mortality was also dependent on age.

O-033 EXPERIMENTAL EVALUATION OF ENDOVASCULAR FENESTRATION SCISSORS IN AN OVINE MODEL OF AORTIC DISSECTION

THORACIC & THORACO-ABDOMINAL DISEASES

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Introduction - To evaluate experimental feasibility of endovascular fenestration using specific endovascular scissor prototypes in an ovine model of acute aortic dissection (AD).

Methods - A previously described endovascular technique was used to create a model of acute type B AD in sheep. Endovascular fenestrations using either endovascular scissor prototypes or a long introducer were compared. Four prototypes of endovascular fenestration scissors were evaluated. Both validity of the experimental model of AD and technical success of endovascular fenestration were assessed by hemodynamic criteria, completion angiography, trans-esophageal echocardiography and post-procedural analysis of harvested aortas.

Results - Experimental acute AD was created by endovascular means in 17 sheep, with a technical success of 82%. Systolic blood pressure was lower in the false lumen as compared to that in the true lumen (58+/-5 vs 79+/-3 mmHg respectively, p<0.001). Endovascular fenestration was performed in 11 models (endovascular scissors n=8; long introducer n=3). Controlled endovascular fenestration was obtained by the use of endovascular scissors (n=5/8), resulting in a significant raise in false lumen systolic blood pressure after fenestration (60+/-2 vs 67+/-9 mmHg before and after fenestration respectively, p<0,047). Long introducer fenestration resulted in an uncontrolled flap motion, leading to either pseudo-coarctation syndrome or aortic rupture (58+/-6 vs 40+/-2 mmHg before and after fenestration respectively, p<0,001).

Conclusion - In this experimental study, a reproducible AD model has been developed in sheep using endovascular procedures exclusively to evaluate endovascular fenestration techniques. Endovascular fenestration using a long introducer appeared hazardous and risky in vivo. Endovascular scissors constitute a dedicated and suitable tool to perform a safe, controlled and effective endovascular fenestration in an ovine model.

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O-034 USEFULNESS OF AN ANGIOSCOPE AS A DIAGNOSTIC AND THERAPEUTIC TOOL DURING ENDOVASCULAR APPROACH FOR AORTIC DISEASE

THORACIC & THORACO-ABDOMINAL DISEASES

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Introduction - Endovascular repair for aortic disease is provided widely, but there is a limitation that it is impossible to perform the procedure under direct vision. For the purpose of overcoming this limitation, we have investigated the role and value of an angioscope as a diagnostic or therapeutic tool during aortic intervention since May 2015. We report our early experience of an angioscope during aortic intervention.

Methods - From November 2010 to March 2018, we treated 193 thoracic aortic diseases with thoracic endovascular aneurysm repair (TEVAR), including 79 aortic arch disease and 70 aortic dissection. We have used an angioscope as a diagnostic tool for aortic dissection as well as a therapeutic tool for aortic arch aneurysms. As a diagnostic tool, we have inserted an angioscope through the false lumen of the thoracic aorta, and have observed the presence or absence of type1a endoleak after endovascular entry closure. As a treatment tool, we have used an angioscope for the direct observation of procedure during TEVAR with in-situ fenestration for aortic arch aneurysm.

Results - Angioscope was used in 8 thoracic aortic cases. We have successfully visualized micro type 1a endoleak during TEVAR in 3 cases and a primary tear in 2 cases in aortic dissection. In addition, in 2 cases of TEVAR with in-situ fenestration for the aortic arch aneurysm, angioscopic image allowed us to observe the surface of the stent graft and was useful in avoiding puncturing the area adjacent to the metallic stent. No angioscope related complication was encountered.

Conclusion - An agioscope may be a useful tool in selected aortic intervention.

O-035 INCIDENCE AND PREDICTORS OF EARLY NEUROLOGICAL COMPLICATIONS FOLLOWING THORACIC ENDOVASCULAR ANEURYSM REPAIR IN THE GLOBAL REGISTRY FOR ENDOVASCULAR AORTIC TREATMENT (GREAT)

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Introduction - The aim of the study was to investigate incidence and predictors of 30-days neurological complications following thoracic endovascular aneurysm repair (TEVAR) in patients included in the Global Registry for Endovascular Aortic Treatment (GREAT).

Methods - The GREAT is a prospective observational multicenter cohort registry on Gore (Gore and Associates, Flagstaff, AZ-USA) aortic endografts that was initiated in 2010. Only those with isolated thoracic aortic pathology were included in the present analysis (aortic arch and descending thoracic aneurysms, type B dissections, penetrating ulcers, intramural hematomas, pseudoaneurysms and transections). Patients treated for thoraco-abdominal aneurysms or for concomitant abdominal aneurysm were excluded. Early (30-days) neurological complications were classified in cerebrovascular accidents (CVA) and spinal cord ischemia (SCI). Clinical and procedural data, as technical characteristics were evaluated for their association with CVAs and SCIs, using univariate analysis and multiple logistic regression.

Results - Among 895 patients of the registry treated with TEVAR, 833 with isolated thoracic aortic pathology were included in the analysis. Mean age was 64.8±14.1 years and 562 patients (67%) were male. There were 28 aortic arch aneurysms (3.3%), 328 descending thoracic aneurysms (39.3%), 273 type B dissections (32.7%) and 204 (24.4%) acute aortic syndromes. A short thoracic aorta coverage ≤15 cm was required in 46.5% of cases (10 cm: n=143, 17.1%; 15 cm: n=244, 29.2%), while 20 cm coverage in 18.8% (n=157) and >20 cm coverage in 34.7% of cases (n=289); distal landing below the celiac trunk was required in 3.3% of cases (n=27). A proximal landing zone 0-1 or 2 was adopted in 248 patients (29.7%) and of these, 116 (13.9%) patients underwent left subclavian artery (LSA) revascularization.
Early overall neurological complication rate was 3% (n=26), including 13 CVAs (1.5%) and 13 SCIs (1.5%), with a 99.6% procedure survival. An higher CVA rate was reported in cases with proximal landing zone 0-1 or 2 compared to zones 3 and 4 (3.2% vs 0.85%; P=.02) and in aortic arch aneurysms compared to other thoracic aortic pathologies (14.2% vs 1.1%; P<.001); LSA revascularization had no significant impact on CVAs (3.7% vs 2.7%; P=.74).
Length of coverage ≤15 was associated to a lower SCI rate compared to 20 cm (0.7% vs 3.1%, P=.04). Distal landing below the level of the celiac trunk (OR 0.93, 95%CI 0.05-16.12; P=.96) and LSA revascularization (OR 1.91, 95%CI 0.19-18.7; P=.57) were not associated to SCI.
At the multiple logistic regression, a length of coverage ≥20 cm (OR 3.68, 95%CI 1.36-9.92; P=.01) and proximal landing zone 0-1 or 2 (OR=2.41, 95%CI 1.06-5.48; P=.03) were independent predictor of overall neurological complications. Aortic arch aneurysm was the only independent predictor of CVAs (OR 16.83, 95%CI 2.93-96.81; P=.001); no independent predictors of SCI were identified.

Conclusion - In this real-world registry, overall neurological complication rate in patients undergoing TEVAR for isolated thoracic aorta pathologies was low. The benefit of LSA revascularization on SCI prevention is still controversial. Endograft for aortic arch aneurysm and landing proximally in zone 0-1 or 2 carries a significant higher CVA risk. A covering length ≥20cm is an independent predictor of neurological complications; however it is important to consider that moving from a 15 cm to 20 cm length of coverage there may already be a significant increase risk of SCI.

O-036 EMERGENCY USE OF BRANCHED THORACIC ENDOVASCULAR REPAIR IN THE TREATMENT OF AORTIC ARCH PATHOLOGIES

THORACIC & THORACO-ABDOMINAL DISEASES

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Introduction - Branched thoracic endovascular aortic repair (b-TEVAR) has revolutionized the treatment of aortic arch pathologies. However, b-TEVAR requires custom design and time for manufacturing, which limits its use in emergency situation.
Methods - We retrospectively studied a series of 11 patients, who underwent emergency b-TEVAR in our institution. Stentgrafts were either already available for the patient or from another patient with similar anatomy. Study endpoints were technical success, 30-day mortality, peri-operative complications, early re-interventions and subsequent image follow up.

Results - Between December 2012 and December 2017, 11 patients (5 male, age 67±14years) were treated emergently with b-TEVAR for type A dissection (n=2), peripheral malperfusion despite ascending repair in type A dissection (n=1), contained ruptured ascending aortic pseudoaneurysm (n=2), symptomatic arch aneurysm (n=4), and ruptured subclavian aneurysm (n=2). Three patients received their personal custom-made endografts but were hospitalized and treated urgently due to new symptom onset; while the remaining 8 were treated with endografts of other patients. Technical success was 100%. Thirty-day mortality was 9% (1/11). Perioperative complications included one major stroke (9%), one sepsis (9%), two respiratory failures (18%), one acute renal injury (9%) and one retroperitoneal hematoma (9%). There were three early stent graft related re-interventions. With median follow up period of 6 (range 1-28) months, two patients had persistent false lumen perfusion, while all supra-aortic branches remained patent.

Conclusion - Our experience demonstrated the feasibility and safety of b-TEVAR with inner branched arch endografts. in emergency situation. The endograft was versatile with potential off-the-shelf use in future.

O-037 ENDOVASCULAR AORTIC ARCH REPAIR WITH PROSTHETIC LANDING ZONE IN STANFORD TYPE A AORTIC DISSECTION

THORACIC & THORACO-ABDOMINAL DISEASES

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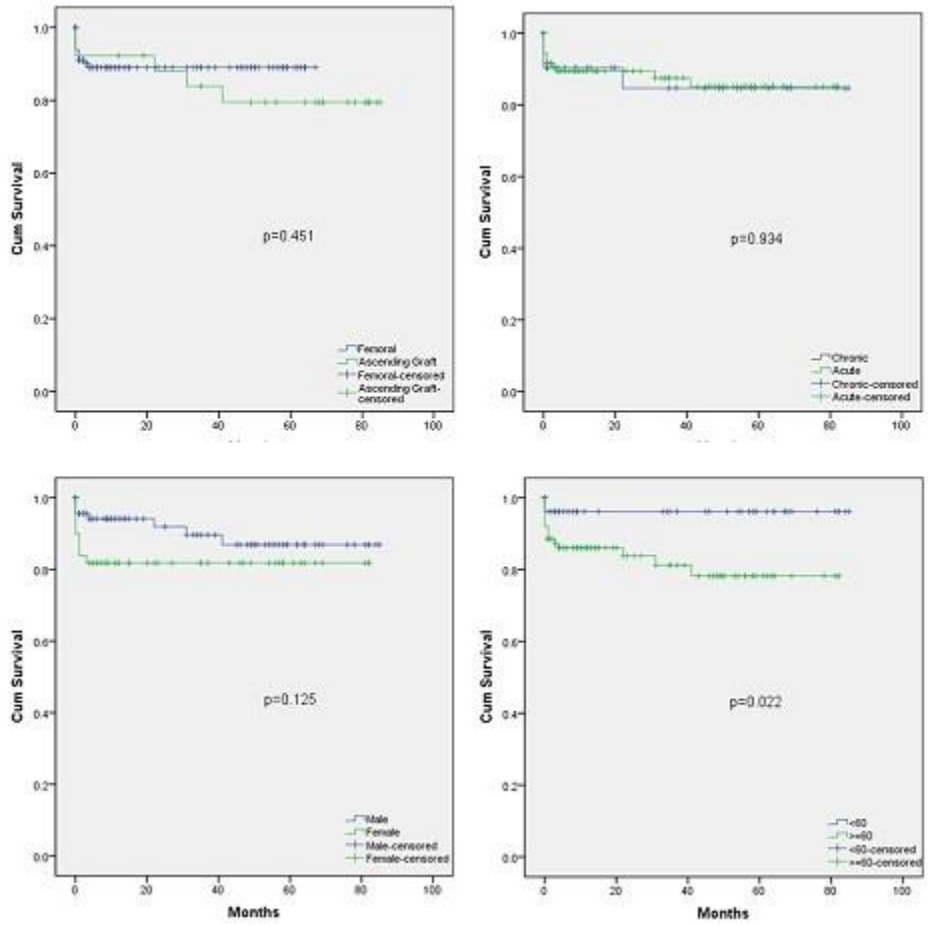
Introduction - Endovascular aortic arch repair is an emerging intervention for the treatment of aortic arch diseases. We report the outcomes from a prospective registry study of endovascular aortic arch repair with prosthetic landing zone for Stanford type A aortic dissection.

Methods - All endovascular aortic arch repair with prosthetic landing zone for Stanford type A aortic dissection performed between November 2009 and November 2016 were prospectively included in the single center registry study. The primary outcome was death from any causes.

Results - A total of 140 patients who were confirmed with Stanford type A aortic dissection involving aortic arch by CTA on admission were enrolled. The mean (±SD) age was 61.8±7.3 years; 35.7% of the patients were women. Either ascending graft branch approach (18.6%) or femoral artery approach (81.4%) was applied for delivery of endovascular grafts into aortic arch. The incidence of death at 30 days and 1 year were 6.4% and 10.3%, respectively. The incidence of radiological diagnosis of stroke and endoleak at 30 days were 3.6% and 7.1%. In multivariate models, patient age (≥60) was associated with reduced survival and antegrade deployment of endovascular graft through ascending graft branch was associated with increased risk of endoleak.

Image -



Conclusion - The results of this registry study revealed the clinical experience of endovascular aortic arch repair with prosthetic landing zone in patients with Stanford type A aortic dissection, in whom utilizing Dacron graft in ascending aorta as prosthetic landing zone for endovascular arch repair appeared to be a reasonable option with favorable clinical outcome and false lumen remodeling in aortic arch.

O-038 TECHNICAL FEASIBILITY OF ARCH BRANCHED ENDOGRAFT REPAIR IN TYPE A AORTIC DISSECTION WITH PRIOR ASCENDING AORTIC REPLACEMENT

THORACIC & THORACO-ABDOMINAL DISEASES

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Introduction - Ascending aortic replacement is a common emergency procedure for treatment of acute type A dissection. Secondary open or endovascular intervention for residual arch pathologies is however difficult due to adhesions, short prosthetic grafts, and distorted anatomy. Aortic arch branched stent graft has emerged as a potential solution for these patients. The aim of this study is to evaluate the technical feasibility of two current aortic arch branch stent grafts in patients who had prior ascending aortic replacement.

Methods - All patients who had a prosthetic ascending aortic replacement for acute type A dissection in a single institution between January 2013 and December 2017 were included. Contrast CT images on follow up were analyzed on a 3D workstation. Morphologic parameters were measured individually including: (i) Ascending aorta: diameter, greater and lesser curvature length from the coronary origin, angulation of residual ascending aorta and prosthetic graft. (ii) aortic arch: width and height of the arch, tortuosity index. (iii) supra-aortic branches: diameter, separation, sealing length, dissection, and take-off clock positions. Each patient's CT scan was individually evaluated for anatomical suitability for the Zenith arch branched device (Cook Medical) and Relay double-branch device (Bolton Medical) according to set selection criteria. Adverse anatomical factors were further identified including prosthetic aortic valve replacement, insufficient proximal landing length, incompatible landing zone diameter, severe angulation of prosthetic ascending aorta, hostile arch branches sealing zone, and insufficient innominate artery (IA) sealing zone.

Results - CT images from 56 subjects (45 males, mean age 57±10.8 years) were reviewed. 45 patients had ascending aortic replacement alone, 7 had a Bentall procedure, and 4 underwent David procedure. Based on our evaluation results, 23 patients (41.1%) were good candidates for an endovascular arch branched device. It should be mentioned that two patients were suitable for Relay double-branch device but not for Zenith branched device because the former displays more accommodating for larger proximal landing diameter (<43mm) than the latter (<38mm). Eleven patients (19.6%) were deemed feasible, but prudent pre-operative planning is required due to complicated anatomy. The other 22 patients (39.3%) were unsuitable due to one or more exclusive criteria. Short prosthetic grafts (8), extreme graft angulations (11) and dissected supra-aortic branches (15) were the main reasons for exclusion.

Conclusion - Endovascular repair is technically feasible in patients with prior ascending aortic replacement for type A dissection. Incompatible prosthetic ascending aorta and dissecting arch branches are the most common exclusive risk factors.

O-039 MID-TERM RESULT OF THORACIC ENDOVASCULAR AORTIC REPAIR IN OCTOGENARIANS AND NONAGENARIANS

THORACIC & THORACO-ABDOMINAL DISEASES

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Introduction - Thoracic endovascular aortic repair (TEVAR) is expected to benefit old patients with high operative risk. We investigated the outcome of TEVAR in octogenarians and nonagenarians.

Methods - From May 1997 through December 2017, 638 patients had undergone TEVAR for TAA or AD in our hospitals. We retrospectively reviewed the medical records of 113 patients aged 80 years or older (17.7%) among them.

Results - There were 78 men and 35 women. The mean age was 83.4±3.1 years (mean±standard deviation). Emergent TEVAR was performed in 28 patients (25.7%). Mortality rate and the rate of mortality plus morbidity calculated using STS score were 6.6±5.1% and 25.8±13.9%, respectively. Operative mortality rate calculated using euroSCORE was 11.7±10.9%. Combined procedure such as debranch or chimney, were performed in 25 patients (22.1%). The mean follow-up term was 23.5±21.1 months. Overall survival rate was 96.4% at 1 month, 94.5% at 3 months, 88.1% at 1 year, and 83.7% at 3 years. Regarding patients undergoing elective TEVAR, overall survival rate was 98.8% in 1 month and 3 months, 91.9% at 1 year, and 88.4% at 3 years. Excluded 6 patients whose discharge to unknown, 107 patients were analyzed about discharge to home or not. After logistic regression, two negative predictors, emergency and combined procedure, were identified for discharge to home.

Conclusion - TEVAR in octogenarians and nonagenarians seems to be acceptable in terms of life prognosis. Emergency and combined procedure were the negative predictors of home discharge.

O-040 MIDTERM OUTCOMES OF STENT-ASSISTED BALLOON-INDUCED INTIMAL DISRUPTION AND RELAMINATION IN AORTIC DISSECTION REPAIR (STABILISE) IN ACUTE TYPE B AORTIC DISSECTION

THORACIC & THORACO-ABDOMINAL DISEASES

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Introduction - This article reports midterm results of 41 patients treated with Stent-Assisted Balloon-Induced Intimal Disruption and Relamination (STABILISE) Technique for acute type B aortic dissection.

Methods - Between November 2011 and November 2017, 41 patients (10 male; median age, 50 years) underwent proximal descending aortic stentgrafting plus stent-assisted balloon-induced intimal disruption of the thoracoabdominal aorta for acute type B aortic dissection. Serial computed tomography angiography was used to assess aortic remodeling.

Results - There were no intraprocedural complications. Fifteen branches arteries supplied by the false lumen were stented (9% of the visceral branches arteries). Thirty-day incidence of death, stroke, and paralysis/visceral ischemia was 2% (n=1), 0%, 5% (n=2), 2% (n=1) respectively. During a median follow-up of 12 months (range, 1 to 168), 8 patients (20%) required reintervention. Primary visceral stent patency was 93% (n=14). No aortic-related deaths occurred. At latest CTA, complete false lumen obliteration and aortic remodeling was obtained in all patients at the thoraco-abdominal level, and in 39% (n=16) at the unstented infrarenal aortoiliac level. Maximal aortic diameter increased only in 2 patients (5%) at the unstented infrarenal level.

Conclusion - The STABILISE technique is safe and reproducible to obtain immediate and durable thoraco-abdominal aortic remodeling in acute type B dissections, while not compromising patency of collateral branches.

O-041 LOW DOSE PROTOCOLS FOR CATHETER-DIRECTED THROMBOLYSIS IN PERIPHERAL ARTERIAL OCCLUSIONS MAY RESULT IN FEWER BLEEDING COMPLICATIONS

PERIPHERAL ARTERAL DISEASES

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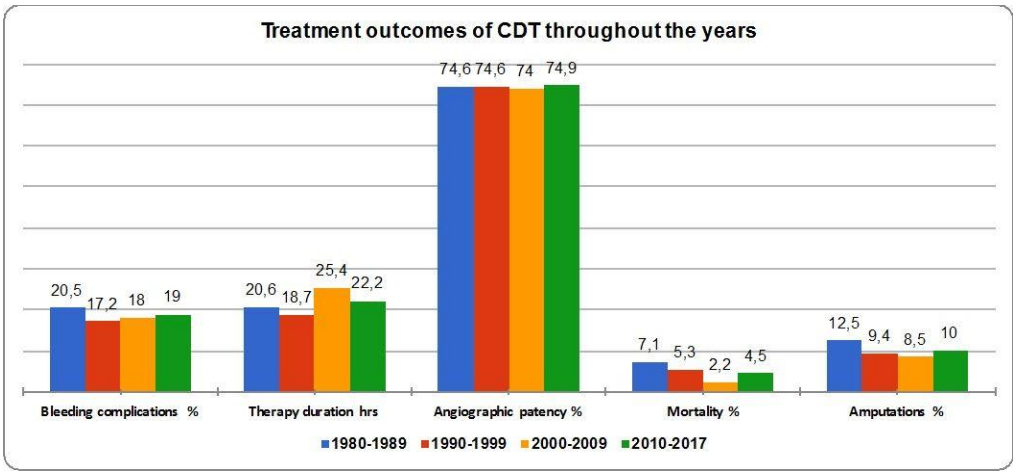
Introduction - Since its introduction as an alternative treatment for open balloon thrombo-embolectomy in the 1990s, thrombolytic treatment for acute arterial occlusive disease has matured in multiple directions. Currently there is no consensus on the optimal fibrinolytic agent nor dose regimens to use. Urokinase (UK) and (recombinant) tissue plasminogen activator ((r)tPA) are the most effective agents but neither of these have shown to be superior. Protocol regimens and techniques are heterogeneous and need optimization to improve results and lower the risk of bleeding complications. A systematic review of the results and outcomes of different catheter-directed thrombolysis (CDT) protocols for patients with peripheral arterial occlusions was performed.

Methods - Electronic information sources (MEDLINE, EMBASE, COCHRANE) and reference lists were searched to identify studies reporting results of thrombolytic therapy of peripheral arterial occlusions.
Two independent observers selected studies for inclusion, assessed the methodological quality of the included studies, and performed the data extraction. Primary outcomes were treatment duration, angiographic success rate and bleeding complications. Secondary outcomes were early- and late mortality and amputation rates. Studies were grouped in high and low dose protocols. A high-dose was defined as ≥75,000 IU urokinase, ≥0.8 mg (r)t-PA or ≥1.0 U rt-PA, a low-dose defined as <75,000 IU urokinase or <0.8 mg (r)t-PA or <1.0 U rt-PA. Results were evaluated over time per decade. The weighted means (95% confidence interval; CI) were used to present outcome data. Pooled weighted mean results for reported patient outcomes were presented for all included studies.
Results - One hundred and six studies were included, 19 RCTs, 38 prospective-, 48 retrospective and 1 mixed cohort. The studies comprise a total number of 10,643 cases of which 9,877 received catheter-directed thrombolysis for lower extremity arterial

occlusion. Heterogeneity of included studies is high and formal meta-analysis could not be performed. CDT is effective with an angiographic success rate of 75%. When stratified for time period the results do not improve over time but remain comparable over the years (figure 1). Pooled results suggest faster thrombolysis with higher doses of fibrinolytics (high dose 21.9 hours, 95% CI 21.4-22.5; low dose 32.7 hours, 95% CI 31.4-34.0). Angiographic patency (high dose 74.9%, 95% CI 74.5-75.4; low dose 74.1%, 95% CI 73.8-74.4), mortality- (high dose 3.8%, 95% CI 3.7-4.0; low dose 3.5%, 95% CI 3.4-3.7) and amputation rates (high dose 9.6%, 95% CI 9.4-9.8; low dose 8.6% 95% CI 8.3-8.9) were comparable. Pooled mean rates for bleeding complications are lower in low-dose protocols (13.4%; 95% CI 12.8-14.0) compared to high-dose protocols (17.1%; 95% CI 16.7-17.5).

Image -



Conclusion - Results of catheter-directed thrombolysis for peripheral arterial occlusions have not improved over the past 30 years. This study indicates that low dose protocols for thrombolysis have the same clinical outcome at the cost of longer treatment duration but with lower risk of bleeding complications.

O-042 PROPENSITY SCORE MATCHED ANALYSIS INDICATED THAT INSULIN-DEPENDENT DIABETIC PATIENTS HAVE MORE BENEFIT OF DRUG COATED BALLOON ANGIOPLASTY IN THE TREATMENT OF CHRONIC LIMB THREATENING ISCHEMIA

PERIPHERAL ARTERAL DISEASES

Author(s) - Mohammad Abualhin*[1], Rodolfo Pini[1], Cecilia Angherà[2], Alessia Sonetto[1], Paolo Spath[1], GianLuca Faggioli[1], Andrea Stella[1], Mauro Gargiulo[1]

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Introduction - There is an increasing evidence on efficacy of drug coated balloons(DCB) in reducing restenosis and reocclusion after endovascular treatment of peripheral arterial disease(PAD), especially in the femoro-popliteal district but DCB use is discouraged by its high cost. The aim of the study was to identify subgroups of patients with chronic limb threatening ischemia (CLTI) that can benefit more from DCB than others and thus, perform a better resources management.

Methods - A propensity score matched analysis was performed on a prospectively maintained database, including all patients treated for PAD between January-2014 and December-2017. Inclusion criteria were: CLTI, infrainguinal PAD and endovascular treatment. Patient's demographics and clinical characteristics were assessed. Limbs were stratified according to WIfI clinical stages. Clinical and Duplex follow-up was performed at 3,6 and every 6 month thereafter. A propensity score analysis was used to match all DCB treated patients to balloon angioplasty(BA) patients in a 1:1 nearest neighbour matching method. The matching variables were: age, diabetes, Rutherford stage, treated arterial segment (femoral, tibial and femoro-tibial) and type of lesion (primary vs. restenosis/reocclusion). Endpoints were: Limb Salvage(LS), Primary(PP), Assisted(AP) and Secondary Patency(SP),

Patient Survival(S), wound healing (WH) and identification of subgroups susceptible to DCB on the basis of Kaplan-Meier analysis and Log-Rank test.

Results - A total of 211 patients satisfying the inclusion criteria were treated in the study period. DCB was used in 60 cases (median age 72 years, male 76.7%). Sixty (median age 73 years, male 66.7%) out of 151 cases treated by POBA were selected, based on the propensity score matching. DCB and POBA groups were similar in terms of Coronary artery disease (47% Vs 50%. P=0.43), insulin-dependent diabetes(IDD) (40% Vs 27%. P=0.09), kidney disease (45% Vs 60%. P=0.07), Rutherford stages 5/6 (87% Vs 88%. P=0.41), and WIfI clinical stages (stage 3: 37% Vs 42%; stage 4: 31% Vs 27%; P=0.92).
In the overall population, femoral, tibial and femoro-tibial lesions were treated in 44%, 49% and 7%, respectively. Lesion type was primary in 73% and restenosis/reocclusion in 27%. The mean follow-up was 21.5 months. WH was 54%, 75% and 85.7% at 6,12 and 24-month, respectively. LS was 87.2%, 86.1% and 84.7% at 6,12 and 24-month, respectively. PP, AP, SP, and S are reported in table 1. At Cox-regression analysis, IDD was an independent negative predictor of LS (HR=3.4, P=0.011). Within IDD patients, at 1-year, those treated by DCB had significantly higher rates of LS (81.1% Vs 56.3%, P=0.05), AP (80% Vs 50%, P=0.04) and SP (85% Vs 56%, P=0.029).

Table 1: endpoints at 6,12 and 24-month

	PP (%)	AP (%)	SP (%)	S (%)
6-month	80	81.8	85.3	89.8
12-month	73.5	75.1	83.1	85.6
24-month	68	72.4	81.1	74.6

Conclusion - The study results suggest a more beneficial effect of DCB in the treatment of infrainguinal PAD associated with CLTI in insulin-dependent diabetes patients. In a limited resources assets, insulin-dependent patients could represent a reasonable target for DCB technology.

O-043 RUPTURED POPLITEAL ANEURYSMS: CLINICAL PRESENTATION AND OUTCOME IN A NATIONWIDE, POPULATION-BASED STUDY

PERIPHERAL ARTERAL DISEASES

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Introduction - Popliteal aneurysms (PA) are complicated by thrombosis and distal embolization, whereas rupture is rare. The aim of this study is to describe the clinical characteristics and outcome in a relatively large cohort of patients with ruptured PA (rPA).

Methods - Operations for rPA were identified in the national vascular registry, 1987-2012. The registry is automatically linked to the population registry, permitting accurate long-term data on survival. Medical records were reviewed, as well as all imaging in a core facility. Comparisons with patients treated for PA without rupture were performed.

Results - Forty-five patients with rPA were identified. The proportion of rupture among all those operated on for PA was 2.5 %. Compared with patients treated for other indications, the patients with rupture were eight years older (77.7 versus 69.7 years, p<0.001), had more lung and heart disease (p=0.003 and 0.023), and the mean diameter was larger, 63.7 mm versus 30.9 mm (p <0.001). There was no correlation between age and diameter (Pearson r= 0.046, p=0.777). At the time of surgery, 49% (22/45) were treated with anticoagulants, seven on indication deep venous thrombosis (DVT) in the affected leg. There was extensive swelling of the whole leg in 44.4% (20/45). In 27 (60%) patients, the initial diagnosis was DVT or a Baker's cyst. The initial diagnosis was rPA (i.e. correct) in only eight cases (17.8%), half of whom had a previously known diagnosis of PA.

Most patients were operated on by open surgery through the medial approach. Fasciotomi was performed in twelve (26.7%). There were four amputations (8.9%), all performed within a week of surgery. One year after surgery, 58% (26/45) of the patients were alive. Among those, the reconstructions were patent in 83% (20/24).

Conclusion - The diagnosis of rPA is difficult, and the initial diagnosis is often incorrect. The condition affects old patients, who often are on anticoagulation treatment, and have large aneurysms. The immediate surgical results are acceptable, but the condition is associated with a high mortality within the first year.

O-044 OUTCOMES OF OCTOGENARIANS IN OPEN LOWER EXTREMITY REVASCULARIZATION

PERIPHERAL ARTERAL DISEASES

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Introduction - Open vascular surgical outcomes in octogenarians are controversial. Octogenarian patients are often not considered suitable candidates for open revascularization due to their advanced cumulative risk factors of smoking, hypertension, hyperlipidemia, diabetes mellitus, and obesity increasing their perioperative and postoperative risks which may be associated with a higher mortality rate. The aim of this study was to examine the differences in outcomes between non-octogenarians and octogenarians following lower extremity bypass surgeries.

Methods - The lower extremity open procedure-targeted American College of Surgeons National Surgical Quality Improvement Program (NSQIP) database was queried in this study using data from 2011-2014. Analyses were performed separately on patients undergoing lower extremity bypass surgery (femoral-distal, popliteal-distal, and femoral-popliteal bypass). Disease, patient, clinical, and procedural characteristics were evaluated using univariate and bivariate analyses (student t, χ^2, and Fisher's exact tests). Independent risk factors and trends of 30-day postoperative outcomes of interest (mortality, readmission, loss of patency [LOP], and wound infection) were assessed using multivariate logistic regression.

Results - The analysis included 2359 femoral-distal bypass patients (19.8% ≥80 years of age); 763 popliteal-distal bypass patients (16.51% ≥80 years of age); and 4894 femoral-popliteal bypass patients (14.22% ≥80 years of age). Thirty-day mortality was low in all surgery types (1.02% femoral-popliteal; 1.97% popliteal-distal; and 1.31% femoral-distal). Age was not found to be a significant predictor of our outcomes of interest in either the femoral-distal or popliteal-distal bypass cohorts. In the femoral-popliteal bypass cohort however, age ≥80 years was an independent predictor of mortality (OR 3.93, 95% CI 2.22-6.98, p<0.001). Emergent procedures (OR 3.15, 95% CI 1.5-6.89, p=0.004) and pre-operative wound infection (OR 2.41, 95% CI 1.36-4.27, p=0.002) were also important predictors of mortality. Age was found to be an independent predictor of LOP (OR 2.2, 95% CI 1.33-3.65, p=0.002), readmission (OR 1.29, 95% CI 1.02-1.64, p=0.033), and postoperative wound infection (OR 1.74, 95% CI 1.45-2.07, p<0.001). A statistically significant trend was found for increasing BMI and risk of readmission (p<0.001).

Conclusion - Age ≥80 years old is a significant independent predictor of mortality, loss of patency, readmission, and wound infection following femoral-popliteal bypass surgery. Smaller sample size and power restrictions limited our ability to analyze the femoral-distal and popliteal-distal subgroups. Given a mortality odds ratio of 3.93, yet also a low overall 30-day mortality, it may be useful to consider the benefit in quality of life of this procedure while also examining therapeutic alternatives for severe PAD in this older age group.

O-045 INTERNATIONAL VARIATIONS IN AMPUTATION PRACTICE – A VASCUNET REPORT

PERIPHERAL ARTERAL DISEASES

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Introduction - To study international differences in incidence and practice patterns as well as time-trends in lower limb amputations related to peripheral arterial disease and/or diabetes mellitus.

Methods - Data on lower limb amputations during 2010-2014 were collected from population-based administrative data from countries in Europe and Australasia participating the VASCUNET collaboration. Amputation rates, time-trends, in-hospital or 30-days mortality and reimbursement systems were analysed.

Results - Data from 12 countries covering 259 million inhabitants in 2014 were included. Individuals aged ≥65 years ranged from 4.2% (Slovakia) to 20.7% (Germany) and diabetes prevalence among amputees from 25.7% (Finland) to 74.3% (Slovakia). Mean incidence of major amputation varied between 7.2/100 000 (New Zealand) to 41.4/100 000 (Hungary) with an overall declining time-trend with the exception of Slovakia, while minor amputations increased over time. The older age group (≥65 years) was up to 4.9 times more likely to be amputated compared to those younger than 65 years. Reported mortality rates were lowest in Finland (6.3%) and highest in Hungary (20.3%). Countries with a fee for service reimbursement system had lower incidence of major amputation compared to countries with a population based reimbursement system (14.3/100 000 versus 18.4/100 000, respectively, $p<0.001$).

Conclusion - This international audit showed large geographical differences in major amputation rates, almost by a factor six, and an overall declining time-trend during the four-year observation of this study. Diabetes prevalence, age distribution and mortality rates were also found to vary between countries. Despite limitations attributable to registry data, these findings are important, and warrant further research on how to improve limb salvage in different demographic settings.

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O-046 PERIPHERAL ARTERY IMAGING BY CONTRAST-ENHANCED 3D TOMOGRAPHIC ULTRASOUND

PERIPHERAL ARTERAL DISEASES

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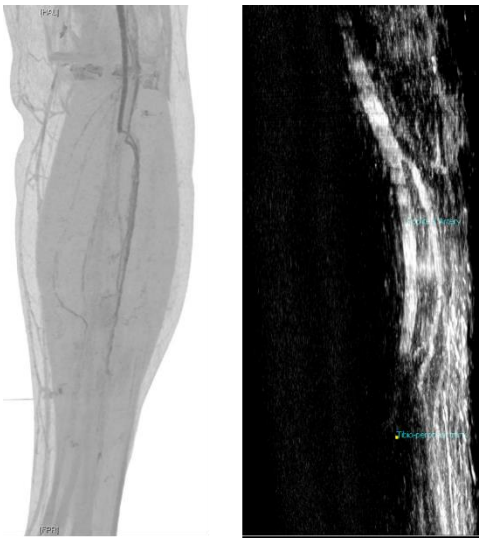
Introduction - High quality below knee arterial imaging is essential prior to femoral-distal bypass or calf artery angioplasty [1]. Contrast-enhanced tomographic ultrasound (CEtUS) using sulphur hexafluoride (Sonovue) is a novel and entirely safe 3-D imaging modality, with no exposure to ionising radiation or nephrotoxic contrast. We compared CEtUS and angiography for imaging the arteries below the knee.

Methods - Symptomatic patients investigated using CT, MR or catheter angiography prior to peripheral arterial procedures, underwent CEtUS the same week. Bolus injections of Sonovue (1.5ml) were given intra-venously with a maximum of 5mL administered/patient. CEtUS and angiography images were then compared using the validated Society of Vascular Surgery (SVS) run off score, assuming angiography to be the gold standard. Angiograms were reported by a Consultant Vascular Radiologists.
Results - 191 vessels were imaged in 42 patients of median weight 78.1±13.3Kg 9 were diabetic. CEtUS was compared with 7 catheter, 13 CT and 20 MR angiograms. The mean SVS scores for the popliteal and tibio-peroneal trunk by CEtUS were 1.10±1.28

and 0.51±1.06 compared to 0.99±1.30 and 0.78±1.25 by angiography. Mean SVS score for the anterior tibial, posterior tibial and peroneal artery by CEtUS are 1.01±1.03, 1.71±1.22 and 1.46±1.32 compared to 0.68±1.01, 1.34±1.32 and 1.06±1.26 by angiography. For the Plantar arch and Dorsalis pedis the mean SVS scores by CEtUS were 2.0±2.12 and 2.0±0.0 with scores of 2.25±1.03 and 2.5±0.0 by angiography. There were 21 instances where CEtUS demonstrated severe arterial stenosis or occlusion not reported on angiography. Conversely there were 12 instances where angiography demonstrated severe stenosis or occlusion but CEtUS did not. There was a good correlation between CEtUS and the various angiogram types, r = 0.67 (95%CI 0.58–0.74), p<0.0001.
(Figure 1. The tibio-peroneal trunk, which appeared occluded on MRa (left) was clearly patent on CEtUS (right).)

Image -



Conclusion - As surgeons can see and interpret CEtUS images themselves and as CEtUS is entirely safe, CEtUS may ultimately replace peripheral angiography. CEtUS is now routinely used in our service to identify target distal arteries for reconstruction.

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O-047 FEMALE GENDER WAS ASSOCIATED WITH IMPROVED CLINICAL OUTCOMES AT 1 AND 3 YEARS IN THE BYPASS VERSUS ANGIOPLASTY IN SEVERE ISCHAEMIA OF THE LIMB TRIAL

PERIPHERAL ARTERAL DISEASES

Author(s) - Ruth A. Benson[*1, 2], Lewis Meecham[2], Catherine Hewitt[2], Andrew Bradbury[2]

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Introduction: Retrospective cohort studies have suggested that women are more likely to suffer from worse outcomes following peripheral arterial interventions. However, this has never been examined within the confines of a randomised controlled trial. The aim of the present study, therefore, was to examine the relationship between gender in the Bypass versus Angioplasty in Severe Ischaemia of the Leg (BASIL) trial which compared a bypass surgery (BSX) first with a balloon-angioplasty (BAP) first revascularisation strategy for severe limb ischaemia (SLI) due to infrainguinal disease.
Methods - Data were obtained from BASIL trial case record forms. Cox proportional hazard models were used to examine the relationship between amputation free survival (AFS), freedom from major adverse limb events (FF-MALE) and overall survival (OS) at 1 and 3 years and primary intervention, gender, age, clinical presentation and ankle to brachial pressure index (ABPI).

Results - 452 patients were randomised between 1999-2004 (228 to a BSX-first and 224 to a BAP-first strategy) of whom 128/269 men and 67/183 women had BSX as their primary intervention. Women were older (74.2 vs 71.8 years, p ≤0.05 95% CI -4.0 - -0.7), less likely to be smokers or have diabetes, and more likely to have untreated hypercholesterolaemia. Baseline creatinine was significantly higher in men (119 µmol/L vs 102 µmol/L, p<0.05, CI 5.1-28.9). ABPI and severity of clinical presentation was similar between men and women as were length of hospital stay and 30-day complications. At 1 year women had better AFS (HR 0.58 (CI 0.35, 0.95), p=0.03), but there were no differences in survival or re-intervention. At 3 years women had better AFS (HR 0.55 (CI 0.37, 0.84), p=0.01) and OS (HR 0.54 (0.34, 0.87), p=0.01) and there was a trend towards better FF-MALE.

Conclusion - These results suggest that men and women presenting with SLI have different risk factors. The data also suggest that in a cohort of people with SLI treated within an RCT, long-term outcomes are better for women than for men. Further analysis of data from on-going trials such as BASIL 2 and 3, and BEST-CLI will be required in order to fully define the relationship between gender and outcome in patients presenting with chronic limb threatening ischaemia (CLTI).

O-048 COMPARISON OF AMPUTATION FREE SURVIVAL IN PATIENTS WITH DIABETES MELLITUS AND PERIPHERAL ARTERIAL DISEASE WITH HEEL ULCER TREATED BY ENDOVASCULAR VERSUS OPEN VASCULAR SURGERY

PERIPHERAL ARTERAL DISEASES

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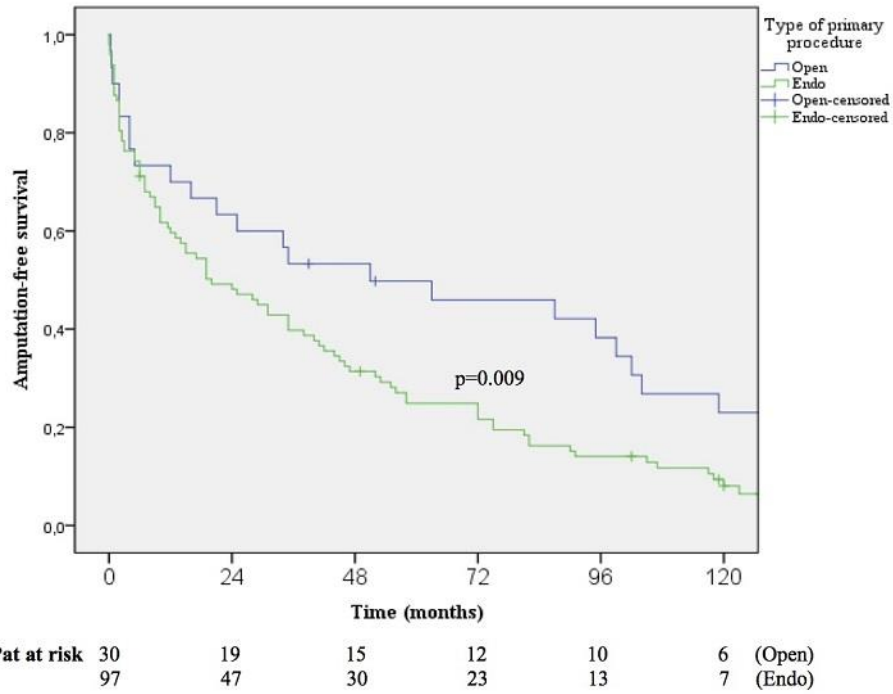
Introduction - Heel ulcers in patients with diabetes mellitus (DM) and peripheral arterial disease (PAD) constitute a clinical challenge. The trend in several countries is to treat a higher proportion of patients with endovascular therapy instead of open vascular surgery. The outcome of this shift has not yet been studied. The main aim of the present project was to evaluate the difference in amputation-free survival (AFS) in patients with DM and PAD with heel ulcers undergoing open versus endovascular revascularization.

Methods - From January 1st 1983 to December 31st 2013 a total of 4,273 patients with DM presented with a foot ulcer at the multidisciplinary diabetes foot clinic at a tertiary referral center. Out of 844 patients with heel ulcers 127 underwent vascular intervention.

Results - Median patient age was 71 years, and 41.7% were women. Patients were treated with endovascular intervention (n=97) or open vascular surgery (n=30). The proportions of healed heel ulcers after endovascular and open vascular surgery were 59.8% and 75.9%, respectively (p=0.12). Kaplan-Meier analysis (Figure 1) showed that AFS was higher in patients undergoing open vascular surgery compared to the endovascular group (p=0.009). Multivariate analysis showed that open vascular surgery (HR 2.1, 95% CI 1.1-3.9; p=0.025) was an independent factor associated with higher AFS. The proportion of patients undergoing endovascular therapy in the former (1983-2000) time period was 47.4% compared to 88.8% in the latter (2001-2013) time period (p<0.001).

Image -



Conclusion - Among patients with DM and PAD with heel ulcer, AFS was higher after open vascular surgery whereas the proportion of endovascular treatment increased during the study period. These results might suggest that open vascular surgery should be offered more often than currently performed in these patients.

O-049 DECALCIFICATION OF HEAVILY CALCIFIED FEMORAL BIFURCATION USING CAVITRON ULTRASONIC SURGICAL ASPIRATOR - MID-TERM RESULTS

PERIPHERAL ARTERAL DISEASES

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Introduction - We previously reported a decalcification procedure for heavily calcified common femoral artery (CFA) and its bifurcation that utilizes a Cavitron ultrasonic surgical aspirator (CUSA) (EJVES Short Rep. 2017). In the present study, we evaluated mid-term results of treated patients.

Methods - This was a single-center retrospective analysis of all patients who underwent our decalcification procedure by CUSA. The follow-up protocol included femoral pulse and ankle-brachial pressure index (ABI) measurements every 6 months, while imaging assessments including computed tomography angiogram (CTA) or duplex ultrasound scanning were performed annually. Curved planar reformation (CPR) images obtained by CTA were employed to determine pre- and post-operative vessel lumen diameters.

Results -Twenty-six patients (85% male) with a median age of 71 years [interquartile range (IQR) 66-76 years], of whom 62% had diabetes and 50% were on hemodialysis [median duration 112 (IQR 63-168) months], underwent a total of 31 procedures for decalcification of the CFA and its bifurcation using CUSA. The indication was claudication in 22 (71%), rest pain in 3 (10%), and tissue loss in 6 (19%) cases. A concomitant profundaplasty was performed in 13. One patient had an intraoperative complication of arterial wall perforation and another had a wound infection requiring re-intervention. Two minor wound complications were treated conservatively. Technical success was achieved in 100% of the cases, with a mean postoperative increase in ABI of 0.27±0.25, and all but 1 (97%) patient showed symptom improvements. Over a median follow-up period of 19 (IQR 6.4-34.4) months, freedom from restenosis at 2 years was 100%, while limb preservation and patient survival at 2 years were 92% and 83% respectively. The minimal inner diameter of the CFA and distal end of the treated lesion (DFA) were increased after the procedure, with a mean increase of 7.7±2.0 and 2.8±2.1 mm, respectively, shown in the latest follow-up scan images.

Conclusion - Decalcification utilizing CUSA for a heavily calcified femoral bifurcation is a promising procedure. Additional studies are needed to establish the long-term effectiveness and identify patients who can benefit.

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O-050 POSTOPERATIVE MORTALITY AFTER LOWER LIMB REVASCULARIZATION IN DENMARK – A 15 YEAR LONG NATIONWIDE HISTORICAL COHORT STUDY

PERIPHERAL ARTERAL DISEASES

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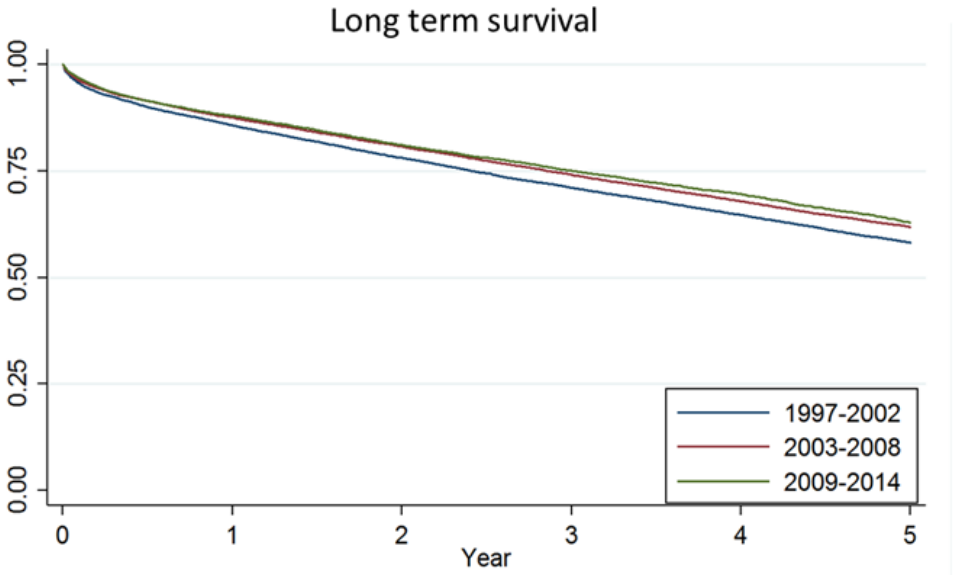
Introduction - In the nineties, high risks of postoperative mortality following lower limb revascularization were reported. However, the number of reports after the introduction of secondary medical treatment, endovascular procedures and improved postoperative care are sparse.
The primary objective of this historical cohort study was to report and compare postoperative mortality after 30 days, 3 months and 5 years after lower limb revascularization in three time periods from 1997-2014. The secondary objective was to identify negatively and positively associated risk factors for postoperative mortality.

Methods - Data on patients ≥ 50 years of age with peripheral arterial disease undergoing revascularization (open surgery, endovascular-, and hybrid procedures) from 1997─2014 were subtracted from the Danish Vascular Registry and linked with information from population-based health care and administrative databases.
Considered potential risk factors were; time period, age, gender, smoking habits, indication for revascularization, central vs. peripheral reconstruction, comorbidities, secondary medical treatment (platelet inhibitors and lipid-lowering drugs), and socioeconomic variables.
Multivariate logistic regression was used to identify risk factors for postoperative mortality within 30 days and 3 months, while multivariate Cox proportional hazards regression was used to evaluate the association between long term mortality and potential risk factors. All independent variables were introduced in the models. Cases with missing data were excluded. Results were expressed both as crude and adjusted odds ratios and hazard ratios, respectively.

Results - A total of 35327 patients had revascularization. The overall mortality was 18466 (53.3%), divided by 30 days, 3 months and 5 years postoperatively it was 1247 (3.5%), 2245 (6.4%) and 12236 (34.6%), respectively.
There was no change in long term mortality between the three periods (figure 1, p = 0.560).
As expected for the crude OR, there was a significant decrease in short term mortality over the three periods (p ≤0.001). However, when adjusting for the potential confounders, there was a significant increase in mortality after 3 months during the three periods (adjusted OR 1.11(95% CI 1.04-1.19), p = 0.003).
Endovascular treatment was associated with a lower 30 days and 3 months postoperative mortality (both p≤0.001). However, there was no significant difference in long term mortality (p = 0.152).

Older age, male sex, smoking, critical lower limb ischemia, hypertension, cardiovascular disease and diabetes were all associated with increased long term mortality (all had a p-value ≤ 0.001), whereas higher education, marriage and the use of secondary medical treatment significantly lowered the risk (all had a p-value ≤0.002).

Image -



Number at risk	0 year	1 year	3 years	5 years
1997–2002	10 699	9174	7608	6220
2002–2008	11 655	10210	8644	7210
2009–2014	12 249	9117	4776	1347

Conclusion - No change in long term mortality following revascularization was found, although the use of secondary medical treatment increased. Several negatively and positively associated risk factors were identified.

O-051 BARRIERS AND ENABLERS TO WALKING IN INDIVIDUALS WITH INTERMITTENT CLAUDICATION: A SYSTEMATIC REVIEW

PERIPHERAL ARTERAL DISEASES

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Introduction - Walking limitation is prevalent in patients with peripheral arterial disease (PAD) and intermittent claudication (IC) resulting in poor disease outcomes. Identifying and examining barriers to walking may be an important step in developing a comprehensive patient-centered self-management intervention to promote walking in this population. The study aim to systematically review the literature regarding barriers and enablers to walking exercise in individuals with IC

Methods - A systematic review was conducted utilizing integrative review methodology. Five electronic databases and the reference lists of relevant studies were searched. Findings were categorized into personal, walking activity related, and environmental barriers and motivators/facilitators using a social cognitive framework

Results - Seventeen studies including quantitative (n=11), qualitative (n=5), and mixed method (n=1) designs, and reporting data from a total of 3023 patients with IC, were included in the review. The most frequently reported barriers to engaging in walking were comorbid health concerns, walking induced pain, lack of knowledge about the disease pathology and walking recommendations, and poor walking capacity. The most frequently reported enablers were receiving specific walking instructions, cognitive coping strategies, perceived improvement, and good support systems. Findings suggest additionally that wider behavioral and environmental obstacles should be addressed in a patient-centered self-management intervention.

Conclusion - This review has identified multidimensional factors influencing walking in patients with IC. Within the social cognitive framework, these factors fall within patient level factors (e.g. comorbid health concerns), walking related factors (e.g. claudication pain), and environmental factors (e.g. support systems). These factors are worth considering when developing self-management interventions to increase walking in patients with IC

O-052 AN ANALYSIS OF LONG-TERM OUTCOMES IN VASCULAR PATIENTS REQUIRING MINOR AMPUTATIONS WITH REGARDS TO THE TIMING OF REVASCULARISATION AT A MAJOR METROPOLITAN HOSPITAL

PERIPHERAL ARTERAL DISEASES

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Introduction - Vascular patients who present with tissue loss requiring minor amputations could be an early sign of a terminal event. Based on current literature, the long-term outcomes for these patients are not well-studied. This study aims to determine if there is a difference in long-term outcomes between patients who have had revascularisation before and after minor amputations.

Methods - A retrospective analysis of 200 consecutive vascular patients who required minor amputations between 2010 and 2015 at a major metropolitan hospital. Patients were followed up until 2017. Further surgeries on the same patient were not considered as a separate entry. Basic patient demographics, pathology results at time of surgery, details of revascularisation, functional status, and clinical outcomes such as recurrent tissue loss, limb loss and deaths were recorded. Limb salvage and mortality assessment were investigated using Kaplan-Meier survival curve and log-rank analysis.

Results - Median age was 71.5 years. 159 (80%) had diabetes and 28 (14%) had end-stage renal failure. 23 (12%) patients presented with sepsis. 118 (59%) patients underwent revascularisation, 100 (84.7%) of which were endovascular. 111 (94%) revascularisation procedures were within 90 days of the minor amputation. 78 (70%) of these were prior to the minor amputation. 141 (71%) of the amputation wounds healed completely. Overall 5-year limb preservation was 89.9%. Patients who required revascularisation were not more at risk for limb loss [5-year limb salvage 86.4% (revascularisation) cf. 93.4% (no revascularisation); p=0.08]. Limb salvage rates were not different between those who had revascularisation before and after minor amputations [1-year 89.5% (before) cf. 90.9% (after); p=0.70]. Overall 5-year mortality rate was 50% and the timing of revascularisation did not affect mortality (p=0.32). In the diabetes subset, those who had revascularisation after minor amputation had worse outcome [5-year mortality 67.9% (after) cf. 50% (before); p=0.03].

Conclusion - Based on this cohort, the majority of patients who underwent minor amputations had diabetes. While selection bias may exist, there was no significant difference in the risk of limb loss or limb salvage rate with regards to the timing of revascularisation. However, this study suggests that diabetic patients undergoing revascularisation after having minor amputations are associated with significant worse long-term prognosis. This finding helps to aid the timing of future revascularisation procedures in diabetic patients requiring minor amputations.

O-053 A COMPARISON BETWEEN HYBRID OPEN AND ENDOVASCULAR REVASCULARIZATION AND ABOVE-THE-KNEE FEMORO-POPLITEAL BYPASS IN THE MANAGEMENT OF INFRAINGUINAL PERIPHERAL ARTERIAL OBSTRUCTIVE DISEASE

PERIPHERAL ARTERAL DISEASES

Author(s) - Walter Dorigo*[1], Aaron Fargion[1], Fabrizio Masciello[1], Sara Speziali[1], Leonidas Azas[1], Alessandro Alessi Innocenti[1], Elena Giacomelli[1], Carlo Pratesi[1]

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Introduction - The aim of the study was to retrospectively compare early and late results of hybrid revascularization (femoral bifurcation endarterectomy with patching and superficial femoral artery –SFA- stenting) and above-the-knee (AK) femoro-popliteal bypass in patients with infrainguinal peripheral arterial obstructive disease (PAOD) in a single center experience

Methods - From January 2003 to December 2016, 469 endovascular and 445 open surgical procedures for infrainguinal PAOD were performed. Data concerning these interventions were prospectively collected in a database. A retrospective analysis of the database was performed and two subgroups of patients were identified: patients undergone hybrid revascularization with femoral endarterectomy and SFA stenting (40 cases, group 1) and patients treated AK femoro-popliteal bypass (58 cases, group 2). The two groups were compared in term of clinical, anatomical and surgical characteristics and of perioperative (<30 days) outcomes with $\chi 2$ test, while follow-up results were compared with Kaplan-Meier curves and log-rank test.

Results - There were no differences between the two groups in terms of demographics, risk factors and comorbidities. Critical limb ischemia was present in 9 patients in group 1 (22.5%) and in 28 patients in group 2 (48%, p=0.01). All the interventions in group 1 were primary interventions, while in group 2 eight patients (14%) were operated on after the failure of a previous endovascular intervention (p=0.01). All the patients in group 1 underwent common femoral artery endarterectomy with polyurethane patching followed by stenting of the SFA (in 29 cases with a covered stent and in 11 cases with an uncovered self-expandable stent); the mean length of the treated arterial segment was 27.5±11.5 cm. Adjunctive endovascular procedures were performed in 17 cases (iliac stenting in four cases and popliteal and tibial balloon angioplasty in 13 cases). In group 2, all but one patients underwent AK bypass with heparin-bonded ePTFE, while in one case reversed autologous saphenous vein was used. Fourteen patients had adjunctive proximal procedures (femoral endarterectomy and patching in 11 cases and iliac stenting in 3 cases); in 27 cases distal adjunctive procedures were necessary (25 popliteal endarterectomy and patching, 2 tibial balloon angioplasty). There were no differences between the two groups in terms of perioperative deaths, thromboses and amputations. Follow-up was available in 95 patients (97%), with a median duration of 28 months (range 1-168). At 5 years, there were no differences between the two groups in terms of overall survival. Five-years primary patency rates were 29% in group 1 (SE 0.08) and 72% in group 2 (SE 0.09; p<0.001, log rank 20.1); the corresponding figures in terms of secondary patency were 41% (SE 0.09) and 78% (0.09; p<0.001, log rank 16.1). Freedom from reintervention at 5 years was 37% in group 1 (SE 0.08) and 80% (SE 0.09) in group 2 (p<0.001, log rank 17); the mean number of reinterventions in group 1 was 0.81 per patients (range 0-5) and in group 2 it was 0.29 (range 0-5, p<0.001). However, there were no differences between the two groups in terms of five-year limb preservation and amputation-free survival rates.

Conclusion - In patients with PAOD due to complex long lesions of the femoral axis, open surgical treatment with AK bypass provided better long-term results than those obtained with a hybrid approach, even in the presence of more complex clinical and anatomical situations.

O-054 STENTING DOES NOT CHANGE THE BEHAVIOR OF THE COMMON FEMORAL ARTERY DURING HIP FLEXION

PERIPHERAL ARTERAL DISEASES

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Introduction - A main concern regarding common femoral artery (CFA) stenting is related to the risk of stent fracture due to mechanical constraints imposed by the hip joint. The aim of our work was to study the anatomical behavior of the CFA when the hip joint passes from the position of extension to the position of flexion and to evaluate the impact of CFA stenting on those dynamic modifications.

Methods - The study was carried out on pelvis taken from fresh subjects (two men aged 72 and 71 and a 94 year old women). An arteriography study was performed to assess the dynamic behavior of the external iliac arteries, CFA and its bifurcations. A first series of arteriography were performed without a stent and a second series were performed after CFA stent implantation (Zilver PTX, Cook Medical, Bloomington, US). In all cases, front and profile angiograms were made in hip extension (0°) and flexion (45°, 90°).

Results - In the extension (0°), we identified four deformation points of the ilio-femoral axis both in the frontal plane (A, B, C, and D) and sagittal plane (A', B', C', D'). All deformation points observed in the two planes seemed to be superimposable (A/A ', B/B', C/C ', and D/D') and were respectively located on the external iliac, at the CFA origin, at the CFA bifurcation and on the superficial femoral artery. A/A', B/B', C/C', D/D' constituted angles vertices that were formed by the arterial deformation in the frontal and sagittal plane. In the frontal plane, all the angles closed during hip flexion, and the closure of the angle increased with the degree of flexion. In the sagittal plane, we observed that the A', C' and D' angles vertices closed when the hip joint was flexed. However B' angle vertex was opened in flexion. We noticed that modifications of the angles was related to the degree of flexion. CFA stenting did not change the location of the deformation points neither the movement of the angles in the frontal and sagittal planes.

Conclusion - After the radiography study in the frontal plane and sagittal plane, the CFA is a fixed segment during the movements of extension and flexion. Stent implantation does not alter this observation.

O-055 SUCCESSFUL IMPLANTATION OF A LONG "BIOTUBE" VASCULAR GRAFT FOR THE BYPASS SURGERY IN CRITICAL LIMB ISCHEMIA (CLI) IN A GOAT MODEL

PERIPHERAL ARTERAL DISEASES

Author(s) - Yasuhide Nakayama*[1], Maya Furukoshi[1], Eisuke Tatsumi[1]

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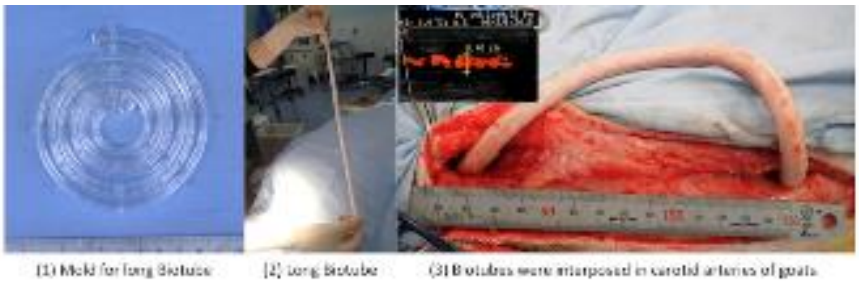
Introduction - There is no superior artificial graft comparable to autologous vein, which can function as a small-diameter graft even under the knee in bypass surgery for critical limb ischemia (CLI). On the other hand, in-body tissue architecture (iBTA) proposed by us can prepare autologous collagenous tubular tissues, called Biotubes, by using a patient's body as a bioreactor. Its process is simple and safe, just subcutaneously embedding a mold for about 2 months. The Biotube has sufficient pressure resistance to arterial pressure and has long-term patency in a canine model. In this study, a small-diameter long Biotube was prepared and the possibility as an alternative vascular graft for bypass in CLI was examined using a goat model.

Methods - Disk-like molds (ca. 8 cm in diameter) having spiral cylinder were embedded in goats subcutaneously for 2 months (**1** in photos). Biotubes with diameter of 4 mm, length of 50 cm, and wall thickness of 1.5 mm were obtained after removing the mold harvested (**2** in photos). The Biotubes were stored in an alcoholic solution at room temperature before implantation. After washing with a saline solution the Biotubes were interposed in carotid arteries of goats to prepare a bypass model (**3** in photos). Follow up was performed with Doppler echo and angiography.

Results - Completely autologous collagenous Biotubes without living cells were autonomically formed in the molds. After bypassing them to the goat carotid artery, pulsatile flow could be confirmed through palpation or Doppler echo over the entire length. Angiography revealed that all Biotubes were patent without blood leakage, aneurysm, or stenosis.

Image -



Conclusion - By only subcutaneous embedding the mold, a small-diameter long Biotube could be prepared autonomically. The Biotubes showed excellent vascular performance as bypass grafts and can be considered useful for CLI patients.

O-056 THE NEUTROPHIL-LYMPHOCYTE RATIO IS A PREDICTOR OF 1-YEAR SURVIVAL FOLLOWING MAJOR LIMB AMPUTATION

PERIPHERAL ARTERAL DISEASES

Author(s) - Nadeem A. Mughal*[1], Aisling Fagan[1], Eleanor R. Atkins[2], Ayoola Awopetu[1], Patrick Coughlin[1]

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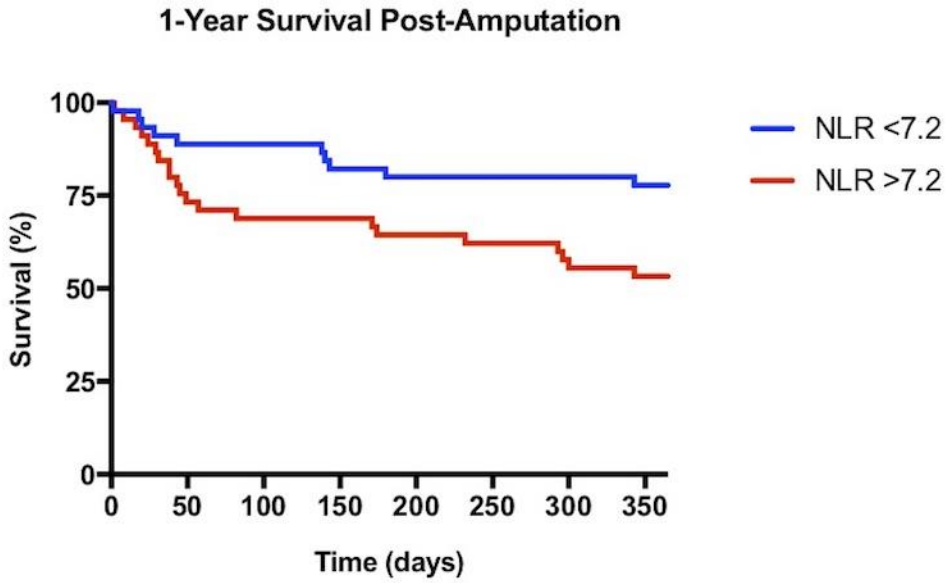
Introduction - Major amputation is often the only intervention available for patients presenting with irretractable pain, tissue loss or severe infection and no revascularisation options. Mortality following amputation for critical limb ischaemia (CLI) is especially high. The neutrophil-lymphocyte ratio (NLR) has been shown to predict survival in patients presenting with CLI as well as those undergoing open repair of both ruptured and non-ruptured abdominal aortic aneurysms. The aim of this study was to assess the NLR's value as a predictor of 1-year survival in patients following major amputation.

Methods - Consecutive patients undergoing above- or below-knee amputation for CLI in a single vascular centre between November 2014 and January 2016 were considered for this study. Total white blood cell count and its differential prior to amputation were recorded. Patients were followed up for 1 year and all-cause mortality documented.

Results - 90 patients were included in the study: 68 men, 22 women; median age 72 (IQR 65-78.). There were 31 mortalities (34%) in the follow-up period with a median time to death of 45 days. Mean NLR in patients who died was higher than those who survived (16.7 vs. 8.1, $p<0.01$). There was however no significant difference in total white cell count between groups (13.9 vs. 12.5, $p=0.3089$). An NLR of >7.2 was considered raised based on the receiver operating characteristic. 45 (50%) patients had a raised NLR prior to amputation. Survival at 1 year was 78% in the low NLR group compared to 53% in the high NLR group ($p<0.05$).

Image -



Conclusion - The NLR is a simple, cheap and accessible test that can be used to predict survival in patients undergoing major limb amputation for critical limb ischaemia. Its prognostic value is maintained out to 1 year. Use of the NLR can help risk-stratify patients, thereby assisting in shared decision-making and identifying those likely to benefit from enhanced pre-, peri- and post-operative care.

O-057 IMPACT OF COMORBIDITY, MEDICATION AND GENDER ON AMPUTATION RATE FOLLOWING REVASCULARIZATION FOR CHRONIC LIMB-THREATENING ISCHAEMIA

PERIPHERAL ARTERAL DISEASES

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Introduction - Chronic limb-threatening ischaemia (CLTI) is associated with a high risk of amputation and mortality. In a recent study, we found that the risk of amputation is specifically high the first 6 months after a revascularization procedure(1). In this report, we investigate how sex, comorbidities and medications influence the outcomes after revascularization for CLTI.

Methods - This population-based observational cohort study includes all individuals <= 50 years of age revascularized for CLTI in Sweden during five years from may 2008 to may 2013, in total 10,617 patients. Both endovascular and open revascularizations were included with an equal distribution between men and women. Data on comorbidities and pharmacotherapy were retrieved and merged from mandatory and highly valid, prospectively collected, national health care registries. Specific details about amputations were validated by cross-checking with individual medical records, making the data robust. Univariate and multivariate Cox regression analyses were performed to explore factors related to major amputation and the combined endpoint of amputation or death.

Results - Mean age at revascularization was 76.8 years. Median follow-up time was 2.7 years (range 0 – 6.6 years). Male gender (HR 1.20 [95% CI, 1.09-1.33], p<0.001), renal insufficiency (HR 1.57 [95% CI, 1.32-1.87], p<0.001), diabetes (HR 1.45 [95% CI, 1.32-1.60], p<0.001) and heart failure (HR 1.17 [95% CI, 1.05-1.31], p=0.006) were independently associated with an increased amputation rate, while the use of statins (HR 0.71 [95% CI, 0.64-0.78], p<0.001) and low-dose acetylsalicylic acid (ASA) (HR 0.77 [95% CI, 0.70-0.86], p=0.001) was associated with a reduced amputation rate.
For the combined end-point of amputation or death, increased rates were found for male gender (HR 1.25 [95% CI, 1.18-1.32], p<0.001), renal insufficiency (HR 1.94 [95% CI, 1.75–2.14], p<0.001), heart failure (HR 1.50 [95 % CI, 1.40-1.60], p<0.001) and diabetes (HR 1.31 [95% CI, 1.23-1.38], p<0.001). The use of statins (HR 0.74 [95% CI, 0.67-0.82], p<0.001) and ASA (HR 0.82 [95% CI, 0.77-0.88], p<0.001) were related to a reduced risk of amputation or death.

Conclusion - Renal insufficiency is the strongest independent risk factor for both amputation and amputation/death in revascularized CLTI patients, followed by diabetes and heart failure. Men with CLTI have worse outcomes compared with women. These results may help govern patient selection for revascularization procedures. The use of statin and ASA is associated with an improved limb outcome. This underlines the importance of preventive medication to reduce general cardiovascular risk, but also to increase limb salvage rates in CLTI.

References - 1. Baubeta Fridh E, Andersson M, Thuresson M, Sigvant B, Kragsterman B, Johansson S, et al. Amputation Rates, Mortality, and Pre-operative Comorbidities in Patients Revascularised for Intermittent Claudication or Critical Limb Ischaemia: A Population Based Study. European journal of vascular and endovascular surgery : the official journal of the European Society for Vascular Surgery. 2017;54(4):480-6.

O-058 WORLD'S SMALLEST CALIBRE MICROBIOTUBE GRAFT: ITS GROWTH EVALUATION AND TWO YEAR FOLLOW-UP IN A RAT MODEL

PERIPHERAL ARTERAL DISEASES

Author(s) - Yasuhide Nakayama[*1], Ryosuke Iwai[2], Eisuke Tatsumi[1]

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Introduction - We recently developed the world's smallest calibre MicroBiotube vascular graft with an inner diameter of 0.6 mm. It is formed using in-body tissue architecture (iBTA) and has a high degree of patency and capacity for regeneration in the acute phase, 1 month after implantation. This report presents the growth ability of Microbiotube and the compatibility and stability of MicroBiotubes in the chronic phase of implantation for 2 years in a rat model.

Methods - The MicroBiotubes (internal diameter 0.6 mm) were prepared by embedding the mould subcutaneously in rats for 2 months. An allogenic MicroBiotube was implanted into the abdominal aorta (inner diameter 0.5 mm) for its growth evaluation up to 3 months, or into the femoral arteries (inner diameter 0.5 mm) for chronic evaluation up to 2 years. Follow-up observation was performed by 7-Tesla magnetic resonance angiogram. Histological observation was performed after 1 year of implantation.

Results - Growth evaluation) Monthly follow-up angiogram showed that internal diameter of MicroBiotubes (length 3 mm) was expanded to ca. 1.5 times after 3 month of implantation according to the growth of native arteries (Fig. 1). At the same time, their length was extended to ca. 1.5 times.
Chronic evaluation) There was no occlusion of all patent implanted MicroBiotubes (length 5 mm, patency 75%) at 1 month after implantation up to 2 years (Fig. 2). In all observation period, no abnormal morphological changes or calcification occurred. Histological observation at 2 years showed layered vascular construction.

Image -

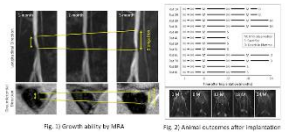

Fig. 1) Growth ability by MRA Fig. 2) Animal outcomes after implantation

Conclusion - This study suggests that MicroBiotubes have growth ability, high compatibility, stability, and durability as replacement grafts.

O-059 A PROSPECTIVE COHORT STUDY OF SUBSTITUTIONS OF POULTRY, RED MEAT OR LEAN FISH WITH FATTY FISH AND THE RISK OF INCIDENT PERIPHERAL ARTERIAL DISEASE IN MEN

PERIPHERAL ARTERAL DISEASES

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Institution(s) - [1]Aalborg University, [2]Vascular Surgery, Aalborg University Hospital, [3]Clinical Medicine, Aalborg University, [4]Unit of Clinical Biostatistics and AF Study Group, Aalborg University Hospital, [5]Clinical Medicine, Aarhus University, [6]Cardiology, Aalborg University Hospital, Aalborg, [7]Department of Public Health, Section for Epidemiology , Aarhus University, Aarhus , Denmark

Introduction - The evidence regarding potential associations between intake of fish, poultry, red meat and the risk of peripheral arterial disease (PAD) is limited. Analysis and interpretation of dietary data are difficult. First, most foods are eaten together with foods characteristic for the dish and secondly, increased consumption of one food type is typically accompanied by a lower intake of other food types. To account for this we used the substitution approach in which we compare individuals with different food patterns corresponding to replacing one food item with another. The aims of this study were to examine associations for substitutions of poultry, red meat and lean fish with fatty fish and the risk of PAD. We hypothesised that a higher intake of fatty fish and a concomitant lower intake of other meat products was associated with a lower risk of PAD.

Methods - We conducted a prospective cohort study based on data from the Diet, Cancer and Health cohort initiated in 1993 to 1997. At baseline, middle-aged men filled in a lifestyle questionnaire and a validated 192-item semi-quantitative food frequency questionnaire about their usual diet the year before. During follow-up, we identified participants with validated diagnoses of peripheral arterial disease with ankle-brachial index below 90% or toe-brachial index below 70%. Data were analysed using multivariable Cox regression models. Substitutions of 150 g/week of either poultry, processed red meat, unprocessed red meat or lean fish with 150 g/week of fatty fish were explored.

Results - After relevant exclusions and follow-up for a median of 13.6 years, 546 eligible PAD cases were identified in the cohort of 25,725 men. In multivariable analyses including adjustment for established lifestyle risk factors for PAD, the HR of replacing poultry with fatty fish was 0.93 (95% CI 0.77-1.11), while the HRs of incident PAD after replacing either unprocessed or processed red meat with fatty fish were 0.88 (95% CI 0.76-1.03) and 0.85 (95% CI 0.73-1.00), respectively. When substituting lean fish with fatty fish the HR of PAD was 0.89 (95% CI 0.72-1.11). The associations were all in the same direction, however not statistically significant.

Substitution between food groups per 150 g/week	HR*	95% CI	HR**	95% CI
Fatty fish instead of poultry	1.00	(0.83-1.21)	0.93	(0.77-1.11)
Fatty fish instead of unprocessed red meat	0.85	(0.73-0.99)	0.88	(0.76-1.03)
Fatty fish instead of processed red meat	0.76	(0.65-0.89)	0.85	(0.73-1.00)
Fatty fish instead of lean fish	0.85	(0.69-1.06)	0.89	(0.72-1.11)

*Model 1A: Crude analysis adjusted for age and energy intake.
**Model 1B: As model 1A with additional adjustment for traditional risk factors including educational level, BMI, waist circumference, physical activity, alcohol intake and smoking.

Table 1. Substitution between 150 g per week of different meat and the risk of peripheral arterial disease

Conclusion - This study suggested that substituting meat products and lean fish with fatty fish might be associated with a lower risk of incident PAD, however not statistically significant.

O-060 TRANSPLANTATION OF AUTOLOGOUS BONE MARROW DERIVED MONONUCLEAR CELLS AND BONE MARROW ASPIRATE IN PATIENTS WITH NONRECONSTRUCTABLE PERIPHERAL ARTERIAL DISEASE

PERIPHERAL ARTERAL DISEASES

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Introduction - The patients with critical limb ischemia (CLI) (nonreconstructable peripheral arterial disease) due to multifocal occlusion especially below-knee-lesion with the non-healing ulcers is a disaster that leads to amputation of extremities. Limb amputations are often the inevitable treatment of non-healing ulcers in patients with infrainguinal arterial occlusive disease.
Only induction of angiogenesis may be an option in treatment such of patients. One method of induction is the use of aspirate of bone marrow (ABM) or/with bone marrow derived mononuclear cells (BMMCs).

Methods - From 2009 till 2013 we have treated 65 patients. Indication: CLI stage III-15, stage IV-40 (PAOD-48, thromboangiitis obliterans-17: mean Rutherford classification 5 [4-6]) with infrainguinal arterial occlusive disease and weren't suitable for or had previously failed revascularization treatment. To patients CLI III – were administered the ABM in ischemic muscle (leg and foot), to patients CLI IV – were administered ABM and injected Ficoll-isolated BMMCs locally (foot-fingers-wounds). To 8 patient procedure where done twice in 1-1,5 year.
These procedures were combined with debridements of ulcers or with minor amputation. Some of them required dermotransplantation. Patients were followed-up by walking distance, resting pain, ABI, wound conditions, but primary outcome was defined as prevention of major limb amputation.

Results - Mean follow-up duration was 3 years. No procedure-related complications were encountered. Due to exacerbation and disease progression major amputation in 30 days after procedure required 4 patients, in term of 4-6 month 3 patients below-knee-amputation, in 36 month were done 5 below-knee-amputations. Size of the ulcers were decreased, and healed by dermotransplantation in 15, in 10 was succeeded by minor amputation (fingers or forefoot). Walking distance improved from 65+/–10 meters to 185+/–45 meters. Rest pain improved markedly in 37, mildly in 16 patients. Mean ABI was increased from 0,28+/–0,05 to 0,35+/–0,40. Limb salvage was 89,2% at baseline to 6 month and in term of 36 month was 81,3%. Also using laser Doppler flowmetry and angiography there is an increase of blood flow recovery and collateral formation.

Conclusion - This study shows that locally administered autologous BMMCs and ABM transplantation represent a safe and effective option of treatment in patients with CLI due to non-reconstructable peripheral arterial disease.

O-061 PREDICTORS OF LIMB OUTCOME FOLLOWING ARTERIAL LIGATION OF INFECTED FEMORAL PSEUDOANEURYSMS IN DRUG ADDICTS

VASCULAR TRAUMA

Author(s) - Mohamed I. Elahwal*[1], Hosny K. Taha[1], Ali A. Elemam[1], Sameh M. Elsayed[1], Ahmed S. Gaweesh[1]

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Introduction - Infected femoral pseudoaneurysms in intravenous drug abusers present a challenging situation to the vascular surgeon. Infection renders the arterial wall unreconstructable and arterial ligation usually remains the only viable option. Following ligation however, the decision whether immediate revascularization is deemed necessary or not remains controversial. Primary revascularization carries a high risk of infection and secondary haemorrhage, while delaying revascularization can jeopardize limb viability with subsequent risk of limb loss. In the absence of objective predictors that can guide decision making, there is no worldwide consensus regarding the optimum management.

Method - We prospectively studied the outcomes of 20 intravenous drug abusers presenting with infected femoral pseudoaneurysms who underwent arterial ligation, evacuation of haematoma, and local wound debridement. We aimed mainly to identify certain potential predictors affecting overall limb outcome namely: 1)Mode of presentation (impending vs. ruptured); 2)Anatomical site of arterial ligation (above vs. below inguinal ligament); 3)Pedal doppler flow post-ligation; 4)Ankle brachial pressure index (ABI) pre and post ligation

Results - Following ligation the overall outcome was as follows: 14/20 patients (70%) were compensated; 6/20 patients (30%) were critically ischemic following ligation where four patients required revascularization by extra-anatomical bypass, while two patients were deemed unreconstructable (due to extensive skin and soft tissue necrosis) requiring hip disarticulation.
While eight patients presented with impending rupture (7/8 were compensated), twelve patients presented with frank ruptured pseudoaneurysms (7/12 were compensated) which was statistically insignificant.
All four patients who had arterial ligation performed proximal to the inguinal ligament were critically ischemic after ligation while when the level of ligation was below the inguinal ligament 14 out of 16 patients were compensated (significant).
Pedal doppler flow signal was detected in ten patients only intraoperatively. However, four more patients regained Doppler signal in the ward few hours after the operation. All 14 patients with Doppler signal were compensated and required no further revascularization for limb salvage till discharge from hospital.
In compensated patients the mean pre-operative ABI was 0.88 and the mean post-operative ABI was 0.49 with an average ABI drop of 0.39. However, in patients who required revascularization or amputation, the mean pre-operative ABI was 0.83 and the mean post-operative ABI was 0.00 with an average ABI drop of 0.83

Conclusion - In drug addicts with infected femoral pseudoaneurysms, arterial ligation with local debridement without revascularization salvaged 70% of limbs in our study. The detection of pedal Doppler flow after ligation can stratify patients in whom revascularization might not be required for limb salvage. Additionally all efforts should be made to ligate the femoral artery below the inguinal ligament to preserve important juxta-inguinal collateral branches that can have great impact on limb outcome after ligation.

O-062 ISOLATED BLUNT VASCULAR INJURY FOLLOWING MOTOR SCOOTER HANDLEBAR IMPACT: A SYSTEMATIC REVIEW

VASCULAR TRAUMA

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Introduction - Motorcycle accidents are the leading cause of blunt trauma and 95% of these are associated with underlying fracture/dislocation. Isolated peripheral vascular trauma without skeletal involvement is rare. Motor scooter handlebar syndrome (MSHS) is a type of isolated blunt vascular injury to the iliac/ femoral vessels without any associated bony injury, following direct impact of a handlebar to the affected part. Considering the increase in the number of two wheeler vehicles and associated trauma, it is likely that this pattern of injury is on the rise.The aim of this study is to review existing literature regarding the incidence, presentation, diagnosis and management of MSHS.

Methods - A systematic review of literature was performed according to the PRISMA guidelines using Pubmed, Ovid and EMBASE databases. Keywords used were blunt injuries, handlebar injuries, femoral artery injuries, iliac artery injuries and aortic injuries. English literature and human studies were the limits applied. In addition snowballing and grey literature review was done. A total of 2709 articles were reviewed, out of which 2677 articles were excluded. The remaining 32 articles, along with one of our unpublished case report, were used in qualitative synthesis

Results - Since the first published case of MSHS in 1965, a total of 39 cases were reported. 38 out of the 39 cases were reported in men. The mean age was 21.9 years(range 9-75 years). 17 patients (44.7%) presented immediately following the trauma and the rest 21(55.3%) presented late(range 2 days to 10 years). Majority of the injuries involved Common femoral artery (CFA) (48.7%, 4 transections and 15 occlusions), followed by External iliac artery (30.8%, one transection and 11 occlusions), Common iliac artery (15.4%, 5 occlusions and one pseudo aneurysm) and the abdominal aorta (2.6%, one case of multiple lacerations).Two cases of venous injury (5.2%), one in the Common femoral vein and one in the External iliac vein were also reported. Treatment options utilised include open surgery in 34 patients (89.5%), endovascular in 2 patients (5.2%), hybrid approach in one patient (2.6%) and therapeutic anticoagulation in one patient (2.6%).

Conclusion - There were less than forty reported cases of MSHS in the medical literature. CFA was the commonest vessel involved and occlusion/ stenosis was the predominant lesion. The vascular injury was frequently missed at the time of trauma and surgery has been the treatment of choice.

O-063 CRITERIA FOR INVESTIGATING PATIENTS WITH VENOUS INSUFFICIENCY FOR DEEP VENOUS OBSTRUCTION

VENOUS DISEASES (INCL. MALFORMATIONS)

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Introduction - Venous hypertension develops in patients with chronic venous disease (CVD) due to reflux and/or obstruction affecting lower limbs superficial veins, deep veins, or both. Duplex ultrasonography (DUS) is usually the first line investigation and can efficiently diagnose most lower limb venous pathologies. However, patients with proximal deep venous pathology usually requires more advanced investigation tools e.g. IVUS, CTV, or MRV to diagnose outflow obstructing lesions which are both being more recognized nowadays and their clinical importance increasingly emphasized. Unfortunately, there is no clear consensus on which patients should be investigated for possible outflow obstruction.

Methods - We retrospectively reviewed our data of 625 patients with CVD (CEAP C2-6) who were investigated since 2008 for venous outflow obstruction using direct CT venography (with direct leg vein contrast injection). We identified clinical and duplex findings during initial examination that positively correlated with finding a deep venous obstructing lesion in CTV images. We aimed from this study to extrapolate criteria that highly suggests the presence of deep venous obstructing lesion and warrants the use of more advanced investigations in patients with CVD.

Results - Clinical Criteria: 1) Advanced CVD (CEAP C4-6); 2) History of deep vein thrombosis; 3) Venous claudication (bursting pain on walking); 4) Bizarre distribution of varicose veins; 5) Unilateral huge varicose veins (with contralateral free leg); 6) Unilateral increased girth of thigh & leg; 7) Progression or worsening manifestations after superficial reflux ablation or stripping; 8) Associated pelvic congestion manifestations and vulval varicosities.
Duplex Criteria: 1) Monophasic CFV wave pattern; 2) Asymmetric right vs left CFV flow analysis; 3) Deep venous reflux in multiple segments; 4) Post-thrombotic changes (wall fibrosis, luminal narrowing, residual thrombus); 5) Direct visualization of compressed iliac vein (<6mm diameter)

Conclusion - Deep venous obstructing lesions are increasingly being diagnosed in patients with CVD. A high clinical suspicion together with the choice of the suitable imaging modality is mandatory to detect significant lesions that require treatment. The proposed selection criteria can both avoid missing patients with underlying significant lesions, and at the same time avoid unnecessarily investigating patients with low probability of finding any venous outflow obstructing pathology.

O-064 QUALITY OF LIFE IN PATIENTS WITH PRIMARY SUBCLAVIAN VEIN THROMBOSIS, RECEIVING EARLY INVASIVE TREATMENT VERSUS LATE DECOMPRESSIVE SURGERY OR ANTICOAGULATION ALONE

VENOUS DISEASES (INCL. MALFORMATIONS)

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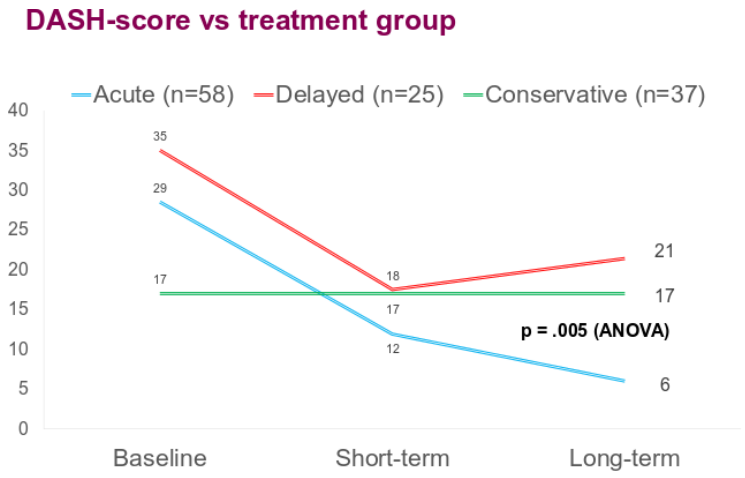
Introduction - Primary subclavian vein thrombosis (PSVT) due to repeated costoclavicular microtrauma is a rare disease (2-4 per 100000 inhabitants and year), commonly affecting young active and otherwise heathy persons[1]. Up to 50% of patientes with PSVT has lifelong reduction of arm function due to a chronic occlusion of the subclavian vein[2]. There is no level 1 evidence for neither recommended standard treatment with anticoagulation, nor for early invasive treatment, althoug the latter has been associated with favourable outcome and proposed as a superior treatment strategy[3]. Our aim was to investigate whether early invasive treatment with thrombolysis and decompressive surgery in patients with PSVT, is associated with improved quality of life (QoL) compared to delayed decompressive surgery or treatment with anticoagulation alone.

Methods - We included 120 patients with PSVT treated at two dedicated Vascular units during 2008-2017. We excluded patients with PSVT during pregnancy. Treatment with immediate (< 2 weeks from symptom onset) catheter-directed thrombolysis and decompressive surgery by infraclavicular first rib resection including venolysis (*acute group*, n=58) was compared to delayed surgical treatment of chronic symptoms (*chronic group*, n=25), and with anticoagulation alone (*conservative group*, n=37). Patients answered a disease-specific quality of life instrument (Disabilities of the Arm, Shoulder and Hand, DASH) before and after treatment with at least 100 days follow-up. Variance analysis was used to identify differences in DASH-score between the treatment groups and a multivariate regression model was used to adjust for confounders.

Results - Mean age was 28 years and 54% were female. Strenous activity was reported from 46% and 8% had signs or CT findings of pulmonary embolism (table). The acute group had superior outcome after intervention with lower DASH-score compared to both the chronic and conservative group (F=10.0, df=1, p=.005). The DASH score decreased from 29 (95% CI, 18 – 33) before intervention to 6 (95% CI, 2 – 8) during follow-up and from 35 (95% CI, 19 – 43) to 21 (9 – 32) in the acute and chronic group respectively (figure). The conservatively treated group had a mean score of 17 (95% CI 4 – 26). We found no significant confounding factors.

	Acute: Surgery and CDT (n=58)	**Delayed: Surgery (n=25)**	**Conservative: Anticoagulation alone (n=37)**
Age median (IQR)	27 (22 – 35)	32 (23 – 43)	30 (23 – 42)
Female n (%)	33 (57%)	14 (56%)	17 (46%)
Strenuous activity n (%)	22 (38%)	13 (52%)	20 (54%)
Pulmonary emboli n (%)	7 (12%)	2 (8%)	0

Image -



Conclusion - Treatment of PSVT with immediate thrombolysis and surgery was related to superior results compared to delayed treatment. A randomized trial is needed to confirm the results and establish immediate thrombolysis and decompressive surgery as the recommended treatment for PSVT.

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O-065 A SYSTEMATIC REVIEW AND META-ANALYSIS OF THROMBOTIC EVENTS FOLLOWING ENDOVENOUS THERMAL ABLATION OF THE GREAT SAPHENOUS VEIN

VENOUS DISEASES (INCL. MALFORMATIONS)

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Introduction - We performed a systematic review and meta-analysis to determine the incidence of thrombotic events following great saphenous vein (GSV) endovenous thermal ablation (EVTA).

Methods - MEDLINE, Embase and conference abstracts were searched. Eligible studies were randomised controlled trials and case series that included at least 100 patients who underwent GSV EVTA (laser ablation or radiofrequency ablation (RFA)) with duplex ultrasound (DUS) within 30 days. The primary outcome for the meta-analysis was deep venous thrombotic events which we defined as DVT or EHIT type 2, 3 or 4. Secondary outcomes were EHIT type 2, 3 or 4, DVT and PE. Subgroup analyses were performed for both the RFA and the EVLA groups. Pooled proportions were calculated using random effects modelling.

Results - Fifty two studies (16,398 patients) were included. Thrombotic complications occurred infrequently. Deep venous thrombotic events occurred in 1.7% of cases (95%CI = 0.9 to 2.7%) (25 studies; 10,012 patients; 274 events). EHIT type 2, 3 or 4 occurred in 1.4% of cases (95%CI 0.8 to 2.3%) (26 studies; 10,225 patients; 249 events). DVT occurred in 0.3% of cases (95%CI

= 0.2% to 0.5%) (49 studies; 15,676 patients; 48 events). PE occurred in 0.1% of cases (95%CI = 0.1 to 0.2%) (29 studies; 8,223 patients; 3 events). We found similar results when the RFA and EVLA groups were analysed separately.

Conclusion - Thrombotic events occur infrequently following GSV EVTA. Given the large numbers of procedures worldwide and the potential for serious consequences, further research is needed on the burden of these complications and their management.

O-066 THE INCIDENCE OF VENOUS OUTFLOW OBSTRUCTION AS A COMPLICATING FACTOR OF RETROPERITONEAL FIBROSIS

VENOUS DISEASES (INCL. MALFORMATIONS)

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Introduction - Iliocaval compression in retroperitoneal fibrosis (RPF) can result in lower limb swelling, discomfort, venous claudication, varicose veins, skin changes or tissue loss. If there are significant symptoms then intervention is often indicated.
This retrospective study reports a tertiary centre's experience of managing patients with iliocaval disease in RPF.

Methods - A retrospective analysis of all patients presenting to a tertiary unit with a diagnosis of RPF was performed from computerised records. The study period extended from January 2013 to January 2018. Data was analysed for demographics, interventions, stent patency and procedural complications.

Results - A total of 213 patients with RPF were identified of which 18/213 (8.4%) had iliocaval (IVC) occlusion as a consequence. The median age of patients with IVC involvement was 60 years (range 47-83 years) of which 11/18 (61%) were male and these patients presented with significant disabling lower limb swelling with one patient presenting acutely with DVT.
Of the 18 patients 7 (39%) have subsequently undergone intervention to reconstruct the IVC. RPF was caused by Ig4 nephropathy in 6 (33%) and was idiopathic in the remainder. In all patients no reconstruction was attempted until the RPF was considered quiescent and all patients underwent the procedure under steroid cover in addition to standard anticoagulation strategies. The majority of patients underwent reconstruction using double barrel technique with Veniti Vici™ stents (5/6) and Sinus XL™ was used if the stent extended into the supra-hepatic portion of the IVC in (2/6).
The occlusion was successfully crossed in 6/7 (86%). Primary, Primary–assisted and Secondary patency are 67%, 100% and 100% respectively at 12 months with a median follow up of 15 months (2 months to 27 months).
Significant symptomatic improvement was noted in all patients who underwent treatment with resolution of swelling in all and additional complete resolution of back pain in 2/7. Back pain had previously been considered to be a consequence of the RPF process causing nerve involvement and this is a new finding.

Conclusion - IVC involvement is a rare but significant complication of RPF. IVC reconstruction is technically feasible and can lead to significant symptomatic improvement with acceptable patency in these patients.

O-067 REDUCED SERIOUS COMPLICATION RATES FROM EMBOLO-SCLEROTHERAPY OF LOWER EXTREMITY HIGH AND LOW FLOW VASCULAR MALFORMATIONS FROM A SPECIALIST SINGLE CENTRE OVER 5 YEARS

VENOUS DISEASES (INCL. MALFORMATIONS)

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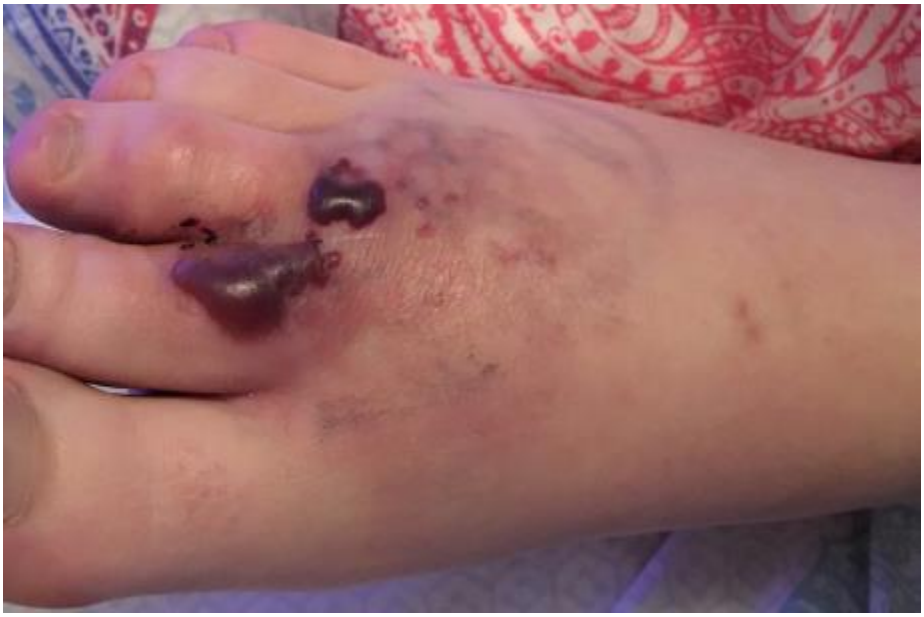
Introduction - Therapeutic management of vascular malformations (VMs) often requires multiple interventions due to their recurrent nature. Embolosclerotherapy (EST) is the gold standard treatment for peripheral VMs including those of the lower extremities. Despite being minimally invasive, EST carries significant risk of serious complications when used for lower extremity VMs ischaemia, amputation, nerve injury, ulceration, thromboembolism and even death, with as high as 24% serious complication rates for foot treatment most recently reported (1). This study reviews 5-year serious complications following EST of all lower extremity VMs in our tertiary referral center for vascular anomalies.

Methods - All VM patients underwent multidisciplinary review directed intervention, and demographic, procedural, follow-up and complication data collected prospectively in a dedicated database. Treatment outcomes for lower extremity VMs from 1 January 2013 to 31 December 2017 were analysed. All ESTs were performed under fluoroscopic guidance. All ESTs of high-flow vascular malformations (HFVM) were performed under selective catheter angiography and direct injection but low-flow vascular malformations (LFVM) with direct injection only. Serious complications were defined as any tissue or functional damage caused by direct injection, distal embolization or tissue reaction.

Results - During the study period, 107 patients had a total of 168 interventional procedures; 160 (95.2%) ESTs, 4 (2.4%) surgical excisions, and 4 (2.4%) endothermal venous ablations and phlebectomies for lower extremity VMs. In this cohort of patients, the median (range) age was 26 (8-70) years; 42 males and 65 females. Of these, 18 patients (17%) had HFVM and 89 patients (83%) LFVM. These included 13 patients with Klippel-Trenaunay Syndrome (1 HFVM, 12 LFVM), one Mafucci's Syndrome (HFVM) and one Milroy's Disease (LFVM). Of the 160 ESTs, 86.25 (n=12 HFVM, n=72 LFVM) included the use of foam sclerotherapy, 8.12%(n=5HFVM and n=2 LFVM) alcohol, and 0.63% (n=1 LFVM) coils. 5% of patients received a combination of sclerosants (e.g alcohol and coil, alcohol and STS). In total, 74.8% (n=80) of patients had clear clinical improvement and have been discharged since. Overall, 93.4% (100) of patients did not suffer from complications. 1.9% (n=2) of patients had non-serious complications characterized by excessive swelling. Meanwhile, 4.7% (n=5) of patients experienced serious complications:
HFVM: 1 cellulitis
LFVM: 2 skin ulcerations (Figure1), 1 cellulitis and 1 deep vein thrombosis (DVT)
All the complications resolved with conservative and medical treatment without significant long-term physical and/or functional disability although the single DVT case required prolonged anticoagulant therapy.

Image -



Conclusion - Currently, EST remains to be the interventional treatment of choice and is relatively safe and effective for lower extremity VMs. Our serious complication rate of 4.7% compares favorably to 11-24% in recent literature on peripheral VMs EST (2). This is possibly due to selective use of foam sclerotherapy versus alcohol, and improved classification and targeted treatment.

Majority of the complications were due to local toxicity after direct injection. These outcomes will direct treatment strategies to avoid local toxic complications in the lower extremities for both HFVM and LFVM, and informing consent.

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O-068 WOMEN WITH VENOUS INSUFFICIENCY IN LOWER EXTREMITY DURING PREGNANCY SHOW DAMAGE IN PLACENTA: EVIDENCE OF HYPOXIA AND OXIDATIVE CELLULAR STRESS

VENOUS DISEASES (INCL. MALFORMATIONS)

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Introduction - Lower extremity venous insufficiency (VI) is a complication of pregnancy. The potential association of this venous disease with structural damage of the placenta has not been described. One of the complications of VI is the appearance of reactive oxygen species (ROS). An imbalance between the ROS production and the antioxidant defense mechanisms, originates an oxidative stress that can produce phenomena of lipid peroxidation (Malondialdehyde-MDA), oxidation of DNA and RNA, oxidation of proteins and inactivation of some enzymes. In this sense, the interaction of ROS with nitric oxide (NO) is highlighted, which would produce cell aging, which would affect iNOS and eNOS, as well as NOX-1 and NOX-2.We analyzed the pattern of histopathological lesions and the gene and protein expression of HIF1-α, apoptosis regulatory proteins, MDA, NO and NOX.

Methods - A prospective study was carried out on placenta samples from 51 women with pregnancy-associated VI and 49 age-matched pregnant healthy controls (HC). The plasma MDA levels were determined at two study times (6 months of gestation and six months postpartum), as well as in placental tissue. We determined expression by immunohistochemistry (IHC) and RT-qPCR techniques.

Results - Women with VI showed a significant increase in the number of villi and in syncytial knots compared to those found in placentas from HC. Significant increases in the expression of Bax and Caspase-3 and 9 in the placentas from women with VI were observed compared to those found in HC. The expression of HIF-1α at both the mRNA and protein levels was also significantly increased in placentas from women with VI. Our results show that women with VI have a significant elevation of plasma MDA levels at six months of gestation compared to patients in the control group (16.07 ± 2.40 μM vs 7, 45 ± 1.82 μM respectively), and how these remain elevated at six months postpartum compared to the HC group (7.18 ± 1.36 μM vs 5.02 ± 0.87 μM). MDA levels were significantly higher in the placenta of women with VI (123.22 ± 5.74 pmol / mg vs. 100.17 ± 4.94 pmol / mg, $p < 0.01$). NOX-1 and NOX-2 showed a significant increase in terms of protein and gene expression in the placentas of women with VI during pregnancy. In addition, the levels of gene expression of iNOS were significantly higher ($p < 0.05$) in VI women, their protein expression being visible in the syncytiotrophoblast cells. The activity of eNOS was limited in both study groups and did not show significant differences in terms of gene and protein expression.

Conclusion - Our study demonstrates that placentas from women with pregnancy-associated VI show structural remodeling, and enhanced apoptotic cellular death. Interestingly, this placental damage is associated with an increased expression of hypoxia-ROS-triggered molecular pathways, such as HIF-1α, NOX, NO.

O-069 AN EIGHT-YEAR EXPERIENCE TREATING CONGENITAL DIFFUSE VENOUS MALFORMATIONS WITH DIODE LASER

VENOUS DISEASES (INCL. MALFORMATIONS)

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Introduction - Diffuse congenital venous malformations are unfrequent vascular anomalies. Their common symptoms are pain, coagulopathy and anatomical deformity. Treatment options include surgery, endovascular techniques such as sclerotherapy or embolization, and intralesional diode laser. Surgery is very often not possible or includes significant scarring, complications and sequellae postoperatively. The limiting condition with the use of sclerosing agents resides in the need of repeated procedures and the associated risk of toxicity. We report our experience in the management of diffuse venous malformations with intralesional diode laser.

Methods - A case series of patients with symptomatic diffuse venous malformations treated with diode laser (1470 nm radial fiber) between 2010 and 2018 were reviewed. Data regarding gender, age, type of vascular anomaly, anatomical location, symptoms and complications were collected. Postoperative health-related quality of life was analyzed.

Results - Sixteen patients (13 women) underwent treatment with intralesional diode laser. Mean age was 30,56 years (8-46 years). Two patients presented with associated anomalies (Cloves Syndrome and Double Cortex Syndrome respectively). Lesions were located in the right hemithorax (4), right superior limb (2), left superior limb (4), left side of the neck (1), left thigh (3) and left foot (1). Common symptoms included pain (11), hemorrhage (3) and deformity (3). Twelve patients had been treated previously with other techniques: surgery (8), sclerotherapy (8) and embolization (2). The procedure was performed in all cases under percutaneous access, except in three cases: one needed a hip replacement and two needed a knee replacement simultaneously. The visualized lesion size was reduced in 9 patients. Eleven patients reported an improvement in pain after the procedure measured by VAS Pain. There were 4 complications, three ecchymoses and one sciatic neuropathy. Significant reduction of D-dimer levels was achieved in the majority of cases at 6 months follow up.

Conclusion - Diode laser is an effective treatment for diffuse venous malformations. It is extremely well tolerated by patients. It reduces the size of lesions, symptoms and postoperative complications. At the present time, there are no reports for dose limitation or restriction in the number of procedures. Therefore, we consider this technique as relevant coadyuvant associated to standard techniques in the treatment of these anomalies.

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O-070 PATENCY OF NITINOL VENOUS STENTS IN PERIPARTUM WOMEN FOLLOWING TREATMENT FOR ACUTE ILIO-FEMORAL DEEP VEIN THROMBOSIS

VENOUS DISEASES (INCL. MALFORMATIONS)

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Introduction - Deep vein thrombosis (DVT) affects ~100,000 patients a year in the UK, and is the leading cause of morbidity and mortality within pregnant and post-partum women. Contemporary management of acute iliofemoral DVT includes catheter-directed thrombolysis and stenting of an obstructive lesion. However, little is known regarding the management outcomes, and risk for peripartum. This study examines venous stent related outcomes of peripartum women with acute ilio-femoral DVT, with the aim of informing more tailored management within this subgroup of patients.

Methods - A database of 190 patients treated for acute ilio-femoral DVT at a single centre using a venous stent between January 2012 and October 2017 was analysed for peripartum women (defined as developing a DVT while pregnant or within 6wks post-partum). Patient demographics, procedural details, stent patency (assessed using duplex ultrasonography), time to re-intervention, and any adverse events were recorded. Primary patency was defined as a patent stent with <50% diameter reduction; primary-assisted patency included those requiring re-intervention to maintain patency, and; secondary patency defined as stents that were blocked and successfully re-opened.

Results - 81 women were treated for acute ilio-femoral DVT during the study period, cumulative patency was 88% (median follow-up 2.3yrs; range 30-328wks). From this group, 9 women were peripartum (11%). Onset of DVT was post-partum for all women, and the mean time to intervention was 4wks after birth (range 3-6wks). Two women were treated with catheter-directed thrombolysis alone, and 7 women were also stented. Median age at the time of stent placement was 29yrs (range 22-41yrs), and no patients had a thrombophilia. Primary, primary assisted, and secondary patency rates were 14%, 43%, and 43%, respectively. Re-intervention was required in 6/7 (86%) peripartum women, with mean time to re-intervention of 9wks (range 1-33wks). Venous stenting in peripartum women was associated with a higher risk of re-intervention (HR 6.58; p=0.0001, 95% CI [2.46, 17.60]), and was a strong predictor of cumulative patency loss (HR 10.71; p=0.002, 95% CI [2.37, 48.51]).

Conclusion - Stenting women during the peripartum period is challenging. They are significantly more likely to require re-intervention and experience cumulative patency loss compared with their non-peripartum counterpart. Thresholds for intervention may need to be higher and periprocedural anticoagulation strategies require more investigation if treatment is to be offered in the peripartum period. Women should be counselled about the increased risk of stent blockage, and monitored closely with duplex surveillance.

O-071 ASSOCIATION OF CONCOMITANT DISEASE IN THE PROFUNDA AND FEMORO-POPLITEAL VEINS TO CUMULATIVE PATENCY AND RE-INTERVENTION RATES FOLLOWING ILIO-FEMORAL VENOUS STENTING OF LIMBS WITH POSTTHROMBOTIC OCCLUSION

VENOUS DISEASES (INCL. MALFORMATIONS)

Author(s) - Adam M. Gwozdz*[1], Prakash Saha[1], Lawrence Stephenson[1], Leonardo Jones[1], Nicholas Jackson[1], Justinas Silickas[1], Taha Kahn[1], Soundrie Padayachee[1], Alberto Smith[1], Stephen Black[1]

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Introduction - Long-term ilio-femoral stent patency in postthrombotic limbs is inferior to that observed in limbs with non-thrombotic venous obstruction (NIVL). Those with occlusion have the lowest long-term patency rate. The aim of this study was to examine whether decreased inflow to the stent, caused by intraluminal obstructive disease below the common femoral vein, was associated with greater risk of re-intervention and inferior long-term patency outcomes.

Methods - Consecutive patients in whom a venous stent was placed for symptomatic ilio-femoral postthrombotic occlusion between 2012 and 2017 were included for analysis. Of 194 patients treated during the study period, 164/194 (84.5%) patients had a full complement of pre-operative ultrasound imaging that was used to identify varying degrees of femoral vein (FV), profunda vein (PV), and/or popliteal vein (POPV) disease (intraluminal scarring and/or residual thrombosis). These findings were categorised into one of 3 groups: absence of disease; disease in a single inflow vessel; or disease in more than one inflow vessel. Stent patency

was assessed using duplex ultrasonography post-intervention, and re-interventions performed when there was a reduction in stent diameter of >50% or occlusion. Cumulative patency included stents that were blocked and successfully re-opened.

Results - Cumulative patency of 164 patients treated during the study period was 89% (median follow-up 2.4yrs; range 46-308wks). However, 70/164 (43%) patients required re-intervention to maintain patency (median number of re-interventions 2; range 1-6). Absence of disease in the deep venous system below the common femoral vein was identified in 52/164 (32%) patients. Intraluminal disease limited to a single inflow vessel (FV, PV, or POPV) was identified in only 20/164 (12%) patients. Combined inflow disease, defined as involving more than one inflow vessel, was observed in 92/164 (56%) patients. The respective combinations of inflow vessel disease state are shown in Table 1. Cumulative patency and re-intervention rates were significantly worse in patients with more than one diseased inflow vessel (P=0.47, P=0.004, respectively). Disease in the FV+PV+POPV was associated with a higher risk of re-intervention (rate of re-interventions 16/25 (64%); HR 2.76; P=0.009, 95% CI [1.29, 5.92]), and was a strong predictor of cumulative patency loss compared with patients that had no inflow vessel disease (cumulative patency 18/25 (72%) HR 17.26; P=0.009, 95% CI [2.02, 147.07]).

Image -

	Varying degree of inflow disease n=164
Absence of inflow disease	**52 (32%)**
Single inflow vessel disease	**20 (12%)**
Femoral Vein (FV)	17 (10%)
Profunda Vein (PV)	0
Popliteal Vein (POPV)	3 (2%)
Combined inflow disease	**92 (56%)**
FV + PV	9 (5%)
FV + POPV	57 (35%)
PV + POPV	1 (1%)
FV + PV + POPV	25 (15%)

Table 1. Analysis of the number of patients with absence or presence of inflow vessel disease, identified by ultrasound imaging, prior to nitinol venous stenting

Conclusion - Concomitant disease in the profunda and femoro-popliteal veins of patients with postthrombotic syndrome is common, and their pre-operative identification is important. Maintaining cumulative stent patency in postthrombotic limbs is influenced by the quality of inflow vessels. Patients with decreased inflow caused by intraluminal scarring and/or residual thrombosis in the FV+PV+POPV should be counselled on their increased risk of cumulative patency loss. A formal evaluation tool for inflow would greatly enhance the treatment pathway.

O-072 CLINICAL IMPLICATIONS OF DIFFERENT RISK FACTOR PROFILES IN PATIENTS WITH MESENTERIC VENOUS THROMBOSIS AND SYSTEMIC VENOUS THROMBOEMBOLISM – A POPULATION-BASED STUDY

VENOUS DISEASES (INCL. MALFORMATIONS)

Author(s) - Saman Salim*[1], Moncef Zarrouk[2], Johan Elf[3], Anders Gottsäter[3], Signy Sveinsdottir[4], Peter Svensson[4], Stefan Acosta[2]

Institution(s) - [1]Department of Clinical Sciences, Lund University, [2]Vascular Centre, [3]Department of Cardio-Thoracic and Vascular Surgery, Skåne University Hospital, [4]Department of Translational Medicine, Clinical Coagulation, Malmö, Sweden

Introduction - Mesenteric venous thrombosis (MVT) is a rare and potentially lethal disease. It is unknown whether the risk factor profile for MVT are the same as for systemic venous thromboembolism (VTE). The aim of the present population-based study was

to compare acquired and inherited risk factors in MVT versus VTE. It was hypothesized that the risk factor profile would be similar in MVT and systemic VTE.

Methods - Identification of all MVT patients at Skåne University Hospital between 2000 and 2015 in hospital records and *AuriculA* (Swedish anticoagulation registry). VTE patients were retrieved from the Malmö Thrombophilia Study (MATS), including 1465 consecutive unselected VTE patients between 1998 and 2008.

Results - Patients with MVT (n=120) were younger (p<0.001), had higher glomerular filtration rate (p<0.001), fewer smokers (p<0.001), and had less often undergone recent surgery (p=0.025). The prevalence of cancer (19.2% in MVT versus 12.1% in VTE; p=0.026) and intra-abdominal cancer (16.7% in MVT versus 2.3% in VTE; p<0.001) were higher in MVT. The prevalence of factor V Leiden mutation without presence of cancer was lower in MVT compared to VTE (26.6% versus 37.9%; p=0.045). Mortality was higher at 30 days in the MVT group (9.2 % versus 0.6 % in VTE; p<0.001), but did not differ at long-term according to Kaplan-Meier curves (p=0.73).

Conclusion - Patients with MVT have different risk factor profile than those with systemic VTE; higher prevalence of cancer and lower prevalence of factor V Leiden mutation. Intra-abdominal cancer should be excluded in MVT patients, and the high prevalence of factor V Leiden mutation without presence of cancer in both groups suggests that screening for thrombophilia in patients without cancer should be considered in this population.

O-073 COMPRESSION THERAPY AND ENDOVASCULAR TREATMENT OF KLIPPEL-TRENAUNAY-WEBER SYNDROME

VENOUS DISEASES (INCL. MALFORMATIONS)

Author(s) - Jie Yin[*1], Xiansheng Zhang[1]

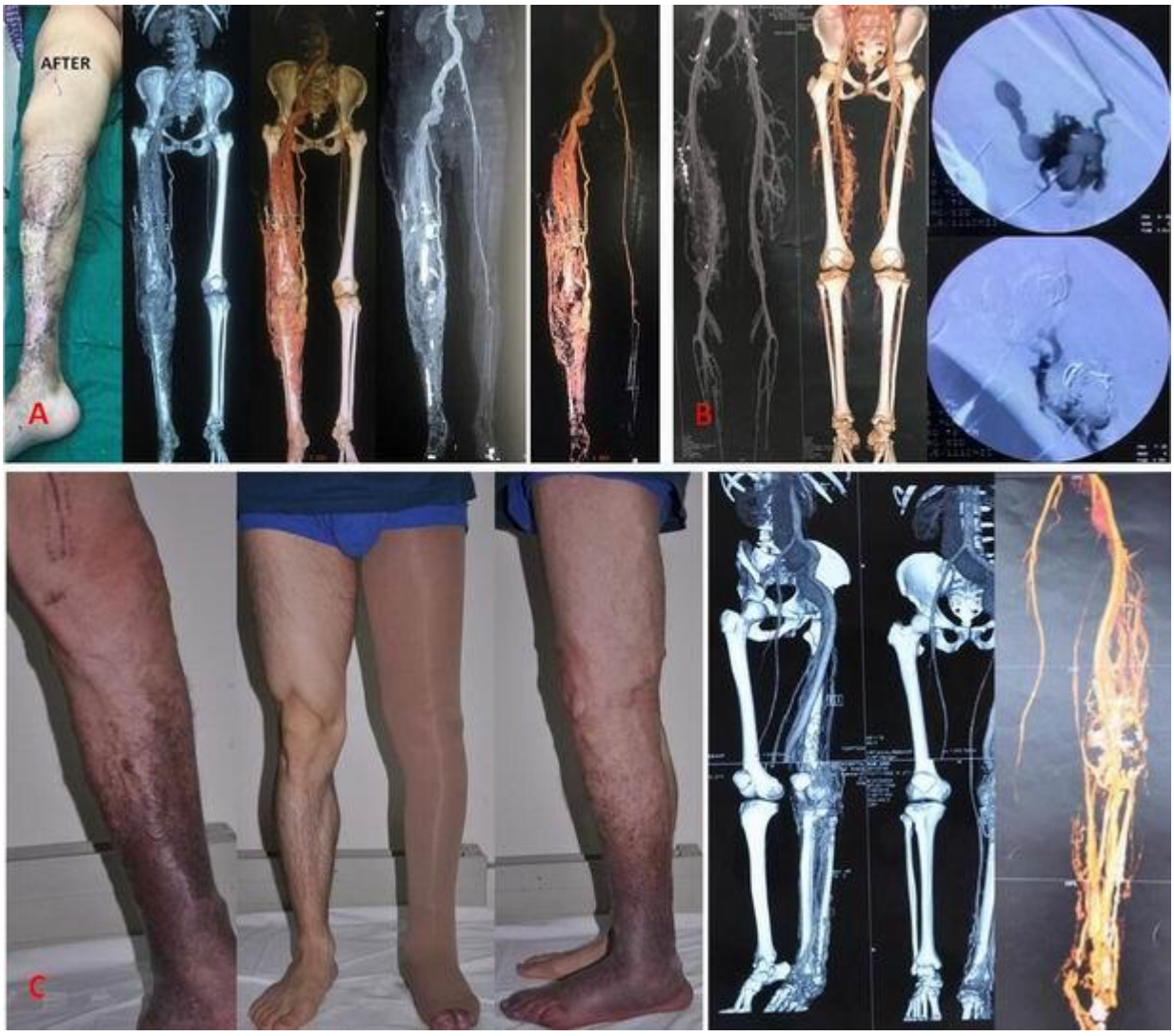
Institution(s) - [1]Vascular surgery, Peking University First Hospital, Beijing, China

Introduction - Klippel-Trenaunay-Weber syndrome (KTWS) is a rare congenital vascular disorder characterized by the classic triad of cutaneous nevi, venous varicosities, and osseous and soft tissue hypertrophy of the affected limb

Methods - From August 2015 to April 2017 our hospital made a diagnosis and gave treatment and follow-up of 12 cases of KTW. All patients were treated with compression therapy. Digital subtraction angiography (DSA) in 12 patients were visible enlargement of limb artery, arterial branch in disorder. With micro catheter super choice into target vessels with polyvinyl alcohol particles (PVA particles) and spring coil embolization, treated 3 to 5 times on average. Arteriovenous fistula was treated with covered stent by transcatheter endovascular interventional techniques.

Results - All patients were followed up for 1 ~ 3 years, an average of 1.5 years. 12 cases of conservative treatment leg symptoms including pain, cramping, limb swelling, and varicose veins decreased with no serious complications. Varicose vein disappeared, pain relieved, without limb necrosis. One case of amputation.

Image -



Conclusion - Compression therapy and surgical treatment significantly improve patients' quality of life. Compression therapy is suitable for all of the patients. Implementation of reasonable surgical treatment after diagnosis can greatly improve patients'quality of life.

O-074 MID-TERM IMPROVEMENT OF PERSISTENT HEADACHES IN PATIENTS WITH MULTIPLE SCLEROSIS UNDERWENT BALLOON VENOPLASTY OF INTERNAL JUGULAR VEINS

VENOUS DISEASES (INCL. MALFORMATIONS)

Author(s) - Pierfrancesco Veroux*[1], Giulia Bernardini [1], Alessia Giaquinta [1], Carla Virgilio[1], Ester De Marco[1], Massimiliano Veroux[1], Clive B. Beggs[2]

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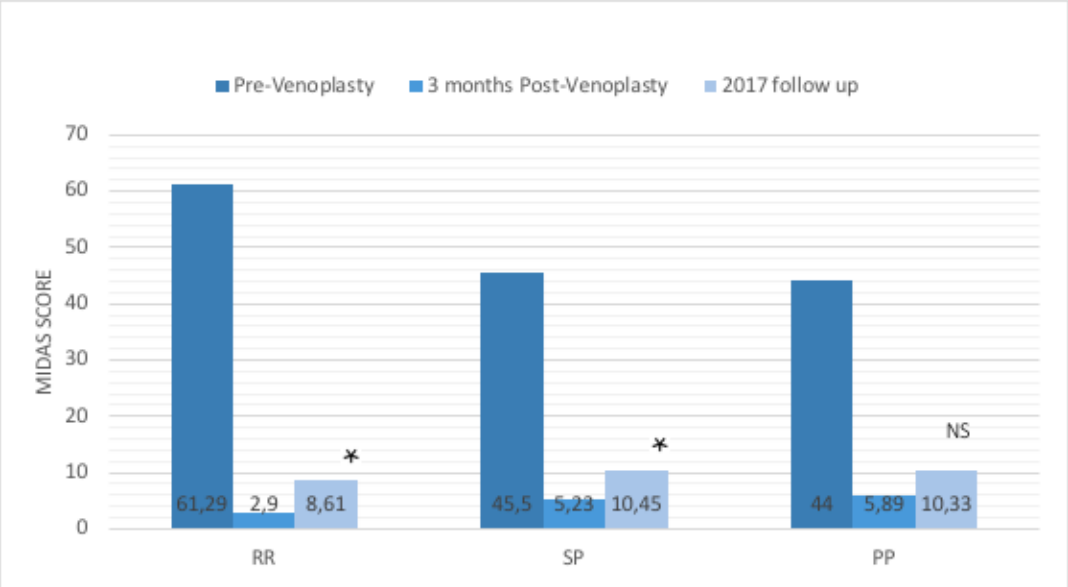
Introduction - While many reports link headaches with obstruction of the cerebral venous drainage pathways, there are no studies specifically investigating the relationship between obstructive disease of the IJVs and headaches. This is the first report evaluating the role of the balloon venoplasty of Internal Jugular Veins (IJVs) in the treatment of patients with persistent headache and Multiple Sclerosis (MS).

Methods - This open label observational study, with data collected prospectively, was designed to evaluate, using a standardized and operator-indipendent catheter venography protocol, the impact of venoplasty on headaches in patients with MS. From May 2011 to December 2015, 113 MS patients, diagnosed with obstructive disease of IJVs and persistent headache (82 Relapsing Remitting, 22 Secondary Progressive, and 9 Primary Progressive) underwent bilateral IJVs balloon venoplasty. In all patients the severity of headache was documented using the *Migraine Disability Assessment* (MIDAS) before venoplasty, 3-months after venoplasty, and at final follow-up in 2017. Patients were evaluated with Doppler sonography of the IJVs before, at 1, 6 and 12 months after venoplasty and yearly thereafter. Non-parametric statistical analysis was performed using a combination of the Friedman test and Spearman correlation analysis.

Results - With the exception of the PP patients there were significant reductions (all $p < 0.001$) in the MIDAS score in the 3-month following PTA. The clinical improvement in MIDAS score following venoplasty was maintained throughout the follow-up period in both the RR ($p < 0.001$; mean of 3.55 years) and SP ($p = 0.002$; mean of 3.52 years) MS cohorts (Figure 1). Furthermore post-venoplasty MIDAS score was significantly negatively correlated with the change in the blood flow score in the left ($r = -0.238$, $p = 0.031$) and right ($r = -0.250$, $p = 0.023$) IJVs in the RR patients and left IJV ($r = -0.727$, $p = 0.026$) in the PP patients.

Image -

Figure 1. Reduction in Midas Score in patients with MS undergoing balloon angioplasty of IJV.
* : p < 0.001



Conclusion - This study documented for the first time a large and sustained (>3 years) reduction in MIDAS score in both RR and SP MS patients undergoing IJVs venoplasty. The results of this study are promising and suggest that balloon venoplasty might be a useful intervention for treating MS patients with selected obstructive disease of the IJVs who currently suffer of headache with little relief.

O-075 ROLE OF THE AGE-ADJUSTED D-DIMER CUT-OFF LEVEL IN THE DIAGNOSIS OF LOWER LIMBS DVT IN OUTPATIENTS

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Institution(s) - [1]Angiology & Vascular Surgery, [2]Hospital Universitari de Bellvitge, Hospitalet del Llobregat, Spain

Introduction - Tromboembolic venous disease, consisting of pulmonary embolism and deep vein thrombosis (DVT), has an incidence rate of 104 to 183 per 100,000 population/year[1]. The diagnostic strategy of these patients in emergency care is based upon a diagnostic algorithm that includes the use of clinical probability scales, D-dimer determinations and duplex ultrasound (DU)[2]. When clinical probability is low or moderate, the diagnosis of DVT can be safely excluded with a negative D-dimer blood test, avoiding the need of DU. In recent years, the age-adjusted D-dimer cut-off value has been studied observing remarkable results[3-7]. In those studies, most of the DU exams included the femoro-popliteal sector until the trifurcation of the calf veins, leaving the distal sector unexplored[4-7]. Despite that acute DVTs may start anywhere in the venous system, it's understood that most start in the calf veins and then propagate proximally. The rate of this proximal extension has been observed in 3 to 15.5% of calf veins DVT[8]. The management of distal DVT is still under discussion.The goal of this study is to analyze the utility and safety of the age-adjusted D-dimer cut-off value in patients with clinical suspicion of DVT in an ambulatory care, including distal DVTs.

Methods - Observational cohort study of 606 consecutive outpatients older than 18 years-old presenting with low or intermediate clinical suspicion of lower limbs DVT (suspected by family doctor or emergency physician) at the emergency department between January and December 2016.
In all patients D-dimer levels were obtained and DU was performed. The DU included the femoro-popliteal sector and meticulous analysis of gastrocnemius, soleus, tibials and peroneals veins.
We calculated sensibility, specificity, positive and negative predictive D-dimer values, and when to apply the age-adjusted D-dimer cut-off value. We also analyzed the relationship between age and D-dimer levels in patients with and without DVT.

Results - Our study population included 249 men (41.1%) and 357 women (58.9%) with a mean age of 69.3 years-old, of which 92 patients had an active neoplasm (15.2%). Wells pre-test probability was moderate in 142 patients (23.4%) and low in 464 patients (76.6%). Forty-one patients were diagnosed with DVT. The most common sector affected was distal (53.7%), followed by popliteal (29.3%), femoro-popliteal (9.76%) and femoral (4.8%). 1 patient had an iliac DVT. Global sensitivity was 93% with a specificity of 8%, positive predictive value was 7% and negative predictive value was 94%. 3 patients had a D-dimer level below 250ug/L but were diagnosed by US with DVT, 1 was femoral and 2 were distals.
When applying the age-adjusted D-dimer cut-off value the sensitivity fell to 76% and specificity raised to 61%, the positive predictive value was 12% and the negative predictive value was 97%. Ten patients had a negative age-adjusted D-dimer cutoff level but were diagnosed by US with DVT. Of these ten patients, 8 had a distal DVT and 2 had proximal DVT.
When stratifying for DVT Yes/No, values of D-dimer (ug/L) did not increase across quartiles of age. Medians and interquartile ranges were 1032 [679;2267], 1741 [526;9305], 1100 [742;3368] and 2566 [1438;6026] for DVT Yes; and 497 [307;810], 510 [331;1036], 576 [385;1035] and 450 [324;982] for DVT No (Figure 1).

Image -

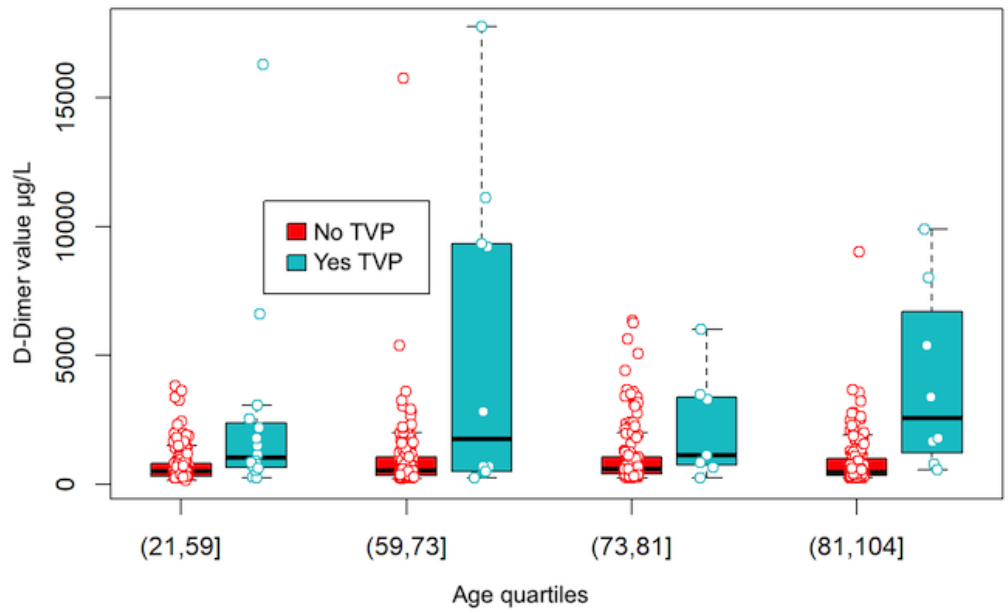

Figure 1.- Box plots of D-dimer value in the different age quartiles

Conclusion - In our series, the age-adjusted D-dimer cutoff level is unsafe in the diagnostic algorithm of DVT.

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O-076 DETECTING STENT GEOMETRY CHANGES AFTER VENOUS RECANALISATION USING DUPLEX ULTRASOUND

VENOUS DISEASES (INCL. MALFORMATIONS)

Author(s) - Mohammad Barbati*[1], Alexander Gombert[1], Irwin Toonder[2], Karina Schleimer[1], Jochen Grommes[1], Cees H. Wittens[2], Houman Jalaie[1]
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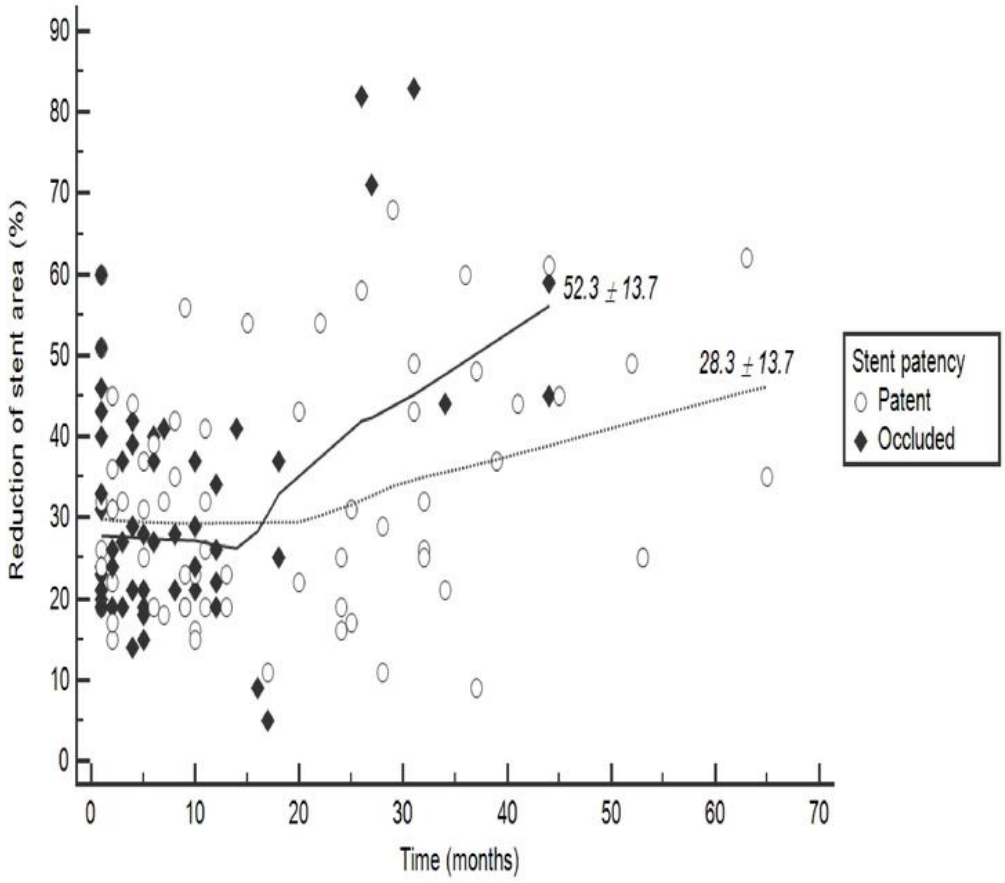
Introduction - Chronic obstruction of the deep venous system can lead to clinical symptoms known as the post-thrombotic syndrome (PTS). Endovenous revascularization has dominated as the therapy of choice in these patients during the last years. The aim of this study is to investigate the efficiency of duplex ultrasound (DUS) in monitoring the stent geometry during follow-ups.

Methods - We retrospectively assessed all prospectively recorded data of patients treated by venous angioplasty and stenting from June 2012 to December 2016. All available gray-scale, color/power DUS images were reviewed retrospectively. The recorded stent diameter and area during the follow-up visits have been analyzed. DUS was used to measure the stent morphology as well as luminal area of the stent in different parts of the stented tract.

Results - A total of 210 stents were placed in 137 limbs. DUS findings showed a decrease in area of stent in all patients (mean: 0.69 cm2). The mean percentage decrease of the stent area before the end of the primary patency was 36.52%. The only significant independent predictor of stent occlusion was the reduction of stent area over the time (OR: 0.910; CI: 0.832–0.997).

Image -



Reduction of stent area over the time and rate of primary patency.

Conclusion - DUS shows a sufficient diagnostic accuracy in the detection of stent changes and its patency. Findings of DUS are suggestive for existing discrepancy between diameters of the stent lumen in vitro and after deployment in all patients. However, stent occlusion appears to be related to reduction of stent lumen over the time rather than the pure percent of the stenosis. The degree of compression was measured with ellipse and calculated as:nominal area of stent (cm2) – measured area of stent (cm2)

X 100 (%). The degree of compression was measured with ellipse and calculated as:nominal area of stent (cm2) – measured area of stent (cm2) X 100 (%).

O-077 SHOULD SUPERFICIAL VARICOSITIES BE TREATED CONCOMITANTLY WHEN PERFORMING MECHANOCHEMICAL ABLATION?

VENOUS DISEASES (INCL. MALFORMATIONS)

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Institution(s) - [1]Academic vascular surgical unit, Hull York Medical School, Hull, United Kingdom

Introduction - Concomitant treatment of tributary varicosities during axial endovenous ablation has been shown in randomised trials to be the best management option, with improvement in quality of life and clinical severity[1,2]. Non thermal, non tumescent methods of ablation aim to reduce the discomfort of treatment, but the optimal management of varicose tributaries with these techniques is unknown and may have an important impact on whether these techniques carry any benefit over endothermal technologies. This study compares outcomes following mechanochemical ablation with concomitant phlebectomy (MOCAP) versus ablation alone with sequential phlebectomy if required (MOCA).

Methods - Patients with symptomatic (C2-C6) unilateral axial reflux were studied. Patient choice determined whether concomitant treatment of varicosities was carried out. The primary outcome was the Aberdeen Varicose Veins Questionnaire (AVVQ) at 1 year. Secondary outcomes included: Venous Clinical Severity Scores (VCSS), complication rates such as venous thromboembolism, phlebitis and skin staining, generic quality of life (EQ-5D), duration of surgery, procedural and post-operative pain scores measured on a 100mm visual analogue scale, anatomical occlusion rate on duplex ultrasound and need for secondary procedures. Outcomes were assessed at baseline then 1 week, 6 weeks, 6 months and 1 year post intervention.

Results - 50 patients underwent MOCAP and 33 patients MOCA. The two groups were comparable at baseline. MOCAP was associated with lower (better) AVVQ scores at 6 weeks (3.4 (0.5-6.0) vs 6.1 (1.8-12.1); *P* =0.009) and at 6 months (1.6 (0.0-4.5) vs 3.34 (1.8-8.4); P=0.009) but by 1 year the difference was no longer statistically significant with this sample size (1.81 (0.0-4.5) vs 3.81 (0.2-5.3); *P*=0.099). This was associated with lower Venous Clinical Severity Scores at all time points in favour of MOCAP (0 (0-1) vs 1 (0-3); *P*<0.001). Secondary procedures were less common following MOCAP (2 vs 6; *P*=0.032 – 4% vs 18%). MOCAP was associated with a longer procedural duration (45mins (36-56) vs 30mins (25-37); *P*<0.001) and maximal procedural pain on visual; analogue scale was also higher (31 (21-59) vs 18 (7-25); *P*=0.001). The incidence of thrombophlebitis was lower in the MOCAP group (6 vs 10; *P*=0.039 12% vs 30%). There were no major complications in this study.
(1.81 (0.0-4.5) vs 3.81 (0.2-5.3);*P*=0.099).(1.81 (0.0-4.5) vs 3.81 (0.2-5.3);*P*=0.099).

Conclusion - Following mechanochemical ablation of axial incompetence, concomitant treatment of tributary varicosities appears to mirror the results following endothermal treatment. It is associated with improved quality of life and clinical severity, whilst reducing the need for further treatment. Complications are also lower. The penalty is a modest increase in procedural duration and discomfort.

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O-078 LONG-TERM TREATMENT OF PROXIMAL DEEP VEIN THROMBOSIS WITH MICRONIZED PURIFIED FLAVONOID FRACTION ADDITIONALLY TO ORAL RIVAROXABAN IMPROVES CLINICAL AND ULTRASOUND OUTCOMES

Author(s) - Kirill Lobastov*[1], Ilya Schastlivtsev[1], Victor Barinov[1]

Institution(s) - [1]Pirogov's Russian National Research Medical University, Moscow, Russian Federation

Introduction - The aim of the study was to assess the impact of long-term micronized purified flavonoid fraction (MPFF) use in the treatment of proximal deep vein thrombosis (DVT)

Methods - It was a pilot randomized open-label study with blind outcome assessor enrolled patients with the first episode of popliteal-femoral DVT confirmed by duplex ultrasound (DUS). All participants were randomized into two groups: control, that received a standard treatment with oral rivaroxaban, and experimental, that required additional treatment with MPFF 1000 mg/day. Both drugs were used for 6 months. Patients were followed up for the whole period of treatment with series DUS every 2 months to evaluate the degree of recanalization by the compressibility of popliteal (PV), superficial femoral (SFV) and common femoral (CFV) veins. The extension of thrombi was assessed by modified Marder score. At the end of follow-up, patients were assessed with Villalta score and VCSS score. Post-thrombotic syndrome (PTS) was diagnosed in those, who had 5 and more Villalta scores.

Results - 60 patients were randomized to the control (n=30) and experimental (n=30) groups: 40 men and 20 women, mean age of 56.3±13.4. Clinically unprovoked DVT was recognized in 65% of cases and left side localization – in 45%. The median of Marder score at baseline was 15.0±4.8 in the main group and 11.1±4.3 in the control one (p=0.002). After 6 months of the treatment, the Marder score reduced to 0.8±1.6 in the main group and to 2.8±3.5 in the control one (p=0,006). The generalized linear model repeated measures found more intensive reducing of Marder score (p<0,0001) and increased speed of recanalization on SFV (p<0,0001) with a non-significant tendency on CFV (p=0,130) and PV (p=0,204) in the main group compared to the control one. Full recanalization of PV at 6 months was observed in 24 patients (80%), received MPFF, and only in 17 persons (57%) of the control group (p=0,047).
The median of Villalta score in the group treated additionally with MPFF was significantly lower compared to the control one: 2.9±2.7 versus 5.8±3.0 (p<0,0001). The same difference was found for VCSS score: 22.3±1.9 versus 4.9±1.9 (p<0,001). According to Villalta score, PTS was recognized in 6 patients (20%) in the experimental group and in 17 patients (57%) in the control one (p=0,004). None of any patient had a severe PTS.

Conclusion - Long-term treatment with MPFF can increase the speed of deep vein recanalization and reduce the incidence of PTS diagnosed at 6 months in patients with proximal DVT treated with oral rivaroxaban.

O-079 POSSIBILITIES OF THE USE OF STANDARD DUPLEX ULTRASOUND SCANNING IN DIAGNOSTICS OF THE MICROCIRCULATORY DISORDERS IN PATIENTS WITH VARICOSE DISEASE

VENOUS DISEASES (INCL. MALFORMATIONS)

Author(s) - Roman Kalinin*[1], Igor Suchkov[1], Ivan Shanaev[2], Nina Mzhavanadze[1]

Institution(s) - [1]Ryazan State Medical University, [2]Ryazan Regional Clinical Cardiologic Dispensary, Ryazan, Russian Federation

Introduction - duplex ultrasound scanning (DUS) is a standard examining procedure in patients with varicose disease (VD). DUS gives sufficient information on the anatomy and function of the superficial, deep, and perforator (PV) veins. A complete examination should include assessment of microcirculatory bed as a key parameter in the pathogenesis of trophic disorders. Capillaroscopy, percutaneous oximetry, and laser Doppler imaging are traditionally used for the evaluation of microcirculation. New generation ultrasound scanners provide a possibility of imaging the microcirculatory bed by using Superb Micro-Vascular Ultrasound Imaging (or SMI mode) with high accuracy, but still indirectly. However, all these methods require additional equipment. Microcirculatory bed may be assessed with the help of a standard DUS device. PVs of the distal part of the medial surface of the lower leg are the main draining vessels of the superficial tissues in this region. Right next to a PV there is an arterial branch (perforator artery, PA), which feeds the vascular wall of the PV on the epiphasic level, fascia, hypoderma, and dermis in this region; altogether these vessels form the microcirculatory bed. Therefore, assessment of the hemodynamic parameters of the perforator vessels can provide important information about microcirculation.
Methods - the study included 195 subjects with VD. Patients with concomitant arterial pathology were not included in the study. Distribution of the patients according to the CEAP clinical classification of chronic venous disorders was as follows: 78 subjects – class C2, 39 - C3, 52 - C4, 26 – C5/C6. The study was performed using a Medison SonoaceX8 scanner. Anatomy and function of

the superficial, deep, and perforator veins were determined. Blood flow velocity and resistive indexes were assessed in the perforator arteries.

Results - the most frequently encountered PVs were those localized on the medial surface in the distal part of the lower leg (Table №1). Interestingly, low resistive indexes were accompanied by normal systolic peak and high diastolic velocities. In addition, pseudopulsating flow was detected in 50% of PVs. According to the DUS criteria, these are direct signs of arteriolo-venular shunting (AVS). Statistical analysis showed significant differences in this parameter between the patients with CEAP classes C2 and C3, C3 and C4 (P <0.05), and classes C4 and C5/C6, despite the fact that the values varied (C4 - 0.83, C 5/C6 - 0.81). Our study confirmed the presence of a perforator vascular bundle. Analysis of the characteristics of the blood flow through the perforator vessels has revealed that there were ultrasound signs of the presence of AVS in areas of trophic changes, which requires appropriate therapies. Moreover, initial signs of AVS were detected in patients with edema, i.e. no trophic changes. Changes in the microcirculation begin at clinical class C3.

Image **-**

Table №1

Occurrence of the incompetent perforator veins and

main characteristics of blood flow in the perforator artery

Parameter	CEAP class C2	CEAP class C3	CEAP class C4	CEAP class C5,6
Total number of incompetent perforator veins, N	41	42	68	35
Number of incompetent Cockett's perforator veins, N	35	34	53	26
Number of incompetent Cockett's III perforator veins, N	28	27	41	17
Number of incompetent Cockett's II perforator veins, N	7	7	12	8
Number of incompetent Cockett's I perforator veins, N	-	-	-	1
Visualization of perforator artery	100%	100%	100%	96.15%
Resistive index	1.0	0.9±0.1	0.83±0.1	0.81±0.06

Conclusion - Standard duplex ultrasound scanners may be useful in assessing microcirculation in patients with trophic changes due to varicose disease.

O-080 EVALUATION OF THE CLINICAL ANATOMY OF THE MOST IMPORTANT PERFORATOR VEINS OF THE LOWER EXTREMITIES BY DISSECTION AND DUPLEX ULTRASOUND SCANNING

VENOUS DISEASES (INCL. MALFORMATIONS)

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Introduction - literature sources provide significant amount of data on the anatomy of the perforator veins (PVs) of the lower extremities. However, detailed descriptions of the topography of PVs are rare.

Methods - 70 amputated lower extremities were subjected to anatomical dissection; 2800 patients (3500 extremities) underwent duplex ultrasound scanning (DUS).

Results - There were 4 to 6 PVs on the medial surface of the foot. They directly connected the medial tributary of the medial marginal vein and vv. plantaris medialis and were located along the medial intermuscular septum. There were 2 to 3 PVs on the lateral surface of the foot. They connected the tributary of the lateral marginal vein (which together with the main trunk of the lateral marginal vein formed small saphenous vein) and vv. plantaris lateralis in a direct manner. Topographically PVs passed behind the lateral muscle group of the foot along the lateral intermuscular septum. Moreover, both PVs had tributaries, which drained the subcutaneous tissues of the lateral and medial surfaces of the foot.
Presence of the muscular/venous pump of the calf complicates the structure of the PVs, among which are direct, indirect, and mixed PVs. Anatomical dissection has shown that the most constant were PVs located at a distance of 7-10 cm and 11-16cm from the lower edge of the medial ankle. Each PV of the calf (direct or indirect) and the foot was accompanied by an arterial twig, and it was often possible to identify a twig from a nearby nerve. There were 2 PVs in the subfascial area, located by the sides of the artery.
PVs in the popliteal region may be referred to as “atypical” due to their rare presence (0.4% according to the DUS and no cases during dissection) in combination with the lack of a typical saphenopopliteal junction. PVs in this area were not supported by the intermuscular septa. 0.34% of the PVs emptied into the popliteal vein at the lateral side, while the small saphenous vein emptied into the great saphenous vein (GSV) at the upper 3rd of the or into the Giacomini vein. Arterial twigs accompanied every PV.
DUS has shown the typical localization of the PVs on the thigh: middle third of the thigh where PVs emptied into the femoral vein at the level of the adductor canal, PVs connected GSV and femoral vein in 82.8% cases; lower third of the thigh – PVs emptied into the popliteal vein below the level of the adductor canal, PVs connected GSV and popliteal vein in 73.6% cases. All PVs passed along the medial intermuscular septum and were accompanied by an arterial branch from the femoral artery in all cases. The angle of the confluence of the PVs and the deep veins was approximately 45°, the length of their subfascial course was 5 to 7cm. Such characteristics prevent incompetence of the PVs in patients with varicose disease but create higher risks of introducing a Babcock’s probe into the deep veins in antegrade direction during phlebectomy (0.5% of cases).

Conclusion - 1. Perforator veins mostly constitute the neurovascular bundles.
2. Perforator veins are primarily located along the intermuscular septa, which provides a solid support for the perforator vessels due to the rigid fixation of the intermuscular septa to the bones.
3. Presence of a concomitant artery makes it possible to propose an additional mechanism of venous outflow via the perforator vascular bundles - an arterio-venous pump.

O-081 A NEW FOOT SAVING PROCEDURE: ANTIBIOTIC-LOADED RESORBABLE BONE-GRAFT SUBSTITUTE INSTEAD OF AMPUTATION IN OSTEOMYELITIS/OSTEITIS

CHRONIC WOUND MANAGEMENT

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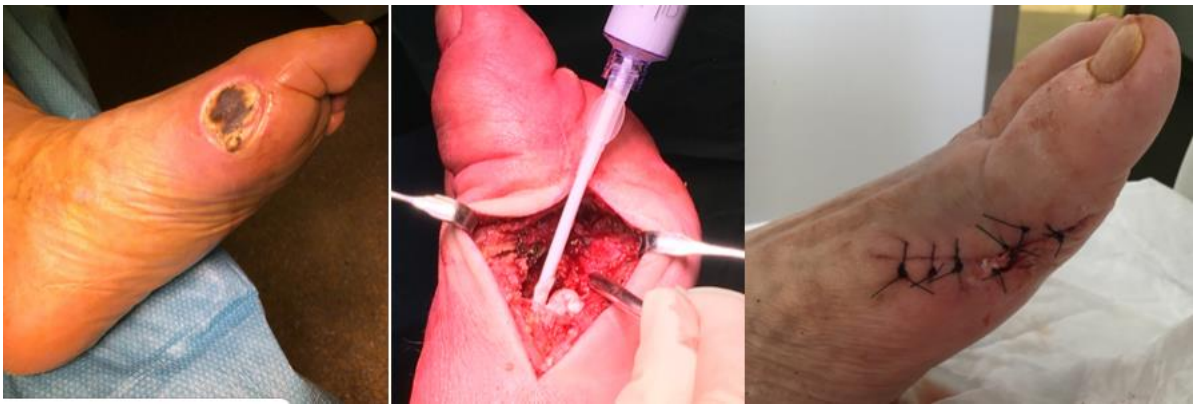
Introduction - Patients with osteomyelitis require usually antibiotic treatment over a long time period, often only to see the inflammation flare up once antibiotics are suspended. Unfortunately, patients on their side often discontinue the antibiotic treatment due to the well known collateral effects. Patients with osteitis are often polymorbid patients with several other diseases such as diabetes mellitus and polyneuropathy, arteriopathy or polyarthritis with immunosuppression.

Methods - In the past two years we included 18 patients which presented all metatarsal and/or phalangeal bones of their feet with osteomyelitis/osteitis, positive bacteriological biopsies or at least undoubtedly positive radiological image findings (MRI).
In all cases the diseased part of the bone was resected, a locally radical debridement of the surrounding tissue was completed and a biopsy for bacteriology and histology were sent for investigation purpose. The residual bone was then drilled open, it’s cavity

prepared and filled with antibiotic-loaded (Gentamicin) resorbable bone-graft substitute under radiologic imaging control. In all cases we achieved a primary wound closure over the cement augmented bone.

Results - In total, eighteen patients are currently without recurrent osteomyelitis with a mean follow-up of 9.77 months (two to twenty-four months). The Kaplan Meier curve shows 83 % survival rate without recurrent osteomyelitis at twenty-four months. Only three patient had a relapse osteomyelitis or local infection: one patient with Morbus Buerger who hurt his foot while swimming in the sea, one patient with untreatable severely compromised peripheric arterial vascular disease and one patient with diabetes mellitus and neuropathy.
All other 15 cases showed a classical course of steady regression of local and systemic inflammatory response. No major amputation was needed, only two patients lost one toe primarily, mainly because of local extension of skin ulcer. 5 patients showed a somewhat delayed definitive wound closure (after more than 6-8 weeks), ten patient showed a complete cicatrization at 3 weeks. All patients were dismissed from oral or parenteral antibiotics, immediately after the operation in eight cases or after two weeks in six cases and at the most after 6 weeks in four cases; this unequal treatment was due to the fact that 6 patients where in follow up also from their family practitioner or diabetologist, whom where skeptic about this new technique without an adequate antibiotical support.

Image -



Conclusion - Due to the small sample of patients there cannot be drawn any conclusion about the necessity of continuing adjuvant oral antibiotics after the implant or not, but we could not find any difference between the three variations, as the mentioned three relapses were to find by one in each group. We could demonstrate that in half of our observed patients the adjuvant antibiotics could be suspended immediately without any consequence (if not the better quality of life of the patients without pharmacological side effects). In our hands the antibiotic-loaded resorbable bone-graft substitute is easy to use, has few complications and presents a low recurrence rate of osteomyelitis treated in this way; it permits to save compromised feet in patients with a notorious tendency for complicated and long ulcer history.

O-082 HOW TO SET UP A MULTIDISCIPLINARY FOOT TEAM (MDFT) FOR PATIENTS WITH DIABETIC FOOT ULCERS?

CHRONIC WOUND MANAGEMENT

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Introduction - We would like to share our experience of setting up an MDFT for patients with diabetic foot ulcers according to NICE guidelines and present early results.

Methods - NICE guidelines indicate that every centre that treats patients with Diabetic foot ulcers should have an MDFT that is based in the hospital. The MDFT should be led by a hospital-based specialist diabetic podiatrist and should comprise of a diabetic physician, vascular surgeon, orthopaedic surgeon with special interest in foot and ankle surgery, diabetic nurse, vascular nurse,

tissue viability nurse and Orthotic specialist. There should be close contact with the community podiatry for a seamless pathway for patients with diabetic foot ulcers in primary and secondary care. The main aims of the Diabetic MDFT are to reduce major amputations, reduce hospital stay and reduce readmissions. Screening patients for diabetic foot problems and education of patients and healthcare professionals are secondary aims of the MDFT.
A diabetic foot ulcer MDFT has been operational at Bedford Hospital since August 2017. This comprises of a weekly diabetic foot round where inpatients and outpatients are discussed. We were successful in securing the National Diabetes Treatment and Care – Transformation Funding bid to help set up the MDFT. We encountered several hurdles in setting up the MDFT, which included dialogue and collaboration between finance officers and clinicians from primary and secondary care and between various hospital departments as well. The hub and spoke model of vascular services adds to the complexity of this venture. We have struggled with Orthopaedic input in the MDFT and organization of podiatry services in hospital. We present some strategies in overcoming these obstacles and recount our experience of setting up the MDFT.

Results - A diabetic foot resister was started in August 2017 and so far >100 patients have been entered in this register. 79 patient episodes have been discussed in the MDFT involving 66 patients. We have had 48 new emergency referrals from the community and of these 30 have been triaged as needing an urgent podiatry appointment. This has been achieved on an average in 1.8 days. We have established an emergency hotline number to the diabetic podiatry clinic in hospital. Revamping of the 'Hospital at Home' team has been a tremendous support to the MDFT. We have reinforced links with community podiatry and MDFTs in other spoke hospitals in the Bedfordshire – Milton Keynes (BMK) Vascular Unit. Early results indicate a marked reduction in hospital admissions and hospital stay due diabetic foot problems. There have been only 3 major amputations since September 2017.

Conclusion - It has been a huge struggle to set up the Diabetic MDFT at the BMK vascular unit, but early results indicate considerable benefits in terms of patient outcomes and costs.

References - https://www.nice.org.uk/guidance/ng19

O-083 A RETROSPECTIVE REVIEW OF THE MANAGEMENT OF VASCULAR AND SOFT TISSUE COMPLICATIONS IN PEOPLE WHO INJECT DRUGS AT A TERTIARY VASCULAR SURGICAL UNIT

CHRONIC WOUND MANAGEMENT

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Introduction - In the UK hospital admissions associated with skin,soft tissue and vascular infections (SSTVI) secondary to illicit opiod use have increased in the last 5 years. People who inject drugs (PWID) utilise a significant amount of secondary care resources and the extent of this has not been fully evaluated in the contemporary literature.
The utilisation of femoral vessels for injection is indicative of long-term intravenous drug use as more easily accesible vessels in the hand and antecubital fossa become thrombosed. This study evaluates the demographics, presentation, subsequent management and outcomes of PWID presenting to a tertiary vascular unit in the UK with SSVTI. The region this work was undertaken experiences the highest number of PWID related admissions to hospital in the UK.

Methods - Admissions to our hospital from Jan 2014 to Dec 2017 were collected for retrospective analysis. A total of 202 patients were admitted with a SSTVI in this time period. Presenting complaint, in-patient length of stay (LOS), receiving speciality, imaging modalities, microbiology, blood borne virus (BBV) status along with subsequent medical and surgical management were reviewed.

Results - 69.3% of patients admitted with a SSTVI were male with the majority being in the age range of 40-60 (55.9%). Median LOS was 6 days (IQR 2-12.75), with 49.5% of patients being treated by the Vascular Surgical team, the rest being managed across medical, orthopaedic and general surgical teams.
30.7% of patients had USS of the SSVTI, 28.7% had a CT angiogram, 10.4% had a plain x-ray and 13.9% had both CT angiogram and USS.

48% of the patients tested positive for the Hepatitis C core antigen indicating current or recent exposure to the Hepatitis C virus. 16.3% of the patients had detectable levels of Hepatitis C viraemia on ribonucleic acid. 1% of patients were positive for HIV-1.
67 patients underwent groin exploration and drainage of an abscess with 27 also requiring ligation of a femoral pseudoanueysm. No patients underwent reconstruction of the femoral artery following ligation and there were 3 above knee amputations performed during the same in-patient episode.

Conclusion - We have noted a significant increase in the number of patients presenting with SSVTI over the period of our study. This has had a significant impact on resources given the LOS and multidisciplinary input required to ensure a safe and timely discharge from hospital when dealing with PWID.
All patients in whom a SSVTI is suspected in the groin should undergo a CT angiogram as the imaging modality of choice as this accurately identifies any vascular complications as well as the presence of foreign bodies which may potentially cause a needle stick injury to the surgical team.
Ligation of femoral pseudoaneurysms generally does not result in patients requiring amputation, however, they are often claudicants as a result.

O-084 PRESENT OR FUTURE: RAPID 3D PRINTING PROTOTYPING TECHNOLOGY FOR AORTIC ANEURYSM SURGERY PLANNING AND ITS UTILITY IN OPEN AND ENDOVASCULAR TREATMENT

VASCULAR IMAGING

Author(s) - Gonzalo Bueno[*1,2], Pere Altes[1,2], Lucia Carnovale[1,2], Natalia Hernandez[1,2], Joan Sancho[1,2], Gino Zamora[1,2], Carlos Esteban[1,2], Secundino Llagostera[1,2]

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Introduction - Nowadays, the use of 3D printing prototyping technology is implemented in surgical practice, especially for anatomical modelling and surgical planning. The aim of this study is to evaluate the utility of 3D printed model prototypes in the planification of aortic clamping placement during juxta or pararenal aortic aneurysm open surgery and their impact in custom made fenestrated endografts for endovascular aortic aneurysm repair (FEVAR).

Methods - A retrospective unicenter study was conducted. We included patients with juxta and pararenal aortic aneurysm. We analysed samples using cross sectional DICOM data from each patient computer tomography. With Horos® program we composed a stereolithographic file through the segmentation process. We obtained the abdominal aortic model from above celiac trunk to iliac arteries by 3D printing in filaflex material for open surgery planning and in hard polymer resin for endovascular planning. In these patients candidates to open repair we used the model to plan the site of clamping. In candidates to FEVAR, the puncture approach strategy and the correct alignment of the endograft fenestrations were analysed.

Results - During 2017 we included 7 patients, 3 juxtarenal aortic aneurysm open surgeries and 4 FEVAR. In open surgery, we performed two infrarenal clamping (66%) and one suprarenal clamping (33%), all accordance to the previous planned strategy with the 3D printed model. No complications were observed and anastomosis were in the intended place. Regarding FEVAR, we designed four 3D models and performed implant simulations. Among these 4 cases, one endograft had to be redesigned (25%) due to the incorrect alignments of the fenestration to the ostium of the model. The other three endografts integrated correctly with the model (75%). Two FEVAR procedures were performed “in vivo” as planned (50%), while one of the cases required a different puncture approach due to the impossibility of cannulating an arterial branch (25%).
Conclusion: 3D models allowed the correct planification of aortic clamping site in open surgery. Regarding to FEVAR, the prototypes were useful to stablish the puncture approach strategy and evaluated the correct fenestrations alignment. More studies are required to introduce this technology in the clinical practice.
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O-085 DIAGNOSTIC IMAGING IN VASCULAR GRAFT INFECTION; A META-ANALYSIS. THE ADDED VALUE OF NUCLEAR IMAGING TECHNIQUES AND AN OUTDATED GOLDEN STANDARD

VASCULAR IMAGING

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Introduction - Vascular graft infection (VGI), a serious complication in vascular surgery, has a high morbidity and mortality rate. Diagnosis is being complicated by nonspecific symptoms and challenged by variable accuracy of different imaging techniques. This systematic review and meta-analysis was conducted to evaluate the role of various diagnostic imaging modalities in patients suspected of VGI.

Methods - A systematic review was conducted according to the PRISMA guidelines. Randomized controlled trials and observational cohort studies were included. Data sources included PubMed/Medline, Embase and Cochrane from January 1997 until October 2017. A meta-analysis was conducted on several imaging modalities: computed tomography with or without angiography (CT(A)), 18F-Fluoro-D-deoxyglucose positron emission tomography with or without low dose or contrast enhanced CT (FDG-PET(/CT)), and white blood cell scintigraphy with or without single photon emission computed tomography combined with low dose CT (WBC (SPECT/CT)).

Results -Out of 4259 papers, 14 articles were included, which contained 8 prospective and 6 retrospective articles. CTA, FDG-PET and FDG-PET/CT showed negligible to moderate heterogeneity, while WBC scintigraphy ± SPECT/CT showed considerable heterogeneity. Pooled sensitivity for CTA was 0.67, in contrast to FDG-PET of 0.94, FDG-PET/CT of 0.95, WBC scintigraphy of 0.90 and WBC scintigraphy with SPECT/CT of 0.99. The pooled specificities were for CTA 0.63, FDG-PET 0.70, FDG-PET/CT 0.80, WBC scintigraphy 0.88 and WBC scintigraphy SPECT/CT 0.82. Pre- and posttest results showed that best probability per imaging modality is achieved by a combination of nuclear imaging and CT, where WBC SPECT/CT favors FDG-PET/CT with a positive posttest probability of 96% versus 83%.

Conclusion - This meta-analysis suggests the diagnostic accuracy of WBC scintigraphy combined with SPECT/CT revealed the highest accuracy in diagnosing VGI. However it is a time consuming technique and not always available. Therefore FDG-PET/CT may be favorable as initial imaging technique. The use of solitary CTA in diagnosing VGI seems to be obsolete.

O-086 IMPROVED PROGNOSIS AND LOW FAILURE RATE IN ANTICOAGULATION-FIRST LINE THERAPY IN MESENTERIC VENOUS THROMBOSIS

VASCULAR IMAGING

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Introduction - Anticoagulation as monotherapy has been considered first line therapy in patients with mesenteric venous thrombosis (MVT). The aim of this study was to evaluate prognosis, prognostic factors, failure rate of anticoagulation as monotherapy, identify when failures occurred and when bowel resection was needed.

Methods - Retrospective study of consecutive patients with MVT diagnosed between 2000 and 2015. Diagnosis of MVT was made by autopsy, explorative laparotomy and computed tomography with intravenous contrast enhancement and imaging in the portal phase.

Results - The overall incidence rate of MVT was 1.3/100 000 person-years. Among 120 patients, seven died due to autopsy-verified MVT without bowel resection and 15 underwent immediate bowel resection without prior anticoagulation therapy. The remaining 98 patients received anticoagulation monotherapy, and 83 (85%) were successfully treated. Fifteen patients failed on anticoagulation monotherapy, of whom seven underwent bowel resection and eight endovascular therapy. Endovascular therapy was followed by bowel resection in three patients. Two late bowel resections were performed due to intestinal stricture (fig 1). The 30-day mortality rate was 19.0% in the former (2000–2007) and 3.2% in the latter (2008–2015) time period (p=0.006). Age ≥ 75 years (OR 12.4, 95% CI [2.5–60.3]), management during the former as opposed to the latter time period (OR 8.4, 95% CI [1.3–54.7]), and renal insufficiency at admission (OR 8.0, 95% CI [1.2–51.6]) were independently associated with increased mortality in multivariable analysis.

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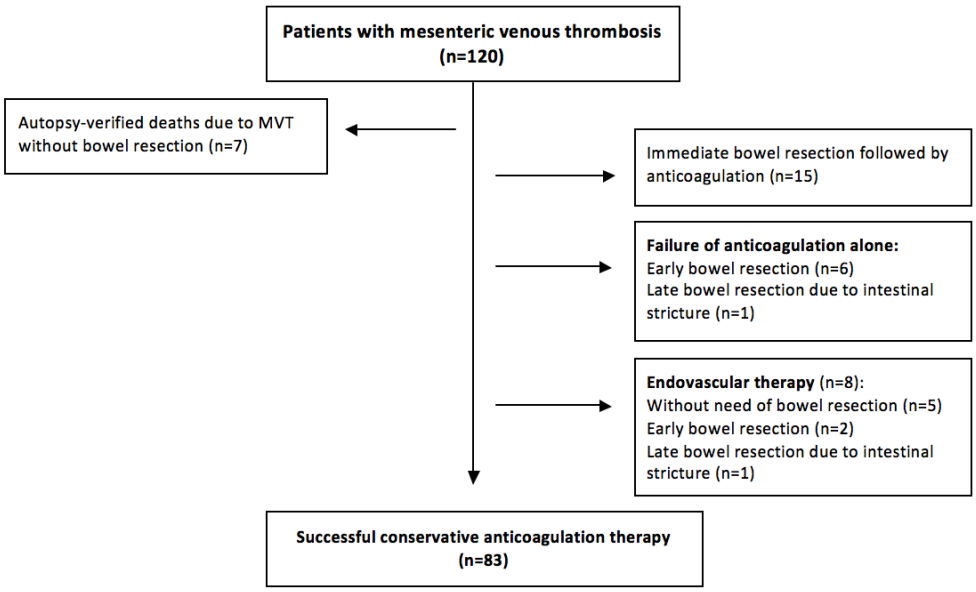

Conclusion - Short-term prognosis in patients with MVT has improved. Contemporary data show that conservative anticoagulation monotherapy is effective first line-therapy in patients with MVT.

O-087 EVALUATING POTENTIAL AUTOLOGOUS BYPASS GRAFTS USING 3D TOMOGRAPHIC ULTRASOUND (TUS)

VASCULAR IMAGING

Author(s) - Steven K. Rogers[*1,2], Joao Carreira[1], Adam Haque[2], Jonathan Ghosh[3], Charles McCollum[2]

Institution(s) - [1]Vascular Studies Unit, Manchester University NHS FT, [2]Academic Surgery Unit, University of Manchester, [3]Vascular & Endovascular Surgery, Manchester University NHS FT, Manchester, United Kingdom

Introduction - Vein mapping using duplex ultrasound is helpful in selecting appropriate autologous grafts for bypass, correlates well with surgical utility [1-3], but is time-consuming, operator-dependent and requires that the surgeon trusts the ultrasonographer or vascular scientist. We compared tomographic 3D ultrasound (tUS) with standard duplex for vein mapping.

Methods - Vein mapping using standard duplex and tUS on the morning of coronary or peripheral artery bypass were compared. The time taken to acquire each imaging modality was recorded. Post-operatively the operating surgeon scored the agreement for each imaging modality with his score for the graft harvested. A score of 5 was complete agreement, with scores of 4 or 5 counting as good.

Results - Standard Duplex and tUS were compared in the assessment of 81 potential grafts in 41 patients: Duplex imaging took a mean (+/-sd) of 11.7±6.8mins compared with 1.1±0.5mins for tUS ($p<0.001$). tUS was scored as equal or more valuable than duplex at determining the most optimal vessel for bypass in 31 grafts with surgeons scoring that tUS gave them the same or better information than duplex in 32. Surgeons felt that tUS matched the duplex when compared to the graft used for bypass in 19 grafts but that tUS correlated more highly than duplex in a further 11. Surgeons reported that tUS would have changed their decision on which vessel to harvest if they had seen the images pre-operatively in 14 grafts. For a further 14 grafts, surgeons concluded that tUS could replace duplex mapping altogether. Compared to the actual vein graft used, most surgeons agreed tUS could replace duplex.
(Figure 1. tUS vein map of the LSV showing associated branches and perforators)

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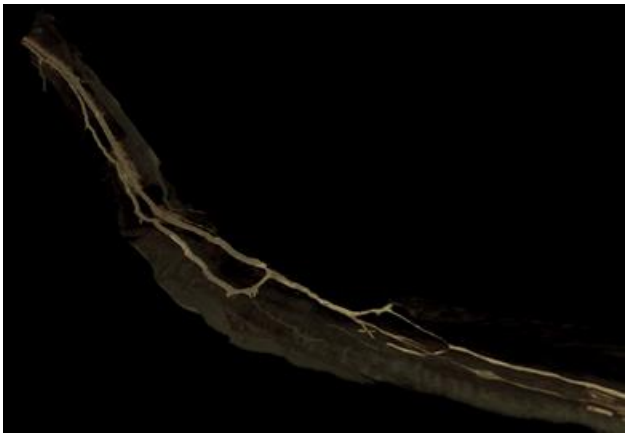

Conclusion - Surgeons preferred to see the potential autologous graft to be used for bypass themselves through the use of tUS images. tUS was significantly quicker than duplex and requires less operator skill, making tUS more cost effective.

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O-088 DIAGNOSTIC MAGNETIC RESONANCE IMAGING CRITERIA IDENTIFY INTRAMURAL HEMATOMA AND PREDICT HIGH LIKELIHOOD OF AORTIC HEALING AFTER TYPE B ACUTE AORTIC SYNDROMES

VASCULAR IMAGING

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Introduction - Type B acute aortic syndrome (AAS) encompasses aortic dissection (AD) and intramural hematoma (IMH), whose diagnosis, evolution and treatment are subject to controversies among cardio-vascular specialists. The aim of our study was to assess the ability of specific magnetic resonance imaging (MRI) criteria to differentiate AD from IMH and predict optimal aortic remodeling following AAS.

Methods - In this retrospective study, we included all patients presenting at our institution between 2008 and 2015 with type B AAS, who had a diagnostic MRI following their admission. Three MRI criteria were established to identify IMH: a) no visualized entry tear, b) no contrast uptake in the false lumen (FL)/IMH on first pass angiographic run, c) no contrast uptake in the FL/IMH on equilibrium phase T1 weighted sequence. On each patient's diagnostic and follow-up imaging studies, we calculated the volume of 1) FL/IMH, 2) total aorta and 3) true lumen. Using paired t-test analysis, we compared the evolution of these volumes according to the presence or absence of the afore-mentioned MRI criteria.

Results - Out of 39 patients included in our study, 7 had all MRI criteria positive (group IMH) and 32 had one or more negative criteria (group AD). There was no difference between both groups concerning patient gender, age or delay between onset of symptoms, diagnostic and follow up imaging study. Eighteen patients had a follow up imaging study after a mean period of 11.2 months: 6 in group IMH and 12 in group AD. FL/IMH volume decrease and true lumen volume increase over time were statistically significant in group IMH ($p=0.043$ and $p=0.029$ respectively) whereas there was a significant increase of FL/IMH volume ($p=0.037$) in group AD.

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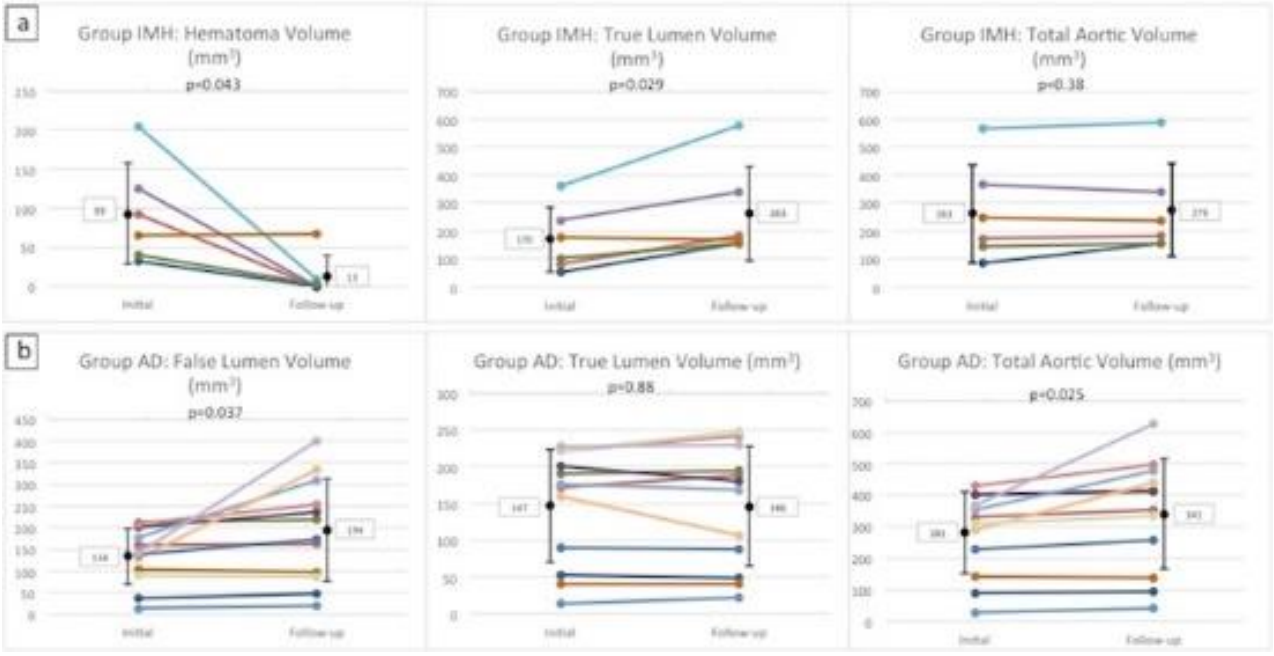

Conclusion - We established three diagnostic MRI criteria that we believe strengthen the sensitivity of identifying IMH. This could have substantial therapeutic benefits, as they have a high likelihood of predicting aortic healing after Type B AAS. This may have an impact on therapeutic decisions and imaging follow-up protocols.

O-089 EVALUATION OF KINETIC IMAGING IN CAROTID AND CEREBRAL X-RAY ANGIOGRAPHY

VASCULAR IMAGING

Author(s) - Viktor I. Orias*[1, 2], David Szollosi[3], Istvan Gog[3], Krisztian Szigeti[3], Szabolcs Osvath[3], Peter Sotonyi[4], Zoltan Ruzsa[1, 4]

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Introduction - Our objective was to compare the performance of kinetic imaging and traditional digital subtraction angiography (DSA) in carotid and cerebral X-ray angiography setting.

Methods - Kinetic imaging is a real-time analysis of X-ray image series aiding the visualization of contrast motion. The algorithm produces so-called Digival Variance Angiography (DVA) images. We examined the image series of 30 patients undergoing standard protocol carotid and cerebral angiography. 15 image series were recorded using only half of the original contrast agent dose. Both DVA and DSA images were calculated. We compared the signal-to-noise ratio (SNR) of carefully selected regions of interest and evaluated the images using an online randomized and anonymized questionnaire. Ultrasonic Doppler Velocimetry (UDV) was used to measure flow dynamics and parametric images were also calculated from the original image series.

Results - On average, DVAs provided 3.5 (± 0.81) times more SNR than DSA ($p < 0.05$). Angiography specialists agreed that full-dose DVAs provided more detailed vasculature than DSA. Half-dose DVAs provided the same diagnostic value as full-dose DSA images. We also found correlation between time-derived contrast motion parameters and UDV values.

Conclusion - DVAs visualized the same anatomical structures with better image quality than DSA. The image quality of half-dose DVA images allows us to further decrease the contrast agent dose. Parametric images could provide real-time periprocedural information about flow dynamics and tissue perfusion.

O-090 AN AUTOMATIZED ALGORITHM TO EVALUATE THE PATENT AORTIC LUMEN IN NON CONTRAST COMPUTED TOMOGRAPHIES

VASCULAR IMAGING

Author(s) - Enrico Cieri[1], Beatrice Fiorucci[* 1], Danilo Costarelli[2], Giacomo Isernia[1], Marco Seracini[2], Gioele Simonte[1], Gianluca Vinti[2]

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Introduction - Contrast medium (CM) use in Computed Tomography (CT) examination is limited by nephrotoxicity and possible allergic reactions. The main purpose of our study is to introduce an automatic tool for the assisted diagnosis of aneurysms of the abdominal aorta avoiding the use of CM.

Methods - With and without CM CT scans of patients with abdominal aortic aneurysm were evaluated.An automatic mathematical algorithm was implemented to allow the visualization of the inner lumen of the aorta in the series without CM.The first step of the proposed algorithm consisted in highlighting a squared ROI (Region Of Interest) close to the target aortic area to which all the following techniques of image processing were applied.The so-called sampling Kantorovich algorithm was then applied to the ROI for image enhancement. The latter algorithm allows to increase pixel resolution of the ROI. After selecting the artery's shape inside the ROI, a wavelet decomposition method is applied to point out the different frequency components of the whole image. By exploiting the wavelet decomposition, the system selects all the low frequency components of the image, corresponding to the major structures.To remove possible artifacts (e.g. calcium) a denoising procedure is further applied.Thus, the lighter parts that can be distinguished in the processed image belong to the lumen of the aorta.In order to extract the contours of the vessel lumen a thresholding method was applied. The choice of the threshold was based on the analysis of the gray-level pixel histogram of the image. In particular, we individuated two typical trends of the pixels histogram, depending from the morphology of the vessel lumen.The final images obtained were compared to the corresponding contrast enhanced scans. In order to validate the automatic algorithm an analysis of the numerical results has been made according to the following types of errors:

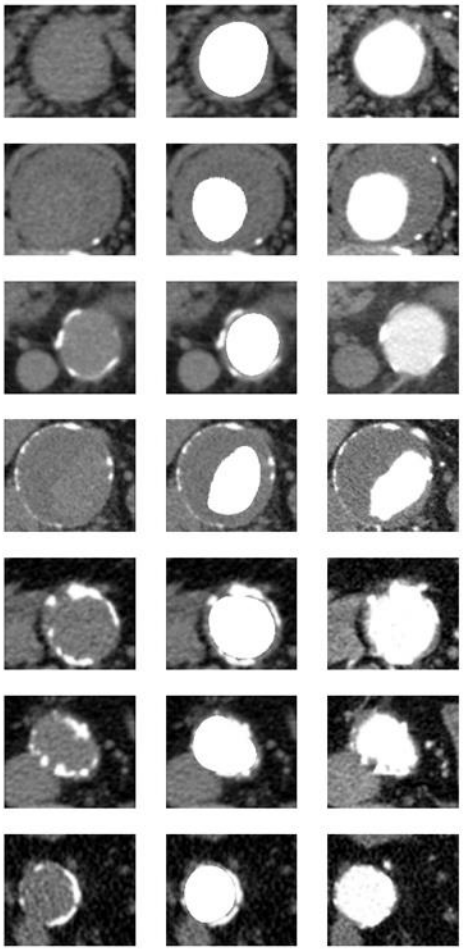
$E_n = \#_m / \#_{ROI}$

$\Delta_A = |1-(\#_{CM} / \#_{CEX})|$

$\#_m$ was defined as the number of misclassified pixels (e.g. wrongly classified as belonging to the vessel lumen or to the occluded area), $\#_{ROI}$ was the total number of pixels in the ROI, while $\#_{CM}$ and $\#_{CEX}$ represent the number of pixels respectively belonging to the contrast medium and extracted areas. The error E_n provided a measure on the pixels wrongly classified by the proposed extraction method normalized with respect to the dimension of the ROI. Further, the error Δ_A expressed the difference in terms of the extracted area.

Results - The algorithm was applied to 233 CT scans related to five different patients. The extracted images were compared to the corresponding ones with contrast medium.Fig.1 shows the ROI selected from the original CT image (left column), the corresponding results after the application of the proposed extraction procedure (middle) and CT image with contrast medium as reference (right).Mean values of the numerical errors for each of the analyzed sequences ranged from 0.12 to 0.17 for E_n and 0.11 to 0.35 for Δ_A. For all the 233 CT images in the analyzed sequences mean error was 0.14 and 0.28 respectively.

Image -



Conclusion - The numerical test shows that the procedure developed in this paper allows to detect the position of the vessel lumen inside the artery and to extract with a good accuracy its contours. Our preliminary experience shows encouraging results and suggests a possible future clinical application to reduce CT contrast medium use especially in high risk patients without compromising the accuracy of the examination.

O-091 INDOCYANINE GREEN FLUORESCENCE IMAGING IN PREDICTING WOUND HEALING AFTER LIMB REVASCULARIZATION

VASCULAR IMAGING

Author(s) - Nicla Settembre*[1], Anders Albäck[1], Pekka Aho[1], Maarit Venermo[1]

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Introduction - The most severe form of peripheral arterial disease is chronic limb threatening ischemia with tissue lesion. Assessment of critically ischemic foot is challenging.The conventional assessment methods are pressure measurements from ankle and toe level, ankle-brachial index (ABI) and transcutaneous oxygen pressure (TcPO2). Indocyanine green fluorescence imaging (ICG-FI) a relatively recent imaging method and still developing in many ways. The principle of ICG-FI is to illuminate the tissue of interest with light at the excitation wavelength (about 750 to 800nm) while observing it at longer emission wavelengths (over 800nm). ICG-FI gives a view of foot hemodynamic. After an intravenous injection of ICG, perfusion of the foot

can be visualized with infrared camera and recorded for further analysis. Intensity of the fluorescence as a function of time can be analysed from the recorded images allowing a time-intensity curve to be drawn. We have earlier published analysis on the repeatability of ICG-FI and use of ICG-FI in immediate quality control after revascularization. In the current study we have analysed the use of ICG-FI in predicting wound healing after revascularization of CLTI and tissue lesion.

Methods - Between January 2015 and February 2016 73 patients with CLTI and tissue lesion underwent either surgical (n=24) or endovascular (EVR) (n=49) revascularization. ICG-FI was done using Spy Elite before the revascularization, immediately after and during the follow-up. Maximum intensity, intensity rate and the relative change in the intensity rate were extracted from the automatic time intensity curve report.

Results - During the mean follow-up of 16 months 77% of the wounds healed. 12 patients died and 9 had major amputation of the index leg. 4 mo, 6mo and overall wound healing rates were 51% and 63% respectively. The mean maximum intensity increased in the wound area from 92 (SD 61) AU to 132 (SD62) AU. The three parameters, change in maximum intensity, change in intensity rate and relative change in intensity rate were testes using ROC. The best area under curve was achieved with the absolute change in maximum intensity. 19AU increase predicted overall wound healing with 69% sensitivity and 68% specificity (AUC 0.79). 35 AU increase in intensity predicted wound healing in 4 months with 64% sensitivity and 63% specificity (AUC 0.68), 30 AU increase predicted wound healing in 6 months with 69% sensitivity and 69% specificity (AUC 0.72).
In patients who underwent EVR the mean maximum intensity increased from 99.7 (SD 60.9) to 127.1 (SD 62.1) in the wound area. The corresponding increase in patients who underwent bypass was from 79.6 (SD60.1) AU to 140 (SD 62.9) AU ($p<0.001$). One-year wound healing rate after EVR was 84% and after bypass 92%.

Conclusion - ICG-FI shows well the success of revascularization in individual patient. In our analysis the best parameter in predicting wound healing was absolute change in maximum intensity. The higher the change is achieved, the faster is the wound healing.

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O-092 REDUCED RECURRENT ISCHEMIC EVENT RATE FOR PATIENTS UNDERGOING INVASIVE CAROTID ARTERY INTERVENTION

SUPRA-AORTIC ARTERIAL & CAROTID DISEASES

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Introduction - Patients with a symptomatic carotid artery stenosis risk a recurrent ischemic event during the waiting time to intervention or in the perioperative period. As the risk of recurrence is highest in the early phase after the presenting event, recent strategies recommend short delay to intervention but there are concerns that the possible benefit from early intervention may be counterbalanced by an increased perioperative complication rate. The aim of this national audit was to study the effects of more expedient carotid intervention on the risk of recurrent ischemic events.

Methods - The Swedish Vascular Registry (Swedvasc) covers all centers in the country performing carotid interventions, and all registrations for symptomatic carotid artery stenosis from May 2008 to December 2015 were analyzed, focusing on recurrent ischemic events in the delay to surgical intervention and during the 30-day perioperative follow-up. The National Prescribed Drug Registry provided data on preventive medications prior to hospitalization for the carotid procedure.

Results - In Swedvasc 6814 procedures for symptomatic carotid stenosis were registered during the time period. The mean age was 72 (±8) years and 68% were male. The presenting events were TIA in 58%, amaurosis fugax in 22% and stroke in 20%. Baseline demographic variables, comorbidities and secondary prevention pharmacotherapy when admitted for the procedure was similar during study period.
The waiting time from the presenting neurological event to carotid intervention decreased from 13 (IQR 6-27) to 7 days (IQR 4-12) during the study period. Importantly, the proportion of recurrent ischemic events decreased over time from 30% (CI 28-33%) in 2008-2009 to 21% (CI 19–23%) in 2014-2015 ($p< 0.01$, χ^2test). The perioperative stroke and/or death rate was 3.6%, with a decreasing trend during study period (5.3% 2008-2009 vs. 3.2% 2014-2015, p=0.05).

Conclusion - In this population-based study, the overall risk for a recurrent ischemic event, from the presenting event until the 30-day follow-up, was markedly decreased during the time period. Efforts in reducing the delay to surgery were not counterbalanced by any increase in the perioperative complication rate.

O-093 15-YEAR STROKE PREVENTION AFTER SUCCESSFUL CAROTID ENDARTERECTOMY FOR ASYMPTOMATIC STENOSIS: EXTENDED POST-TRIAL FOLLOW-UP OF PATIENTS IN THE FIRST ASYMPTOMATIC CAROTID SURGERY TRIAL (ACST-1)

SUPRA-AORTIC ARTERIAL & CAROTID DISEASES

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Introduction - The first Asymptomatic Carotid Surgery Trial (ACST-1) showed that successful carotid endarterectomy (CEA) for asymptomatic stenosis halved the 10-year stroke rate. By further follow-up of half the survivors we assess the 15-year effects of successful CEA on stroke risk.

Methods - Between 1993 and 2003, asymptomatic patients from 30 countries were allocated equally to immediate CEA or deferral of any CEA until it was considered to be more definitely indicated (both groups having medical treatment), and followed until mid-2008. Half were from two countries where electronic linkage to health records has now provided ~9 more years follow-up of stroke incidence. Median follow-up in survivors in all 30 countries combined is now 13 (IQR 9-19) years. Kaplan-Meier and logrank analyses assess 5-year and 15-year effects on the incidence of non-perioperative stroke. We compare those allocated CEA versus those not, although these intention-to-treat analyses may slightly under-estimate CEA effectiveness. This study is registered, number ISRCTN26156392.

Results - 1560 patients were allocated immediate CEA vs 1560 not. By year 5, 92% vs 17% had had CEA while still asymptomatic. Mean age was 68 (SD 8) years and two-thirds were men. About 90% were on anti-thrombotic therapy, 65% on antihypertensive therapy and 32% on lipid-lowering therapy. Use of lipid-lowering therapy increased markedly after entry, so by 2002-03 some 70% were on lipid-lowering therapy, almost all of whom were on all three classes of drug (ie, triple therapy).
In those allocated CEA the non-perioperative stroke incidence in the first 5 years was approximately halved. The absolute gain appeared to grow over the next decade, although on its own the extra gain in years 5-15 was not significant. The stroke risks were 6% vs 11% at 5 years (absolute gain 5%, 95% CI 3-7%, P<0.00001) and 28% vs 36% at 15 years (absolute gain 8%, 95% CI 1-16%, logrank P=0.0001).

Conclusion - Successful CEA for asymptomatic patients reduces 15-year risks. If effective triple drug therapy is given, the *net* additional benefit of CEA depends on the 5- and 15-year risk from the carotid lesion with drug therapy but no CEA, and on CEA risks (which should be less than in previous decades).

O-094 CAN CAROTID PLAQUE VOLUME BE MEASURED BY 3D TOMOGRAPHIC ULTRASOUND?

SUPRA-AORTIC ARTERIAL & CAROTID DISEASES

Author(s) - Steven K. Rogers[*1,2], Joao Carreira[1], Stephen Ball[2], Jonathan Ghosh[3], Charles McCollum[2]

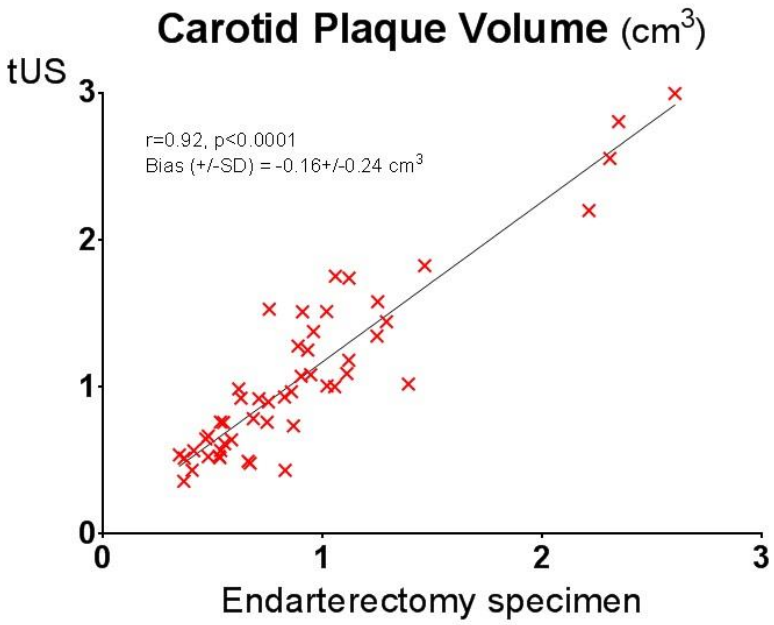
Institution(s) - [1]Vascular Studies Unit, Manchester University NHS FT, [2]Academic Surgery Unit, University of Manchester, [3]Vascular & Endovascular Surgery, Manchester University NHS FT, Manchester, United Kingdom

Introduction - Carotid Plaque Volume (CPV) correlates more closely than severity of stenosis with symptoms of cerebral ischemia in patients with carotid disease [1]. If we could measure CPV by a minimally-invasive technique, it may replace severity of stenosis as the principle indication for carotid endarterectomy (CEA) and may even be used for population screening in the future.

Methods - Standard Duplex and 3D tomographic ultrasound (tUS) imaging of the carotid bifurcations were undertaken on the day of CEA in 50 patients. CPV of the endarterectomy specimen was measured using a validated modified Archimedes suspension technique. CPV by tUS was calculated by dedicated software using the intima-plaque and plaque-blood boundaries in 1mm slices through the tUS image, corrected for the plaque length.

Results -The mean endarterectomy specimen CPV was 0.92±0.51cm^3 and the tUS CPV was 1.08±0.61cm^3 with the mean difference between the endarterectomy specimen and tUS CPV's being only -0.16±0.24cm^3 (95% LOA -0.63-0.32). There was an excellent correlation (Figure) between CPV measured by tUS and the endarterectomy specimen with r = 0.92 (95%CI 0.87 – 0.96 cm^3) p<0.0001. There was no correlation between CPV and the severity of stenosis measured by peak systolic velocity; (r = 0.0052, p=0.97).

Image:



Conclusion - tUS measurement of CPV strongly correlated with CPV of the endarterectomy specimen and is an accurate technique for calculating atherosclerotic burden or CPV. This technique may lead to a new indication for CEA and possibly even to population screening for carotid disease associated with enhanced stroke risk.

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O-095 THE BENEFIT OF DEFERRED CAROTID REVASCULARIZATION IN PATIENTS WITH MODERATE DISABLING CEREBRAL ISCHEMIC STROKE

SUPRA-AORTIC ARTERIAL & CAROTID DISEASES

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Institution(s) - [1]Vascular Surgery - Bologna University, Bologna, Italy

Introduction - Symptomatic carotid artery stenosis needs prompt revascularization, preferentially within 2 weeks by endarterectomy (CEA) in order to reduce the risk of symptoms recurrence. However, the last ESVS-guidelines[1] suggest delaying CEA in patients with large volume cerebral ischemic lesion (LVCIL) and modified Ranking Scale (mRS) $\geq$3, but the optimal timing of intervention is yet to be defined. Aim of the present study is to determine the most appropriate timing of CEA in patients with a recent stroke and LVCIL.

Methods - Data from two tertiary hospitals for vascular treatment, serving a metropolitan area of 1 million people, were analyzed from 2007 to 2017. All patients submitted to CEA for an ischemic stroke were reviewed. Patients selected for the study had a clinical indication for CEA and an ischemic stroke with moderate disability (modified Ranking Scale [mRS] 3-4) and ipsilateral carotid stenosis >50%. The volume of cerebral ischemic lesion (CIL) was evaluated at the cerebral computed tomography after 48-72 hour from the stroke (calculated by the ellipsoid from the three major axis of the CIL), and only patients with LVCIL (>4000mm^3)[2] were considered in the analysis. CEA were performed in cases of stabilized neurological symptoms excluding patients with deteriorating neurological status after the stroke. Perioperative stroke/death were evaluated stratifying for timing of CEA by Chi-square and multiple logistic regression.

Results - In an 11-year period, over a total 4020 CEAs, 126 (2.9%) were performed in patients with a moderate stroke and LVCIL. The patients mean age was 69±10 years, 72% (91) were male, with mRS=3±1 and LVCIL volume of 20000±47000mm^3. The mean time elapsed from symptoms to CEA was 7±8 weeks. Overall perioperative stroke/death was 6.3% (8 stroke and 1 death). By selective timing evaluation of the post-operative events, CEA performed within 4-week were associated with a significant higher rate of stroke/death compared with patients operated after 4-weeks: 11.9% (8/67) vs 1.7% (1/59), P=.03. Patients submitted to CEA within and after 4-week from symptom had similar clinical and surgical characteristics. By logistic regression CEA within 4-weeks was an independent (from gender, CIL-volume, dyslipidemia and carotid stenosis) risk factor for postoperative stroke/death OR: 8.2, 95%CI 1.01-73.

Conclusion - The surgical risk of CEA in patients with a recent moderate ischemic stroke and LVCIL is particularly high if the operation is performed within a 4 weeks period with significant reduction after that time. Despite its retrospective and observational nature this study suggests a careful evaluation of patients with LVCIL and a waiting time of at least 4 weeks.

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2. Pini R, Faggioli G, Longhi M, Ferrante L, Vacirca A, Gallitto E, Gargiulo M, Stella A. Impact of acute cerebral ischemic lesions and their volume on the revascularization outcome of symptomatic carotid stenosis. J Vasc Surg. 2017 Feb;65(2):390-397.

O-096 TESTOSTERONE TO ESTRADIOL RATIO REFLECTS SYSTEMIC AND PLAQUE INFLAMMATION AND PREDICTS FUTURE CARDIOVASCULAR EVENTS IN MEN AFTER CAROTID ENDARTERECTOMY

SUPRA-AORTIC ARTERIAL & CAROTID DISEASES

Author(s) - Ian David van Koeverden[*1], Marie de Bakker[2], Jean-Paul P. de Vries[3], Sander W. van der Laan[4], Imo E. Hoefer[5], Gerard Pasterkamp[5], Gert J. de Borst[1], Hester M. den Ruijter[4] and Athero-Express Biobank Study

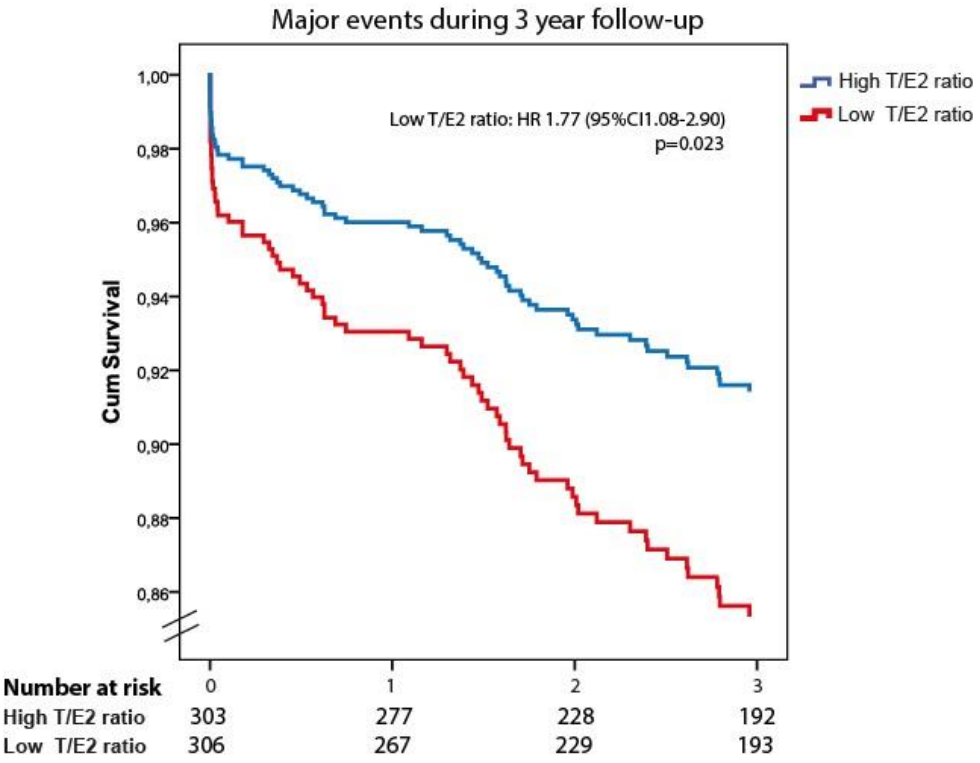
Institution(s) - [1]Vascular Surgery, UMC Utrecht, [2]Experimental Cardiology, UMCU, Utrecht, [3]Vascular Surgery, St. Antonius Hospital, Nieuwegein, [4]Experimental Cardiology, [5]Clinical Chemistry and Hematology, UMC Utrecht, Utrecht, Netherlands

Introduction - The effects of testosterone on cardiovascular disease (CVD) as reported in literature have been ambiguous. Recently, the interplay between testosterone and estradiol as assessed by testosterone/estradiol (T/E2) ratio was suggested to be better informative on the normal physiological balance. Considering the role in CVD, we hypothesized that a low T/E2 ratio in men with CVD is associated with increased inflammation, a more unstable plaque and a worse cardiovascular outcome.

Methods - Testosterone and estradiol concentrations were determined in blood samples of 709 male carotid endarterectomy patients included in the Athero-Express Biobank Study. T/E2 ratio was associated with baseline characteristics, atherosclerotic plaque specimens, inflammatory biomarkers and three-year follow-up information.

Results - Patients with low T/E2 ratio had more unfavorable inflammatory profiles compared to patients with high T/E2 as observed by higher levels of C-reactive protein (CRP) (3.08 µg/mL vs. 1.21µg/mL (p<0.001)) and higher leukocyte counts (8.95*109/L vs. 7.84*109/L (p<0.001)) in blood. In atherosclerotic plaques, a negative association between T/E2 ratio and number of neutrophils (B=-0.56(p=0.010)), smooth muscle cells (B=-0.049(p=0.046)), interleukin-6 (IL-6) (B=-0.15 p=0.009) and Il-6receptor (B=-0.13 p=0.024) was found. Decreased T/E2 ratio showed an overall trend towards histological features that represent the vulnerability of atherosclerotic lesions. Furthermore, in multivariate cox regression analysis, low T/E2 ratio was independently associated with an increased risk for major cardiovascular events (MACE) during three-year follow-up (HR 1.77 (95%CI: 1.08 - 2.90 p=0.023)).

Image -



Conclusion - In male patients after carotid endarterectomy, low T/E2 ratio was associated with increased systemic inflammation, increased inflammatory plaque proteins and an increased risk of future major cardiovascular events as compared to men with normal T/E2 ratio. Normalization of T/E2 ratio may be a useful tool for the secondary prevention of CVD in men.

O-097 LONG-TERM OUTCOME AND RISK FACTOR ANALYSIS FOR LATE POSTOPERATIVE STROKE AFTER CEA AND CAS FOR SYMPTOMATIC CAROTID STENOSIS – A NATIONWIDE COHORT STUDY

SUPRA-AORTIC ARTERIAL & CAROTID DISEASES

Author(s) - Kimberley Joshua*[1], Ann Charlotte Laska[1], Kevin Mani[2], Magnus Jonsson[3]

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Introduction - Carotid endarterectomy (CEA) has become the mainstay of the treatment of symptomatic carotid stenosis, based on the results of the NASCET and ECST trials. However, there is a lack of long-term data and analysis of risk-factors for late postoperative stroke after CEA and stenting (CAS) outside the randomized controlled trials. ′
Our aim was to evaluate the long-term effectiveness in stroke prevention of invasive treatment of symptomatic carotid stenosis in a nationwide cohort study, and to identify risk factors for late postoperative stroke.

Methods - All patients registered in the national vascular surgical registry (>97% coverage) treated with CEA or CAS 2008-2017, were included. Using the unique personal identification number, the cohort was cross-matched with the national stroke registry (>95% coverage) to identify stroke events occurring more than 30 days after the operation. All patients were followed-up until death or final study date. Primary endpoint was stroke >30 days postoperatively. Risk-factors were determined by Cox-regression.

Results - During the study period, 7354 patients underwent surgical treatment for symptomatic carotid stenosis; CEA n=7116, CAS n=238. Mean age was 72.2 years, 67.3% were male. Perioperative (<30 days) stroke and death rate was 3.5%, 75.3% were operated <14 days from neurologic event and 25.5% had a contralateral stenosis of >50%.
Median follow-up time was 4.1 years, equivalent of 32253 person-years. 615 patients had a stroke >30 days postoperatively and 1559 patients died during follow-up. The estimated risk of late stroke was 1.9 per 100 person years.
Multivariable Cox-regression analysis showed that smoking, diabetes and ischemic heart disease were associated with an increased risk of late stroke. Transient ischemic attack (TIA), and minor stroke, as indication for treatment had increased risk of late stroke compared to amaurosis fugax (HR 1.7;1.7,p<0.01). Increasing age had increased risk, but degree of stenosis (ipsilateral and contralateral) had not. CAS was associated with a twofold increased risk of late stroke compared to CEA; adjusted HR 2.1, 95% CI 1.6-2.9.

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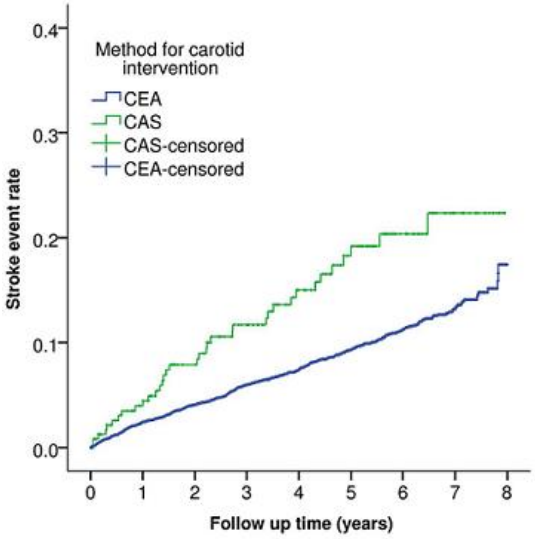

Conclusion - Invasive treatment of symptomatic carotid stenosis is effective in preventing stroke in the long-term. Several risk factors have been identified to increase the risk of late stroke. CAS was associated with doubled risk of late stroke compared to CEA.

O-098 PROGNOSTIC FEATURES OF NEW LESIONS ON DIFFUSION WEIGHTED IMAGING IN THE BRAIN OF PATIENTS AFTER CAROTID REVASCULARIZATION: A SYSTEMATIC REVIEW

SUPRA-AORTIC ARTERIAL & CAROTID DISEASES

Author(s) - Marjolijn Rots[*1], Hesther den Ruijter[2], Gert Jan de Borst[1]

Institution(s) - [1]Vascular Surgery, [2]Experimental Cardiology Laboratory,, UMC Utrecht, Utrecht, Netherlands

Introduction - Diffusion weighted imaging (DWI) lesions have emerged as a surrogate marker of outcome following carotid revascularization. New ischemic lesions after carotid intervention may lead to clinically relevant future events such as cognitive decline and have been associated with a higher risk for recurrent cerebrovascular events1,2. In the present systematic review provide an overview of prognostic features being associated with development of new DWI lesions after carotid artery revascularization.

Methods - PubMed, EMBASE and Cochrane library databases were systematically searched for studies reporting on new DWI lesions in carotid artery endarterectomy (CEA) or carotid artery stenting (CAS) patients. Data derived from CEA and CAS were analysed separately to account for inherit differences in patients selected for the two procedures. Studies reporting on prognostic features that were present prior to revascularization included demographic data, comorbidities, plaque characteristics, and cerebrovascular hemodynamics.

Results - [PRELIMINARY] We included 49 studies with 7249 unique patients on CEA (10 studies; 1677 patients), CAS (30 studies; 2325 patients) or both patient categories (9 studies; 1017 patients). A weighted average of 17.4% new post-interventional DWI lesions were found in CEA patients compared to 37.5% in CAS patients. Sixteen articles (12 on CAS-patients, 4 mixed population) focused on the relation between plaque characteristics on MRI, CT or duplex, where the jellyfish sign, proximal calcification, lesion length, signal-intensity ratio (plaque to adjacent muscle) and plaque composition were correlated to the development of DWI lesions. Six articles reported on cerebrovascular hemodynamics in CEA-patients and 2 in CAS-patients; in which cerebrovascular reactivity, cerebral blood flow, CBRBP/CBF images, MCA signal intensity and presence of hemodynamic tandem intracranial lesions could identify patients at risk for new DWI lesions. Preoperative symptom status, white matter lesions and infarction on imaging were associated with new DWI lesions in both CEA and CAS. Age, sex, hyperlipidemia, hypertension and diabetes were not associated with an increased risk in CEA patients, but both age and hyperlipidemia were found to be significantly associated with new DWI lesions in some but not all CAS-studies. Presence of concurrent carotid artery disease and aortic arch calcification were also identified as risk factors in CAS- and mixed population patients. Odds ratio's of the prognostic factors will be available at the time of the ESVS conference.

Conclusion - Risk factors associated with the development of DWI lesions after carotid revascularization are heterogeneous. For CEA-patients, cerebral hemodynamics may help to identify those at risk for new DWI lesions. In CAS-patients imaging of plaque characteristics provides information on the susceptibility to postprocedural ischemic lesions. These prognostic features may help in decision making to determine the indication for and optimal type of carotid revascularization.

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O-099 COMPARISON OF HOSPITAL OUTCOMES OF TRANSCAROTID ARTERY REVASCULARIZATION WITH FLOW REVERSAL (TCAR) VS. CAROTID ENDARTERECTOMY (CEA)

SUPRA-AORTIC ARTERIAL & CAROTID DISEASES

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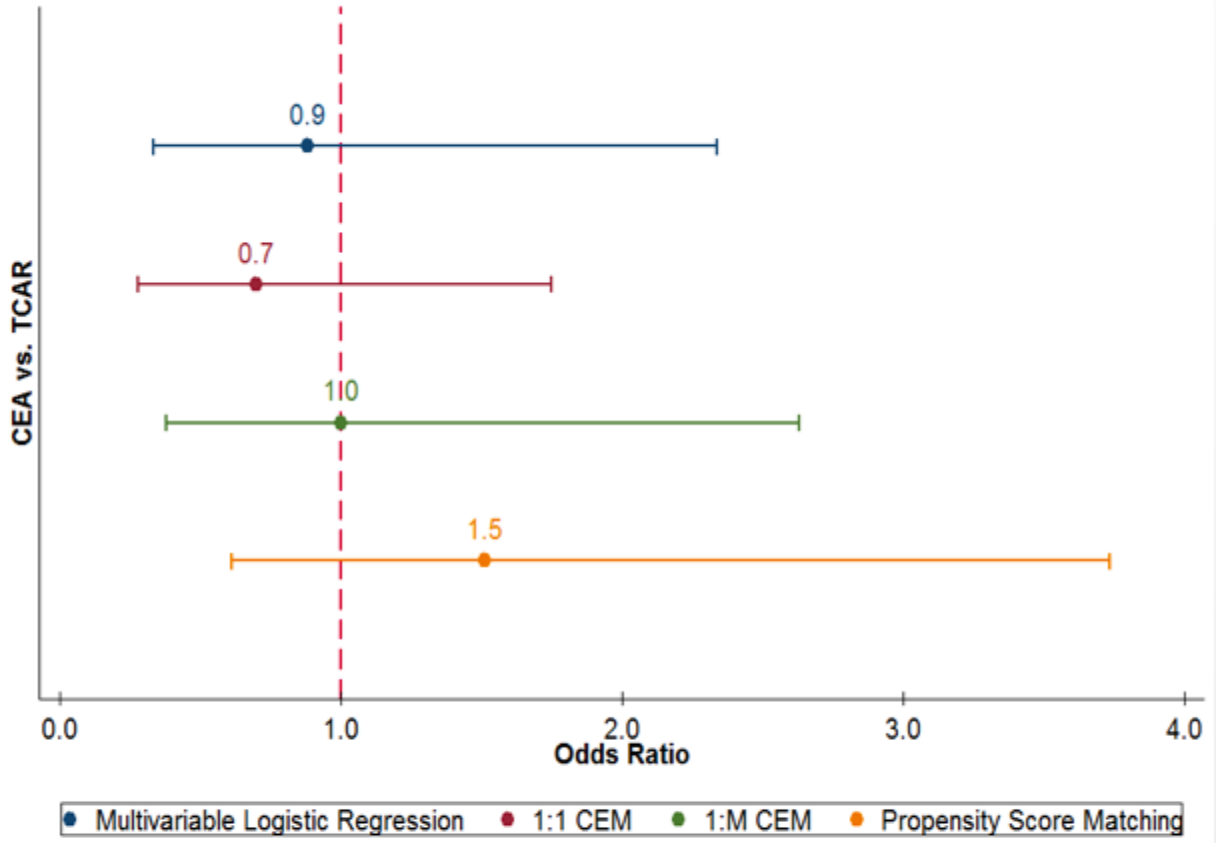
Introduction - TransCarotid Artery Revascularization with flow reversal (TCAR) offers a less invasive option to carotid endarterectomy (CEA) in high risk patients and has the lowest reported overall stroke rate for any prospective trial of carotid artery stenting (CAS). This study compares initial in-hospital outcomes of CEA and TCAR using the Society for Vascular Surgery (SVS) Vascular Quality Initiative (VQI) TCAR Surveillance Project (TSP) done in collaboration with the Centers for Medicare & Medicaid Services (CMS) to create more information for future coverage decisions.

Methods - The SVS TSP isdesigned to evaluate the safety and efficacy of TCAR in real world practice, using a contemporary comparison to CEA.Patients enrolled in this project were compared to those undergoing CEA during the same time period (2016-2017). The primary outcome was a composite of in-hospital stroke and death. Average treatment effects were estimated via augmented inverse-probability weighting (AIPW). Additional analysis was performed using multivariable logistic regression as well as various matching techniques such as propensity score matching and coarsened exact matching (CEM).Adjusted analysis accounted for age, gender, race, insurance status, CAD, CHF, CKD, COPD, symptomatic status, restenosis, prior vascular procedures, degree of ipsilateral stenosis and preoperative medication use.

Results - A total of 637 patients underwent TCAR compared to 12,049 patients who underwent CEA. Patients undergoing TCAR were older (median age 74 vs.71 years), more likely to be symptomatic (33.6% vs. 27.9%),and had more medical comorbidities such as CAD (47.3% vs.26.6%), CHF (19.8% vs.11.1%), COPD (26.5% vs. 22.3%), CKD (39.9% vs. 33.6%), and prior vascular procedures compared to CEA patients (All $p<0.01$). The majority of TCAR procedures were done under general anesthesia (79.0% vs.90.3% in CEA, $p<0.001$). On average, TCAR was 36.7 minutes shorter than CEA (78.0±33.9 vs. 114.7±42.5, $p<0.001$). On univariate analysis, there were no differences in the rates of in-hospital stroke/death (1.3% vs. 1.7%, $p=0.42$), overall neurological events (2.0% vs.1.9%, $p=0.83$), in-hospital MI (0.7% vs.1.1%, $p=0.31$) and 30-day mortality (0.5% vs. 0.9%, $p=0.08$) between CEA and TCAR, respectively. Patients undergoing CEA had higher rates of cranial nerve injury (2.8% v.0.8%, $p<0.01$) and postoperative hypertension (18.3% vs. 11.6%, $p<0.001$) compared to TCAR patients. On multivariable analysis and using different matching methods, there were no differences in overall stroke, stroke/death or overall neurologic events (Figure 1). The absolute difference in adjusted stroke/death rates between the two groups was 0.3% [95%CI: -1.7%, 1.0%, $p=0.64$].

Image:

Figure 1. Odds Ratio of In-Hospital Stroke/Death using Differet Matching Methods



	Univariate Analysis			Multivariate Logistic Regression		1:1 CEM		1:M CEM Matching	
	CEA (N=12,049)	TCAR (N=637)		CEA(N=12,049) vs. TCAR (N=637)		CEA (N=384) vs. TCAR (N=384)		CEA (N=4,199) vs. TCAR(N=387)	
	N (%)	*N (%)*	*P*	*OR(95%CI)*	*P*	*OR(95%CI)*	*P*	*OR(95%CI)*	*P*
Total Stroke	149 (1.2)	9 (1.4)	0.70	0.77 (0.29-2.05)	0.6	0.68 (0.25-1.82)	0.44	0.99 (0.35-2.78)	0.99
Stroke or Death	162 (1.3)	11 (1.7)	0.42	0.88 (0.33-2.34)	0.8	0.70 (0.28-1.75)	0.44	1.00 (0.36-2.76)	1.00
Any Neurological Event (TIA/Stroke)	242 (2.0)	12 (1.9)	0.83	0.72 (0.31-1.66)	0.44	0.66 (0.30-1.47)	0.31	0.58 (0.30-1.12)	0.10

Conclusion - Despite a substantially higher medical risk in patients undergoing TCAR, preliminary analysis of the SVS-VQI TCAR Surveillance Project showed similar in-hospital stroke/death rates between TCAR and CEA after multivariable adjustment and rigorous matching. Further studies with larger sample sizes and longer follow will be needed to establish the equivalence of TCAR compared to CEA.

O-100 MID-TERM OUTCOMES OF THE (ROADSTER) MULTI-CENTER TRIAL OF TRANSCAROTID STENTING WITH DYNAMIC FLOW REVERSAL

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Introduction - The Safety and Efficacy Study for Reverse Flow Used During Carotid Artery Stenting Procedure (ROADSTER) multicenter trial has introduced a novel transcarotid neuroprotection system (ENROUTE Transcarotid NPS; Silk Road Medical Inc, Sunnyvale, Calif). Perioperative results demonstrated that the use of EROUTE Transcarotid NPS was safe and effective. Overall 30-day stroke rate was 1.4% which was the lowest reported in any clinical trial for carotid artery stenting. We now present the mid-term results to evaluate the durability of transcarotid carotid artery revascularization (TCAR).

Methods - This study is a prospective, single-arm clinical trial. Current enrollment occurs in 14 centers. Primary endpoints were incidence rates of ipsilateral stroke and death at one-year following (TCAR). The occurrence of stroke was ascertained by an independent clinical event committee.

Results - Overall, 286 patients were enrolled (lead-in phase: 67, pivotal phase: 141 and extended access: 78 patients). Of those, 164 were included in the long-term follow-up (112 patients from the pivotal phase and 52 from the extended access). Mean age was 73.9 years (range: 42.1-91.3years). Patients of age 75 years and older were 43.3% of the cohort. 34.8% of patients were females, 92.7% were Caucasians and 5.5% were African-American. Most patients were asymptomatic (79.9%). Patients with anatomical high-risk factors for carotid artery endarterectomy (CEA) were eligible for ROADSTER trial. Those anatomical risk factors were distributed as follows: contralateral carotid artery occlusion was reported in 11.0% of patients, tandem stenosis of greater than 70% was found in 1.8% of patients, high cervical carotid artery stenosis contributed to 25.0% of TCAR indications, restenosis after CEA was found in 25.6%, while bilateral stenosis requiring treatment occurred in 4.3% and hostile neck was the indication of TCAR in 14.6% of cases. two-vessel coronary artery disease was reported in 14.0% of the participants and severe left ventricular dysfunction (LEVF<30%) was reported in 3 (1.8%) patients. In general, anatomical high-risk factors took place in 43.3% while clinical high-risk factors were 29.9%. Both subsets of factors were present in 26.8%. At one-year follow-up, ipsilateral stroke incidence rate was 0.6% and the overall mortality rate was 3.7%. The one-year risk of stroke found in this study is the lowest to date to be reported in any FDA approved carotid stents (Figure).

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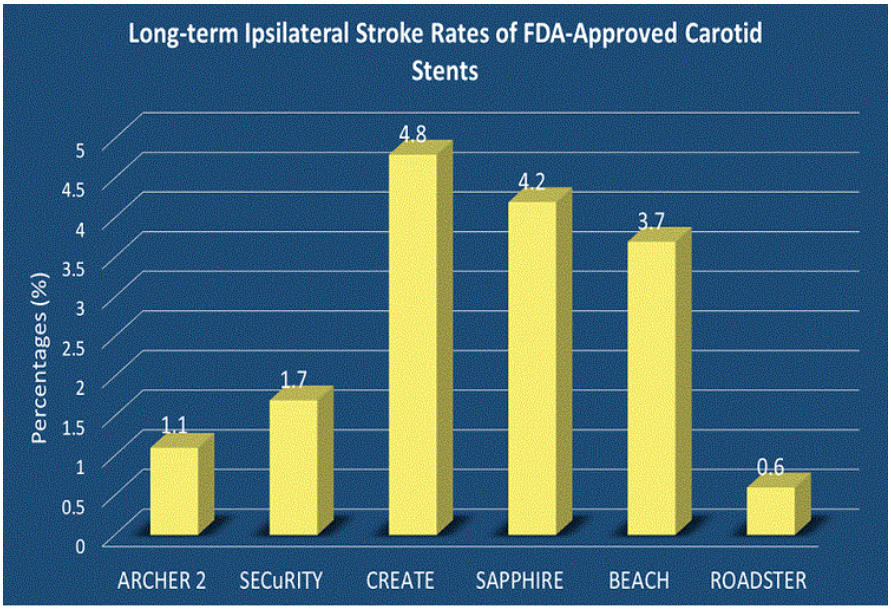

Figure 1: One-year ipsilateral stroke rates (31-365 day) after carotid artery stenting clinical trials

Conclusion - Transcarotid carotid artery revascularization with dynamic flow reversal had previously shown favorable 30-day perioperative outcomes. This excellent performance seems to extend to one year following TCAR as illustrated in this analysis. The promising results from the ROADSTER trial might stem from the novel cerebral protection provided by the ENROUTE Transcarotid NPS in comparison to distal protection devices. The trans-cervical approach circumvents aortic arch manipulation that takes place through the transfemoral approach. TCAR offers a potentially safe option for patients who are deemed to be high-risk for CEA.

O-101 FENESTRATED AND BRANCHED ENDOGRAFTING AFTER PREVIOUS OPEN INFRA-RENAL AORTIC ANEURYSM REPAIR

THORACIC & THORACO-ABDOMINAL AORTIC DISEASE

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Introduction - Proximal para-anastomotic aneurysms, or aneurysmal degenerations of the native aorta above a previous infra-renal aortic open repair (P-AAAs), are not rare challenging scenarios. The aim of this study was to report the early and mid-term outcomes following endovascular repair of P-AAAs with fenestrated and branched endografts (FB-EVAR)

Methods - From 2006 to 2017, we prospectively collected and retrospectively analyzed pre, intra and postoperative data of patients undergoing FB-EVAR for P-AAAs at two European vascular surgery units. Early outcomes were: technical success (target visceral vessels cannulation and stenting, absence of Type I-III endoleak, iliac limb occlusion and 24-h mortality), spinal cord ischemia (SCI), and 30-day mortality. Mid-term outcomes were: survival, target visceral vessels (TVV) patency, and freedom from re-interventions. Fisher's exact test, Kaplan Mayer and Log rank were used for the statistical analysis

Results - During the study period**,** 108 patients (M:94%; age:71±4years; ASA 3-4:74%>26%) were enrolled. The previous aortic OR was a tubular aorto-aortic 63(58%), a bifurcated aorto bi-iliac 37(34%) or an aorto bi-femoral 8(8%) bypass. The OR was performed 10±2years prior to the FB-EVAR. A previous TEVAR had also been performed in 7 patients (6%). The aortic lesions at the time of FB-EVAR was a type I-III 69(64%) or type IV 39(36%) thoracoabdominal aneurysm according to the Crawford's classification. The mean aneurysm diameter was 64±6mm. Overall, 390 TVVs (3.6±1 TVV/case) were perfused by endograft fenestrations (63;58%), branches (26;24%) or both fenestrations and branches (19;18%). Tubular, tri-modular or aorto-monoiliac implants were planned in 68 (63%), 38 (35%) and 2 (2%) patients, respectively. Proximal TEVAR, carotid-subclavian bypass and iliac branch devices were planned adjunctive procedures in 41 (38%), 5 (5%) and 3 (3%) cases, respectively. Technical success was 93%. Technical failures included 5 TVV-loss (celiac trunk:1; renal arteries:4) and 3 deaths within 24 hours (cardiac aetiology). Post-operative SCI was diagnosed in 7 patients (7%), including 4 (4%) permanent. Type I-III TAAAs (p .04) and endograft incorporating both fenestrations and branches (p .04) were associated with SCI. Cardiac and pulmonary morbidity was 9% and 10%, respectively. Post-operative renal failure (GFR reduction ≥30% of baseline) was diagnosed in 22 patients (20%). Bowel ischemia was depicted in 3 (3%) patients. The 30-day mortality was 4%. Preoperative chronic renal failure (p .03), post-operative cardiac morbidity (p .04), and bowel ischemia (p .003) were associated with 30-day mortality. The mean follow-up was 38±18 months. Survival at 1, 3 and 5 years was 82%, 64% and 54%, respectively. There was no late aneurysm-related mortality. Survival during follow-up was significantly impacted by pre-operative chronic renal failure (p .005), post-operative cardiac morbidity (p .04), and SCI (p .04). Target visceral patency at 1, 3 and 5 years was 93%, 91% and 91%, respectively. New onset of hemodialysis was required in 4 patients (4%). Aneurysm enlargement (≥5mm) was detected in 6 (5.5%) cases. Freedom from re-interventions at 1, 3 and 5 years was 89%, 77% and 74%, respectively

Conclusion - Endovascular treatment of aortic aneurysmal evolution above a prior open AAA repair with FB-EVAR is safe and effective. If those promising results are confirmed during late follow-up, FB-EVAR should be considered as a therapeutic option, especially in high-risk patients

O-102 THORACIC ENDOVASCULAR AORTIC REPAIR USING COMBINED THE NAJUTA FENESTRATED STENT GRAFT PLUS THE DISTAL CTAG STENT GRAFT FOR AORTIC ARCH ANEURYSM

THORACIC & THORACO-ABDOMINAL AORTIC DISEASE

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Institution(s) - [1]Vascular Surgery, [2]Surgery, The Jikei University Kashiwa Hospital, Chiba, [3]Surgery, The Jikei University School of Medicine, Tokyo, Japan

Introduction - The Najuta fenestrated stent graft extend the proximal sealing zone during thoracic endovascular aortic repair (TEVAR). On the other hand, the CTAG stent graft has good conformability in the inner curvature of the aortic arch and has a less spring-back force of the stent graft. Based on these strength, we used the Najuta fenestrated graft for proximal fixation while the CTAG was used for distal landing for TEVAR of aortic arch in high-risk patients. We report the early results of this combined strategy.

Methods - From January 2015 to March 2018, 117 TEVARs were performed in our facility. 16 patients (94% male; mean age 75 years) treated with combined the Najuta plus the CTAG stent graft.

Results -TAA were fusiform in 7 cases, saccular in 4, dissecting in 4, and 1 patient was treated for proximal type 1 endoleak after previous TEVAR. The stent graft was landed in zone 0 in 13 cases, in zone 1 in 3 cases. The Najuta custom made fenestration was designed to preserve flow in the left common carotid artery in 11 patients, in the left subclavian artery in 2. There were 10 cases (63%) in which we could avoid the debranching bypass. No proximal type 1 endoleak occurred and proximal sealing was achieved in all cases. Technical success was 100% with no 30-day mortality. Mean operative time was 185 minutes. All targeted vessels were patent. One stroke occurred with TEVAR landing in zone 0 with an overall stroke rate of 6%. No paraplegia and retrograde dissection were encountered. During a mean follow up of 12 months, no conversion to open surgical repair and no aortic rupture occurred.

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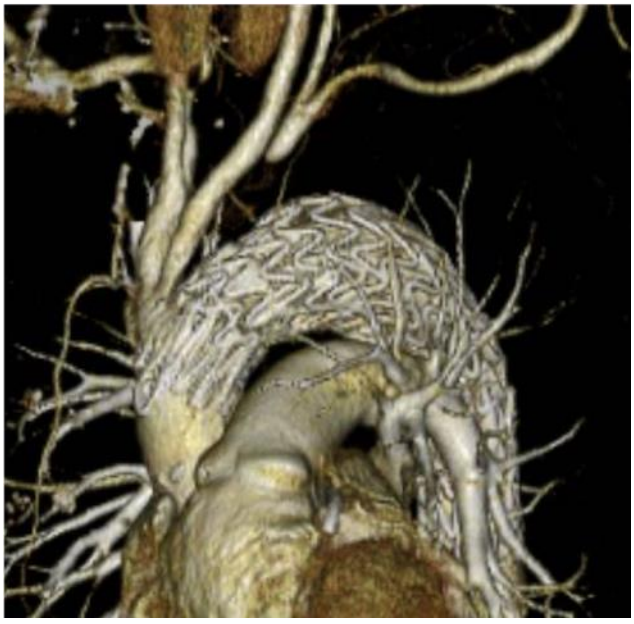

Conclusion - Combined proximal Najuta and distal CTAG stent grafting appears to be a safe and effective treatment. This strategy also decreases the need for debranching bypass procedures.

O-103 STRICT CONTROL OF BLOOD GLUCOSE WITH AN INTRAVENOUS INSULIN INFUSION DECREASES THE RISK OF POSTOPERATIVE LOWER EXTREMITY WEAKNESS AFTER COMPLEX ENDOVASCULAR AORTIC ANEURYSM REPAIR

THORACIC & THORACO-ABDOMINAL AORTIC DISEASE

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Introduction - We have previously shown that postoperative lower extremity weakness (LEW) is associated with elevated blood and cerebrospinal fluid (CSF) glucose levels in patients undergoing multi-branched endovascular repair (MBEVAR) of thoracoabdominal (TAAA) and pararenal aortic aneurysms (PRAA). The purpose of the current study is to determine whether the use of an insulin infusion protocol (IIP) to achieve tight blood glucose control decreases the rate of LEW.

Methods - In 10/2013, we began collecting blood and CSF samples pre-operatively, immediately postoperatively, and on post-operative day 1 in asymptomatic patients undergoing MBEVAR. In 7/2016, an IIP was initiated to maintain a postoperative blood glucose level ≤ 120mg/dl for 48 hours. Data on demographics, operative repair, complications, and outcomes were collected prospectively.

Results - Between 10/2013-10/2017, 41patients underwent MBEVAR with pre-operative placement of a lumbar drain and permissive hypertension. The mean age was 72.7±7.1 years and 29/41 (71%) were men. 7/41 (17%) patients reported a history of diabetes mellitus (DM); 4 of these patients were on oral medications for glucose control, 3 were diet-controlled, and none were on insulin pre-operatively. The mean maximum aneurysm diameter was 64±7 mm. 22 patients (Group A) underwent MBEVAR *before* initiation of the IIP. Of these, 7/22 (32%) (Group A1) developed LEW within 48 hours of repair. This was temporary in 5/22 (23%) patients and permanent in 2/22 (9%) patients. The subsequent 19 patients (Group B) underwent MBEVAR *after* initiation of the IIP. No patient in Group B developed LEW while on the IIP, but 1/19 (5%) developed paraplegia on POD 4, 2 days after the insulin infusion had been stopped. The rate of early (<48 hours postop) LEW was significantly lower after initiation of the IIP (32% in Group A vs. 0% in Group B, p=0.01). There was no difference in age, sex, maximum aneurysm diameter, aneurysm extent, coronary disease, hypertension, lung disease, DM, renal function, or operative time between Groups A and B. In Group A, postoperative blood and CSF glucose levels were significantly higher in patients with LEW (Group A1) compared to those without LEW (Group A2) (Table 1).

Image -

Table 1. Blood and CSF Glucose Values in MBEVAR Patients

	Group A1, n=7	Group A2, n=15	P-value	Group B, n=19
Blood Glucose (mg/dL)				
Pre-operative	117 ± 20	108 ± 24	0.44	110 ± 25
Immediately Postoperative	162 ± 53	142 ± 31	0.27	129 ± 26
Postoperative Day 1	140 ± 27	117 ± 16	0.02	116 ± 23
CSF Glucose (mg/dL)				
Pre-operative	67 ± 13	58 ± 13	0.14	59 ± 14
Immediately Postoperative	80 ± 15	66 ± 14	0.03	68 ± 18
Postoperative Day 1	102 ± 15	77 ± 15	0.001	73 ± 20

Conclusion - In the first 48 hours after MBEVAR, the use of an IIP to control blood glucose decreases the rate of postoperative LEW. Tight control of blood glucose should be considered after any extensive reconstruction of the thoracoabdominal aorta to minimize the risk of postoperative LEW.

O-104 RISK OF SPINAL CORD ISCHEMIA AFTER TREATMENT OF COMPLEX AORTIC ANEURYSMS WITH FENESTRATED OR BRANCHED DEVICES

THORACIC & THORACO-ABDOMINAL AORTIC DISEASE

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Introduction -The aim of our study was to analyze the incidence of spinal cord ischemia (SCI) in patients presenting with complex aortic aneurysms treated with fenestrated (F-EVAR) and branched endovascular aortic aneurysm repair (B –EVAR), and identify risk factors associated with this complication.

Methods - A retrospective study of prospectively collected data was undertaken including patients presenting with complex aortic aneurysm (para-renal and thoraco-abdominal; TAAA) treated with the F-EVAR or B-EVAR. The primary end point was the incidence of SCI and the assessment of any associated factors.

Results - Between January 2011 and August 2017, a total of 243 patients (mean aneurysm diameter and age of 65.2±15.3mm and 72.4±7.5 years, respectively; 73% males) were treated with F-EVAR or B-EVAR. Asymptomatic patients presented in 73% (177/243) (in contrast to 27%; urgent) and in 52% (126/243) were treated for TAAA (in contrast to 48%; pararenal AAA). F-EVAR (mean number of fenestrations 3.3/case) or B-EVAR (mean number of branches 3.7/case) were undertaken in 67% (164/243) and 33% (79/243), respectively. The total incidence of SCI was 17.7% [43/243; paraplegia in 4% (10/243), paraparesis in 13.7% (33/243)]. Most of the patients with SCI presented immediate post-operative symptoms (72%; 31/43). Spinal drainage had been preoperatively placed in 53% (130/243) and was associated with the prevention of SCI (SCI with spinal drainage 12%; 16/130 vs. SCI without spinal drainage, 24%; 27/113, P=.018). The 30-day mortality rate was 9% (21/243). After multiple logistic regression analysis, SCI was associated with pre-operative renal function (SCI with pre-operative GFR<60, OR 2.43; 95% C.I. 1.18 – 4.99, P= .016) and number of vertebral segments covered (SCI with higher position of proximal stent in terms of vertebra, OR 1.2; 95% C.I. 1.1 – 1.3, P= .000). Similar outcome derives when height of proximal end of stent graft is replaced by total length of aortic coverage. (SCI with pre-operative GFR<60, OR 2.36; 95% C.I. 1.11 – 5.00, P= .025 and with longer length of aortic coverage, OR 1.01; 95% C.I. 1.003 – 1.009, P= .000).

Conclusion - The majority of SCI after F-/or B-EVAR of complex aortic aneurysms present immediate post-operatively. The use of preoperative spinal drainage may prevent SCI. Patients with GRF <60 mL/min/1.73 m^2 and with longer aortic length stent graft coverage are at higher risk SCI.

O-105 OPEN THORACIC AND THORACOABDOMINAL AORTIC REPAIR AFTER PRIOR ENDOVASCULAR THERAPY

THORACIC & THORACO-ABDOMINAL AORTIC DISEASE

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Introduction - As endovascular techniques have evolved, the indications for endovascular therapy of aortic disease have expanded to more complex pathologies and to all aortic segments (1). However, the rising number of endovascularly treated patients entails an increase in the number of required secondary reinterventions, especially in the mid- and long-term (2-4). Despite the ongoing improvement of endovascular modalities to treat different kinds of failures and complications following endovascular treatment (5), not all of them can be managed by endovascular means. There are still a relevant number of patients who require

secondary open surgery or conversion. When the thoracic aorta is involved, this means thoracic aortic (TAA) or even extensive thoracoabdominal aortic (TAAA) surgery with or without simultaneous repair of the ascending aorta and the aortic arch (6, 7).
The aim of this study was to present current results of open TAA and TAAA repair as secondary procedure after previous endovascular aortic therapy.

Methods - From 2006 to July 2017 45 open thoracic aortic (TAA) or thoracoabdominal aortic (TAAA) operations were performed on 44 patients (median age 58[15-80] years) as secondary surgery after previous endovascular therapy comprising TEVAR (n=38;86%), EVAR (n=3;7%), fenestrated EVAR (n=1;2%) and TEVAR plus EVAR (n=1;2%). 11 patients(25%) had had previous open aortic surgery at the secondary surgery site. Indications for TAA(A) repair were type I endoleak (n=10;23%), post-dissection aneurysm progression due to persisting false lumen perfusion (n=8;18%), proximal/distal disease progression (n=16;36%), device fracture/dislocation (n=4;9%), infection (n=5;11%) and initial endograft misplacement (n=1;2%). The operations included descending thoracic aortic repair (n=13, 29%), TAAA type I (n=4;9%), type II (n=5;11%), type III (n=13;29%), type IV (n=7;16%) and type V repair (n=3;7%) with simultaneous arch repair in 18%(n=8). Median time to secondary surgery was 36(2-168) months. Median follow-up was 39(3-118) months.

Results - In-hospital mortality was 20%(n=9) due to intraoperative aneurysm rupture, pneumonia-induced sepsis, hemorrhagic cerebellar infarction, mesenteric ischemia, bronchoesophageal fistula and multiorgan failure (1/9,respectively) as well as hemorrhage (3/9). Estimated survival was 73% at one year and 71% overall. The most frequent complications were pneumonia (n=19;43%), bleeding requiring revision (n=11;25%) and sepsis (n=14;32%). Transient dialysis was required in 32%(n=14), permanent dialysis in 6%(n=2). Permanent spinal cord deficit (paraparesis) occurred in 6%(n=2). Estimated freedom from aortic reintervention was 86%.

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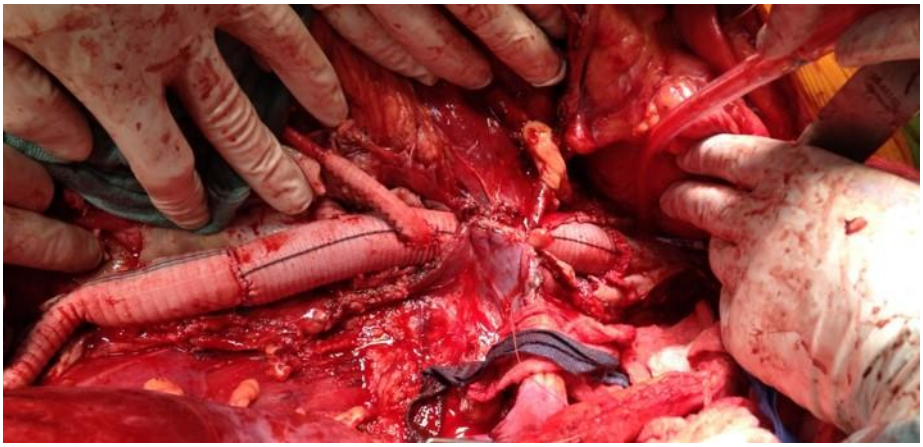

Conclusion - Open TAA(A) repair as secondary procedure after previous endovascular aortic therapy is an important treatment option even in the endovascular era. It represents a durable treatment that can produce respectable outcomes. Yet the perioperative morbidity and mortality are relevant and a specialized team and infrastructure are mandatory in these complex procedures. Therefore, centralization is required.

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O-106 A 10MM AORTIC ARCH SEALING RING DISTAL TO THE SECOND CHIMNEY SEEM TO PREVENT A GUTTER ENDOLEAK IN AORTIC ARCH TEVAR

THORACIC & THORACO-ABDOMINAL AORTIC DISEASE

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Introduction - A common problem when using the chimney graft technique for arch pathologies is the "gutter" endoleak, a type Ia endoleak resulting in pressure of the aneurysm sac. The chimney technique used for the renal arteries, though, seems to have less of these problems.
The aim of the present study was to define the possible anatomical and technical parameter that might predict the occurrence of gutter endoleak or type Ia endoleak (EL Ia) in patients treated using chimney graft technique in aortic arch.

Methods - We performed a review of our institutional endovascular aortic database of patients who had undergone TEVAR with chimney graft technique (ChTEVAR) as a debranching method of the supraaortic arteries between 2010 and 2017.

Results - ChTEVAR was performed in 35 patients with a chimney in the left common carotid artery (LCCA) in eight patients, in the brachiocephalic trunk (BCT) in two patients and in both LCCA & BCT in 25 patients. The Gore® cTAG® Thoracic Endoprosthesis was used as a main stent-graft in all patients, Excluder® Iliac leg was used as a chimney in the BCT and Viabahn® (n=32) or Atrium Advanta V12® (n=3) as a chimney in the LCCA (off-label use).
Five patients had an EL Ia and they all had a sealing ring distal to the most distal chimney of less than 10mm (P <.036).
The rate of stent-graft oversizing (median 14%, IQR: 10-15% vs. 12%, 7-18%), the diameter of the proximal (35mm, 34-37mm vs. 37mm, 33-41mm) and distal landing zones (26mm, 23-34mm vs. 30mm, 24-34mm) as well as the aortic diameter directly proximal to the pathology (36mm, 30-39mm vs. 34mm, 28-37mm) did not differ between the patients with and without EL Ia respectively (P>0.05).
Furthermore, the patients with an EL Ia had a larger preoperative aortic arch curve diameter (P.033). A proximal overlap (chimney/aorta) >52.5 mm from the LCCA towards the aortic valves was also associated with an EL Ia (P.015).

Conclusion - A sealing ring distal to the most distal chimney more than 10mm prevented from ELIa. In contrast to other studies, a longer overlap between the LCCA stent graft and the aorta would predict an ELIa. The relatively few patients and the single center nature require larger studies to verify the present results.

O-107 TEVAR FOR ACUTE TYPE B AORTIC DISSECTION: RESULTS FROM THE INTERNATIONAL REGISTRY OF ACUTE AORTIC DISSECTION INTERVENTIONAL COHORT (IRAD-IVC)

THORACIC & THORACO-ABDOMINAL AORTIC DISEASE

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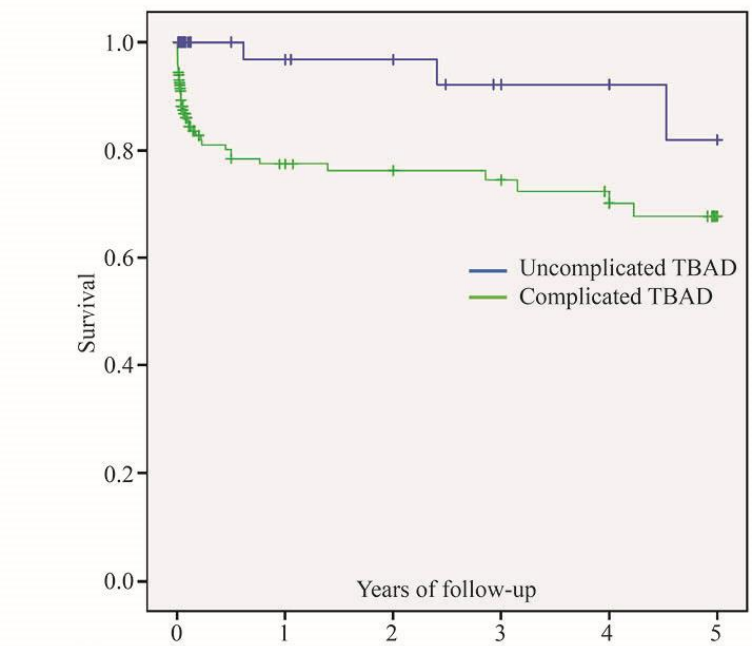
Introduction - Current guidelines recommend thoracic endovascular aortic repair (TEVAR), covering the primary entry tear, for patients presenting with complicated type B aortic dissection (TBAD).[1] Optimal medical treatment, aimed at controlling blood pressure to prevent complications, is recommended for uncomplicated TBAD.[1] In spite of clinical practice guidelines, the optimal treatment of uncomplicated TBAD is still a matter of debate.[2] Over 50% of uncomplicated TBAD patients treated with OMT demonstrate aneurysm formation during follow-up.[3] In contrast, early TEVAR promotes positive aortic remodeling.[4] The present study aims to report on the outcomes of TEVAR for acute TBAD and compare the results in patients presenting with uncomplicated versus complicated TBAD.

Methods - The interventional cohort of the International Registry of Acute Aortic Dissection (IRAD-IVC) was queried for patients treated with TEVAR for TBAD. Patient characteristics, procedural characteristics, in-hospital outcomes, and five-year follow-up mortality and reintervention rates were analyzed. Furthermore, potential correlations between procedural characteristics and perioperative complications were investigated.

Results - A total of 280 patients were included, 63 patients were treated for uncomplicated and 217 for complicated TBAD. Baseline patient characteristics and procedural characteristics were similar in both groups. The in-hospital mortality rate was lower in uncomplicated TBAD: 0% versus 13.8% (P=0.002). The following postoperative complication rates were also significantly lower in patients with uncomplicated TBAD: new neurological deficit (0% versus 18.3%, P<0.001), acute renal failure (0% versus 18.6%, P<0.001), limb ischemia (0% versus 8.1%, P=0.028) and respiratory insufficiency (0% versus 16.8%, P=0.022). Procedural characteristics that were related to in-hospital mortality were: number of deployed endografts (P=0.014), proximal endograft size (P=0.013) and additional stent deployment in the celiac artery (P=0.045). Estimated five-year survival rates were 81.9±10.8% for uncomplicated TBAD and 67.6±5.2% for complicated TBAD (P=0.004). The estimated five-year freedom from reintervention rates were 72.2±10.0% and 64.7±9.6%, respectively (P=0.876).

Image -



No. at risk:						
Uncomplicated	63	31	28	23	18	14
Complicated	217	73	62	45	36	31

Conclusion - In-hospital and long-term follow-up outcomes of TEVAR for uncomplicated TBAD are significantly better compared to TEVAR for complicated TBAD. Postoperative mortality and complication rates could potentially also be related to procedural characteristics. Our findings support the recent evidence of randomized studies showing that early TEVAR in uncomplicated TBAD is a safe option with low perioperative complication rates.

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O-108 SELECTIVE VERSUS ROUTINE PREOPERATIVE CORONARY CT ANGIOGRAPHY FOR PATIENTS UNDERGOING THORACOABDOMINAL AORTIC ANEURYSM OPEN REPAIR

THORACIC & THORACO-ABDOMINAL AORTIC DISEASE

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Introduction - Cardiac complications are reported to affect one fourth of patients submitted to thoracoabdominal aortic aneurysm (TAAA) open repair[1]. Current guidelines do not consider the use of routine coronary computed tomography (CCT) in the setting of preoperative risk stratification. Aim of this study is to compare the efficacy of selective versus routine use of CCT in preventing perioperative cardiac complications following open TAAA repair.

Methods - Data of 510 patients submitted to elective open TAAA repair at our Centre between 2009 and 2017 were retrospectively analyzed. Patients operated before March 2015 (Group 1, n = 327) underwent selective preoperative CCT according to the European Society of Cardiology recommendations for non-invasive imaging stress testing before surgery in asymptomatic patients[2]. Patients operated from March 2015 (Group 2, n = 183) underwent routine preoperative CCT, except when contraindicated or considered redundant. CCT acquisition and interpretation was performed following a standard published protocol[3], and was associated with concurrent thoraco-abdominal aortic CT assessment when necessary. Pre-, intra-, and post-operative data were compared in the two groups by using Fisher Exact test or Student t test. Specific considered clinical endpoints included: 30-day mortality, composite major adverse events (MAE) rate (death, paraplegia, renal failure requiring dyalisis, myocardial infarction), composite cardiac complications rate (arrhythmias, cardiac failure, pericardial effusion, acute myocardial infarction), and acute myocardial infarction rate.

Results - Groups were similar in terms of demographics, except for gender (females: 26% in Group 1 *vs* 35% in Group 2; P = .04). No significant differences were found in preoperative risk factors and aneurysm etiology or extent. Preoperative CCT was performed in 43 patients in Group 1 (13%), and 150 patients in Group 2 (82%). At least one critical coronary lesion was identified in 9 patients in Group 1 and in 33 patients in Group 2 (2.7% *vs* 18%, P < .0001). The rate of identification of critical coronary lesions in scanned patients was similar in the two groups (21% *vs* 22%, respectively; P = 1.0). Following CCT results, 2 patients in Group 1, and 13 patients in Group 2 underwent surgical or endovascular myocardial revascularization before TAAA repair. Perioperative clinical outcome of TAAA open repair was similar in Group 1 and Group 2 (30-day mortality 6% *vs* 9%, P = .374; composite MAE 12% *vs* 13%, P = .890; composite cardiac complications 20% *vs* 21%, P = .821; acute myocardial infarction 3% *vs* 3%, P = 1.0, respectively).

Conclusion - Routine use of preoperative CCT before TAAA open repair allows detecting a significant number of critical coronary lesions. However, this approach is not associated with a significant reduction in the rate of perioperative death, MAEs and cardiac complications.

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O-109 EXPANDED USE OF PRELOADED BRANCHED AND FENESTRATED ENDOGRAFTS FOR ENDOVASCULAR REPAIR OF COMPLEX AORTIC ANEURYSMS IN THE US IDE EXPERIENCE

THORACIC & THORACO-ABDOMINAL AORTIC DISEASE

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Introduction - To report the expanded use of preloaded catheters and wires of fenestrations and directional branches to facilitate access to renal and mesenteric target arteries during endovascular repair of complex aortic aneurysms.

Methods - Prospectively collected data from six physician-sponsored investigational device exemption (IDE) studies at US centers was analyzed. Patients were treated with fenestrated and branched aortic endografts for suprarenal (SRA) and thoracoabdominal aortic aneurysms (TAAA) between 2012 and 2017. Technical success was defined as successful intraoperative cannulation and stenting of all intended target visceral arteries. Univariate and stratified analyses were performed to identify differences between preloaded and standard devices.

Results - There were 564 patients (73% men, mean age 73±8) treated for 168 SRAs (30%), 216 type IV TAAAs (30%) and 180 type I-III TAAAs (32%). Preloaded grafts (PG) were used in 387 (69%) patients and standard grafts (SG) in 177 (31%). PGs were preferentially used for type IV TAAAs (45% vs. 24%, P<.01), whereas standard devices were used more frequently among patients with type I-III TAAAs (24% vs. 49%; P<.01). The majority of custom-made devices were preloaded (65% vs. 25%; P=.01). A total of 2157 target arteries were incorporated (mean 3.9/patient) utilizing 1469 fenestrations (68%), 603 directional branches (28%), and 85 double-wide scallops (4%). Most PGs included fenestrations (80% vs. 43%, P<.01) whereas directional branches were more frequent in standard devices (17% vs. 53%, P<.01). Contrast volume, fluoroscopy time, radiation dose and operative time were not significantly different between preloaded and standard devices (Table). Upper extremity access was more frequent for PGs (87% vs. 72%, P<.01). Overall technical success was 98.8% and 30-day mortality was 1.9%. Technical success was higher for PGs compared with standard grafts (99.5% vs. 97.2%, P=.02). 30-day mortality was lower among patients undergoing procedures with PGs (1% vs. 5%; P<.01). Stroke rate was the same for PGs and SGs (2%).

	Preloaded n=387	**Standard n=177**	**P value**
Technical success	385/387 (99.5)	172/177 (97.2)	.02
Contrast use (cc)	115±56	119±67	.56
Fluoroscopy time (min)	85±35	82±37	.47
Total radiation dose (mGy)	2474±1723	2672±1903	.31

Conclusion - Endovascular repair of complex aortic aneurysm is safe and effective. The expanded use of preloaded catheters and wires of fenestrations and directional branches for target artery incorporation is associated with even higher technical success and lower early mortality.

O-110 OUTCOMES OF AORTIC ARCH CHIMNEY TECHNIQUE IN A SINGLE CENTER WITH 226 CASES

THORACIC & THORACO-ABDOMINAL AORTIC DISEASE

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Introduction - To report our single-center experience with chimney technique for aortic arch diseases and the early- and mid-term outcomes in these patients.

Methods - From August 2012 to October 2017, 226 patients (mean age 54 ± 12 years; 197 men) with aortic arch diseases underwent thoracic endovascular aortic repair combined with chimney stents. Pathologies included type B aortic dissection (n = 185), aortic arch aneurysm (n = 10), descending thoracic aortic aneurysm (n = 3), aortic arch pseudoaneurysm (n = 2), descending thoracic aortic pseudoaneurysm (n = 8), penetrating aortic ulcer (n = 7), intramural hematoma (n = 7), and aortic rupture (n = 4).

Results - The aortic stent-grafts were deployed in zone 0 (n = 22), zone 1 (n = 13), and zone 2 (n = 191). 22 patients in zone 0 received preliminary supra-aortic vessel debranching. A total of 230 chimney stents were deployed (innominate artery, n = 21; right common carotid artery, n = 1; left common carotid artery, n = 13; left subclavian artery, n = 195). The technical success rate was 84% (189/226) and immediate type Ia endoleak occurred in 37 (16%) patients. The 30-day mortality and morbidity was 2% (4/226) and 4% (8/226), respectively. Four major strokes, three spinal cord ischemia and one aortic rupture occurred in the early-term.

The mean duration of clinical and imaging follow-up was 22 ± 16 months and 20 ± 14 months, respectively. Late type Ia endoleaks were recorded in two patients. Chimney stent occlusions were recorded in six patients and all were in left subclavian arteries. During follow-up, five patients died due to aortic rupture (n = 3), cerebral hemorrhage (n =1) or rectal cancer (n = 1). Two major strokes occurred, one of them died and the other recovered). One patient received reoperation because of the distal expansion, so the re-intervention rate was 0.5% (1/222).

Conclusion - The early and mid-term outcomes from the present study demonstrate that the chimney technique for different zones aortic arch diseases is safe and feasible, but immediate type Ia endoleak should be concerned due to these patients with uncertain late outcomes.

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O-111 DEVELOPMENT OF AN ENDOVASCULAR TRAINING MODEL FOR SIMULATION OF EVAR PROCEDURES USING 3D RAPID PROTOTYPING FOR THE PRODUCTION OF EXCHANGEABLE PATIENT SPECIFIC ANATOMIC MODELS

ABDOMINAL AORTIC DISEASES

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Introduction - Cardiovascular diseases are the most common cause of death in Europe, aortic aneurysms are one of the possible manifestations. The implementation of endovascular treatment options for aortic aneurysms had a big impact on the vascular surgical routine. In Europe, approximately 80,000 patients with aortic aneurysm are treated each year, already half of them is treated with EVAR procedure. Concording to the developments of the past we can assume, that the importance and the frequency of the endovascular treatment will rise in the future.
The technical skills needed for the performance of endovascular aortic interventions differ from the ones needed for open aortic surgery. This also means that the training requirements change.

Methods - As a part of the NavEVAR project we are developing an anatomically correct training model for endovascular treatment of infrarenal aortic aneurysms. The goal of the NavEVAR project ist he development of a x-ray- and contrast-agent-free EVAR procedure. To avoid animal testing we need a realistic environment for scientifical testing purposes. This model – when fully developed and evaluated – will give an excellent training model as well.
We collected CT data of 26 patients with abdominal aortic aneuryms after informed consent. The CT scans were segmented and 3D computer models oft he aorta and its main branches were created in cooperation with Fraunhofer MEVIS institute. Based on this we could print 3D models in cooperation with Fraunhofer EMB, using a Connex 500™ 3D printer. Some oft the models were covered with a silicone layer to improve the resistance and impermeability.
The 3D printed vessels were set into the model of a human torso which contains the spine and the pelvis as anatomical landmarks. It is metal free and can be easily x-rayed. The vascular model is perfusable when connected to a pump.

Results - The torso was build by the company Human X according to our requirements. The first patient specific vessel model was 3D-printed and covered by silicone afterwards, then integrated into the torso and fixed at the spine and the pelvis. The vascular model can be easily exchanged, which gives the opportunity of testing and training under different anatomical conditions.
We could then start the first testings by performing fluoroscopy and CT scans. The bony structures of the model have a density similar to that of real bones. For better visibility of the vascular model, we filled it with a mixture of water and contrast agent. A relation of 1:40 was appropriate to get a sufficient contrast.

The first attempts of perfusion of the model showed some points of leakage, which led to tests with other materials. At the time of abstract submission, this problem was not sufficiently solved.

Image -

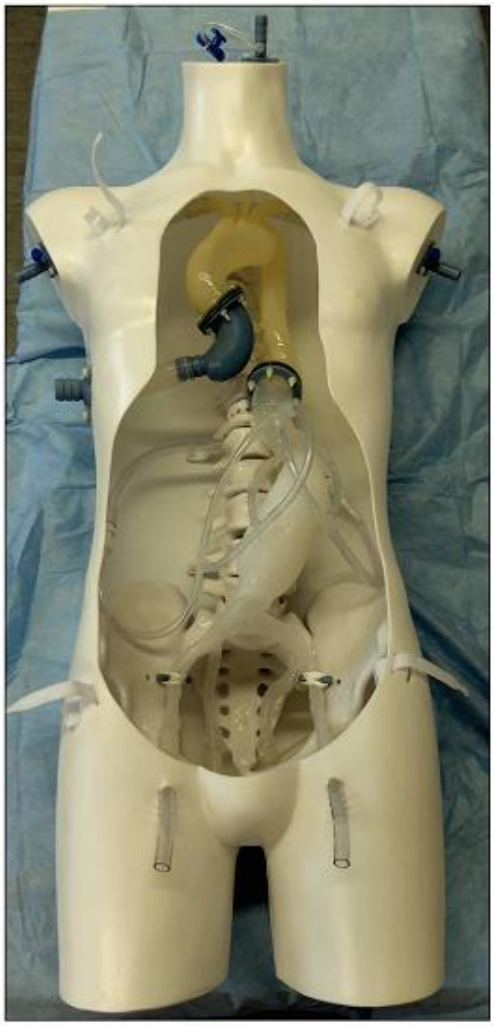

Fig. 1a)

Fig. 1b)

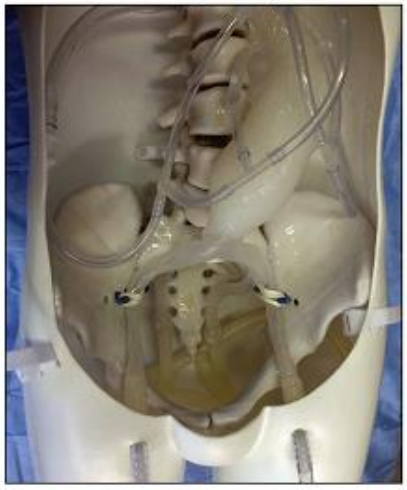

Fig. 1c)

Figure 1: Torso with build-in 3D printed aorta. The visible hoses are part of the outlet network.
a) Overview
b) Thoracic part
c) Abdominal part

Conclusion - It is feasible to create a close-to-reality training environment for endovascular aortic procedures for testing purposes as well as for training, although the development of our model is not yet complete.
A unique feature of our model is the interchangeability of the vascular models and the fact that these are based on real patient data.
Further patient specific vascular models will be produced and further testing of printing materials is necessary. The perfect material should be as flexible and resistant as realistic vessels without any leakages under perfusion.
Another hitch is the reusability of vascular models after implantation of an aortic stentgraft. We will face this challenge in the near future.

O-112 IMPACT OF ACCESSORY RENAL ARTERY EXCLUSION DURING FENESTRATED ENDOVASCULAR REPAIR FOR JUXTARENAL AORTIC ANEURYSM

ABDOMINAL AORTIC DISEASES

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Introduction - The purpose of this study is to determine the clinical impact of accessory renal artery coverage on the renal function after fenestrated endovascular repair (f-EVAR) for juxtarenal aortic aneurysm.

Methods - Between January 2005 and December 2016, 77 patients had f-EVAR for juxtarenal aneurysm with the Cook Zenith fenestrated endograft. Retrospectively, pre-operative CT was reviewed for the number and the diameter of accessory renal artery and post-operative CT was analyzed for accessory renal artery thrombosis and renal infarct. Patients with at least one renal accessory artery covered by the endograft were in group Acc and patients without renal accessory artery covered were in group NoAcc. Immediate postoperative renal insufficiency was compared between both groups. During follow-up, significant renal dysfunction was defined by a 25% or more deterioration of estimated glomerular filtration rate asses on two or more successive control.

Results - Sixty-one patients (79%) were included in group NoAcc and sixteen patients (21%) were included in group Acc, 21 accessory renal arteries were covered, 8 had a diameter ≥ 3mm and 4 patients had 2 renal accessory arteries. The demographics of the patients were similar, the median pre-operative serum creatinine levels (group NoAcc vs group Acc) were 92 mmol/L (range 49-156 mmol/L) and 99 mmol/L (range 72-163 mmol/L) (p = .692), median aneurysm diameters were 54 mm (range 50-89 mm) and 55.5 mm (range 52 - 63 mm) (p=.138), respectively. Median quantity of contrast medium was 204 ml (range 67 – 540) and 230 ml (range 120 – 450) (p=.526). On post f-EVAR CT, 4 patients had an identified renal infarct, all of them were secondary to intentional coverage of an accessory renal artery, no immediate renal stent thrombosis was observed. New onset of postoperative renal insufficiency was detected in 8% versus 12% (p=.630), mortality was 2% vs 6% (p=.374), in NoAcc and Acc groups, respectively. At 3 years, patient survival was 89% vs 84% (p=.358), freedom from renal function deterioration was 78% vs 74% (p=.702).

Conclusion - This retrospective analysis found no immediate postoperative renal failure or late renal function deterioration resulting from accessory renal arteries coverage during f-EVAR for Juxta renal aneurysms.

O-113 PATIENTS TURNED DOWN FOR NON-EMERGENCY ABDOMINAL AORTIC ANEURYSM (AAA) SURGERY: ARE WE DOING THE RIGHT THING? FACTORS THAT INFLUENCE DECISION MAKING AND THE LONG-TERM OUTCOME - A SINGLE CENTRE EXPERIENCE

ABDOMINAL AORTIC DISEASES

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Introduction - Decision to intervene once an AAA has reached the threshold size for repair relies on a careful balancing of risks and benefits. Advances in endovascular treatment have made it possible to intervene in patients that were previously considered unfit for open surgery. Despite this, there will always be patients in whom the survival benefit will not prevail the risks of AAA repair. Our study aims to determine the outcome of AAA patients turned down for non-emergency open and endovascular (including fenestrated or parallel stent graft) treatment as well as the factors involved in the decision-making process.

Methods - All patients deemed unfit for open/endovascular AAA repair following multidisciplinary team (MDT) discussion at a tertiary referral hospital from 1st of January to 31st of December 2015 were included. Data was retrospectively analysed from the MDT database and the follow-up period extended until the 1st of June 2017. Reasons for not intervening were recorded using both MDT discussion outcomes and pre-operative assessments. AAAs were stratified according to size at the time of MDT discussion. Cause of death was accepted as "ruptured AAA'' in those proven on CT scan. Survival was calculated from the date of the MDT discussion and the end point was either death or the close of the study.

Results - 118 patients met the study inclusion criteria. 89 (75%) were men and the median age was 77 years. Median survival was 29 months. 77 (65%) patients were dead at the end of the study. Median survival according to AAA sizes were: 36 months (5.5-5.9 cm), 26 months (6.0-6.9 cm). 23 months (7.0-7.9 cm), 8 months (≥ 8.0 cm) ($p<0.05$, Log Rank test). 16 (14%) patients died of rupture - one patient had open surgery and another one underwent endovascular treatment but unfortunately both died. Cardiopulmonary exercise test (CPEX) was performed in 52% of cases and considered inappropriate in frail patients. Mortality rates were comparable in patients who had (65%) and had not (64%) undergone CPEX ($p = 0.94$, Chi square test) with a median survival 32 vs 28 months respectively ($p = 0.001$, Mann-Whitney U test). Median survival was similar for anaerobic threshold: 5-7.9 (32 months) and 8-11(31 months) ($p = 0.42$ Mann-Whitney U test). The reasons for not intervening included: patient choice (19%), cardiovascular, (67%) respiratory (48%), dementia (14%), malignancy (19%), renal failure (36%), poor CPEX (15%), frailty/not suitable for endovascular intervention (66%).

Conclusion - It is reasonable to turn down patients based on their fitness, since they appeared to have a correlated poor life expectancy. 86% of patients turned down for non-emergency AAA repair died of unrelated illness within 2.5 years. 14% of patients during the study period had a documented AAA rupture. None of the patients who underwent emergency repair survived.

O-114 THE EFFICACY OF A PROTOCOL OF ILIAC ARTERY AND LIMB TREATMENT DURING EVAR IN MINIMIZING EARLY AND LATE ILIAC OCCLUSION

ABDOMINAL AORTIC DISEASES

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Introduction - Iliac limb occlusion is a possible late complication of endovascular aortic repair (EVAR) which occurs in up to 8% and requires surgical or endovascular reintervention in most instances. Attention to any intraoperative EVAR defect of iliac limbs with subsequent appropriate treatment may prevent those occurrences. Aim of our study was to analyze the long-term effect of an intraoperative protocol of iliac limb treatment in EVAR on iliac limb occlusion (ILO).

Methods - All patients treated from January 2012 to December 2017 for abdominal aortic aneurysm (AAA) with standard EVAR were prospectively collected in a dedicated database, after approval by the internal ethical committee. The analysis was performed in all elective standard EVAR with bilateral common iliac sealing. Preoperative characteristics of patients and anatomical features of iliac arteries at CT-Scan were evaluated. The protocol for intraoperative iliac limb management during EVAR was: a. pre-EVAR angioplasty of common/external iliac artery in case of >50% stenosis; b. routine iliac limbs kissing ballooning with high pressure non-compliant balloons; c. stenting of the iliac limbs in case of residual iliac limb stenosis >50% or kink and adjunctive external iliac stenting for residual stenosis (>50%) or dissection after EVAR. The study-endpoint was to evaluate ILO in the perioperative period and at follow-up, which was performed by duplex ultrasound before discharge, at 3, 6 months and yearly thereafter. Clinical characteristics, aorto-iliac anatomy and intraoperative details were considered for the evaluation of ILO and reintervention rate

Results - A total of 442 patients and 884 iliac limbs were included in the study. Clinical characteristics of the cohort were: mean age 75±8 years, female sex 10% (46/442), peripheral artery disease 7% (31/442), chronic renal failure 38% (168/442) and diabetes[GF1] 17% (77/442). Severe iliac calcifications and tortuosity were present in 8% (70/884) and 15% (132/884), respectively. All procedures were performed with kissing iliac ballooning; external iliac angioplasty and stenting of iliac limb were performed in 2% (18/884) and 9.5% (84/884) of limbs. The 30-day mortality was 1.6%; no ILO occurred in the perioperative period. At a mean follow-up of 33±12 months, ILO occurred in 7/884 (0.7%) limbs of 6 patients. Twelve, 24- and 60-months freedom from

ILO was 99.7±0.2%, 98.7±0.6% and 96.5±1.9%, respectively. All ILO cases were treated, 3 by endovascular recanalization and limb relining; 4 cases were treated surgically, 3 by femoro-femoral bypass and one by surgical explantation of the endograft and aorto-bi-iliac bypass. By the analysis of preoperative characteristics of ILO no factors were associated with late limb thrombosis. Patients with ILO had a significantly higher sac shrinkage rate compared with patients without iliac limb thrombosis (26.5±3 mm vs 6.2±2 mm, P=.002).

Conclusion - A protocol of aggressive intraoperative iliac limb treatment in EVAR leads to a very low rate of late ILO, further enhancing the efficacy of EVAR. The role of sac shrinkage on ILO occurrence should be further investigated.

O-115 VARIABLES AFFLICTING LATE OPEN CONVERSIONS AFTER EVAR: A 22-YEARS SINGLE-CENTER EXPERIENCE

ABDOMINAL AORTIC DISEASES

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Introduction - Late Open Conversions (LOC) are still necessary to correct some tedious complications following EVAR. Several authors reported an increase of these interventions during the last years. We aimed to analyze the incidence and outcomes of these hazardous procedure in our reality, to find out any variables afflicting mortality and morbidity.

Methods - From 1994 to 2016 all preoperative, intraoperative and postoperative data about LOCs performed at our institution at least 30-days from EVAR have been retrospectively collected. Patients who underwent LOC due to endograft's infection have been excluded from the analysis of our primary endpoints to achieve results as homogeneous as possible. Primary endpoint was the analysis of preoperative and intraoperative variables related to in-hospital mortality, postoperative acute kidney injury and long-term survival. Secondary endpoint was the analysis of LOC incidence and causes in our center.

Results - 58 LOCs were performed at our institution (11 underwent EVAR at other centers), but 16 were excluded as stated in method section; a total of 42 patients were considered suitable for the analysis of the primary endpoint. 2388 EVAR were performed during the study period; 47 patients were converted at our institutions and 5 at other centers, determining an overall LOC rate of 2.18% (n=52/2388). Mean age was 69.68 ± 2.41 years; 41 patients (97.62%) were male. Median time to conversion was 42.87 months (range 1.17-129.43). 73.81% (n=31/42) of interventions were elective and 7 patients (16.67%) required urgent LOC due to post-EVAR rupture. Indications for LOC were: untreatable endoleaks in 33 patients (78.57%) and graft failure with limb thrombosis in 9 (24.43%). Median laparotomy was performed in 85.71% (n=36/42), temporary supraceliac clamping was adopted in 37 patients (88.10%) and the endoprosthesis was completely removed in 83.33% (n=35/42). Median supraceliac clamping time was 7 minutes (range 4-20 minutes). 2 intraoperative deaths occurred during urgent interventions and in-hospital mortality was 14.29% (n=6/42). In-hospital mortality was found to be related with CKD (P .004), COPD (P .023), urgency (P .032), rupture of the aneurysm (P .048) and endograft's suprarenal fixation (P .016) at the univariate analysis. CKD (P .022) was the only variable influencing postoperative acute kidney injury. The multiple regression model demonstrated that in-hospital mortality was related only to CKD (P .010). Overall survival was 82%, 63%, 51% and 31% at 1, 3, 5 and 10 years respectively. Dyslipidemia (P .045), CKD (P .014), urgency (P < .001) and endograft's suprarenal fixation (P < .001) were found to afflict long-term survival at the univariate analysis. Endograft's suprarenal fixation (P .001) and urgency (P .002) were also found significant at the Cox proportional hazard regression. Supraceliac clamping did not influence both in-hospital mortality (P >.999) and long-term survival (P .985).

Conclusion - The number of LOCs increased during the last years, whereas new endografts' results appear encouraging. CKD, urgency and endograft's suprarenal fixation revealed to be predictors of in-hospital mortality and long-term mortality. Temporary supraceliac clamping could be a useful option for specific situations, but an infrarenal vascular control should be achieved whenever possible.

O-116 THE ITALIAN MULTI-CENTRE EXPERIENCE OF FENESTRATED ANACONDATM ENDOGRAFT FOR JUXTA/PARA-RENAL AORTIC ANEURYSMS

ABDOMINAL AORTIC DISEASES

Author(s) - Rodolfo Pini[*1], Mauro Gargiulo[1], Jacopo Giordano[1], Michelangelo Ferri[2], Nicola Mangialardi[3], Gian Franco Fadda[4], Bruno Palmieri[5], Stefano Michelagnoli[6], Enrico Gallitto[1], Andrea Stella[1] and On behalf of Italian Registry of Fenestrated Anaconda

Institution(s) - [1]Vascular Surgery - Bologna University, Bologna, [2]Vascular Surgery - Mauriziano Hospital, Torino, [3]Vascular Surgery - San Camillo Hospital, Roma, [4]Vascular Surgery - San Francesco Hospital, Nuoro, [5]Vascular Surgery - Niguarda Hospital, Milano, [6]Vascular Surgery - San Giovanni di Dio Hospital, Florence, Italy

Introduction - Aim of this study is to describe the outcomes of "Anaconda™-Fenestrated Endograft (Vascutek, Inchinnan, UK) Italian registry" for challenging abdominal aortic aneurysms (AAA), unfit for standard endovascular aortic repair (EVAR).

Methods - Between 2012 and 2017, patients with proximal neck unsuitable for standard EVAR were prospectively enrolled. Clinical (demographic, cardiovascular risk factors, co-morbidities) and morphological aortic-iliac features were collected. Intra and peri-operative data were analyzed. Early endpoints were technical success (TS defined as absence of endoleaks (EL) I-III, patency of target visceral vessels (TVV) and iliac legs and 24-hour survival). Late endpoints were survival, endoleaks, TVV patency and limb occlusion/stenosis, freedom from re-interventions and AAA-related mortality during the follow-up.

Results - Seventy-eight patients (male 92%(62); mean age 74±4 years, ASA III-IV:73-27%) were submitted to Fenestrated-Anaconda™ in 25 Italian Vascular Surgery Units (73 juxta/para-renal AAA, 4 Type IV TAAA and 1 EL 1A post-EVAR). The mean AAA diameter was 58mm ± 3mm (range: 50-70mm). Configuration with 1, 2, 3 and 4 fenestrations were used in 3 (4%), 40 (51%), 25 (32%) and 10 (13%) cases, respectively for a total of 198 visceral vessels, (3.6±1TVV/patient). Sixty-six (85%) bifurcated and 12 (15%) tube endograft were implanted. The endograft was repositioned during the procedure in 42% (33/78) of cases. From the brachial access, at least 1 TVV was cannulated in 54% (27/52) of cases. TS was 90% (70/78) due to 5 type I EL, 1 type III EL (between fenestration and vessel stent) and 2 renal artery occlusions. All the target visceral vessels were cannulated and stented. The 30-day mortality was 5.1% (4/78). One patient died for a multiple organ disfunction syndrome (MOF) after renal artery ligature ad nephrectomy; one patient died for sepsis after embolization of the renal artery for artery perforation, two patients died for cardiological reasons. Two of the 5 type I EL solved spontaneously at 30-day for adaptation of the sealing ring of the device to the aortic neck. Two type III endoleak detected at the completion angiography were treated by relining of renal artery. At a median follow-up of 20 months (range:1-60) there were 3 type I EL, 2 type III EL and 3 occlusions of renal artery. The reintervention free-survival was 91% and no AAA-related mortality occurred. One patients had a bilateral renal artery occlusion so he has subjected to thrombolysis combined with angioplasty. A patient with type II EL underwent to open hypogastric ligature and another to lumbar embolization. There was an aortic rupture due to a proximal progression of AAA in a patient with two fenestrations for renal arteries; the patient was treated by suprarenal extension with chimney technique for celiac trunk and upper mesenteric artery. The survivor at 36 months was 77% (no AAA-related mortality hasn't been reported).

Conclusion - Anaconda™-Fenestrated Endograft is an effective treatment of challenging AAA. The repositionability, the brachial access and the adaptation during the follow-up of the proximal ring are useful for complex anatomies and increase the technical success of the procedure.

O-117 ABDOMINAL COMPARTMENT SYNDROME AFTER ABDOMINAL AORTIC ANEURYSM REPAIR: SUBGROUPS, RISK FACTORS AND OUTCOME

ABDOMINAL AORTIC DISEASES

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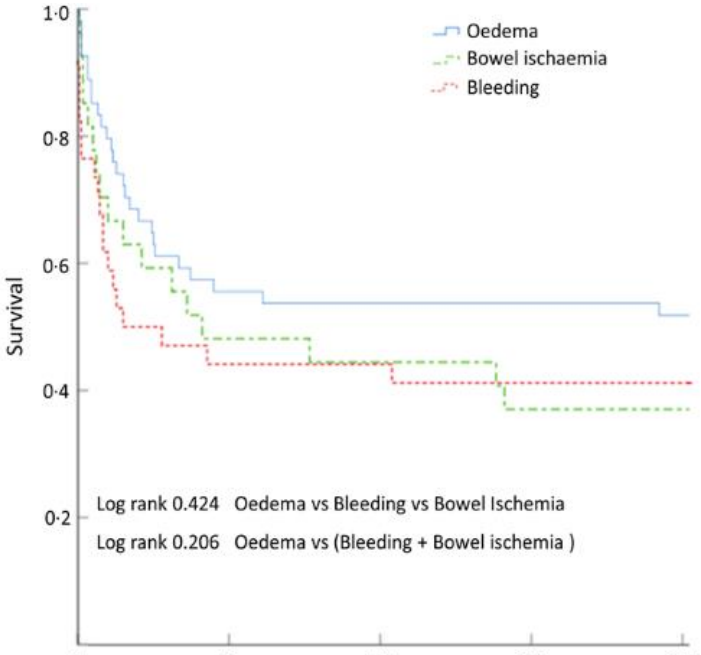
Introduction - Abdominal compartment syndrome (ACS) remains a lethal complication after abdominal aortic aneurysm (AAA) repair. The aim of this population-based cohort study was to investigate factors associated with outcome.

Methods - Since 2008, postoperative ACS and decompression laparotomy after AAA repair are registered prospectively in the National vascular registry. The case records of all patients registered for ACS 2008-2015 were reviewed. The main pathophysiological mechanism seen at laparotomy was defined and the duration of intra-abdominal hypertension (IAH) prior to decompression was registered.

Results - In all 119 patients from 24 vascular centres were included in the study. Among 82 repairs for ruptured AAA (rAAA), there were 44 Open surgical repairs (OSR) and 38 endovascular aortic repair (EVAR), and among 37 repairs for intact AAA (iAAA), there were 30 OSR and 7 EVAR. Mortality did not differ between EVAR and OSR for rAAA but was higher after EVAR for iAAA at one-year (6/7 [85.7%] versus 9/30 [30.0%], *p=.011).* Patients treated with EVAR for rAAA reached peak intra-abdominal pressure (IAP) values, and had DL earlier, than those treated with OSR (*Both p<.001)*.
Decompressive laparotomy (DL) was performed within twenty-four hours in 55 (48.2%) patients, between twenty-four and forty-eight hours in 30 (26.3%) and after forty-eight hours in 29 (25.4%).
There were three main findings at DL: bowel ischemia in 27 (23.5%), postoperative bleeding in 34 (29.6%) and general oedema/fluid overload in 54 (47.0%). Mortality did not differ depending on findings at DL, *figure 1,* or timing of DL.
Ninety-day non-survivors (60/119, 50.4%) were older (*p<.001)*, had larger aneurysms (*p=.045),* received more intraoperative blood transfusions (*p=.001)* and were more often treated with suprarenal clamping/balloon occlusion (*p<.001),* compared to those who survived 90 days or longer after surgery.
In multivariable regression analysis, only age was a predictor for one-year mortality *(p=.026)*. Duration of intra-abdominal pressure ≥15 and ≥20 mmHg prior to DL were independent predictors for the need of renal replacement therapy (RRT) (*p=.041 and p=.031)*.
Open abdomen treatment was performed in 106 patients of whom 98 (92.5%) received negative pressure wound therapy (NPWT), which in a majority also was combined with mesh-mediated traction. Among 85 patients with NPWT who survived until the abdomen was closed, 81 (95.3%) achieved primary delayed fascial closure.

Image -



Conclusion - Mortality in ACS did not differ depending on the cause of ACS or on whether DL was performed early, intermediate or late. The duration of IAH prior to DL affected the need for RRT, suggesting the value of close monitoring and early treatment of

IAH to prevent renal failure. ACS after EVAR for rAAA developed early after surgery, and in this clinical scenario monitoring of IAP may be life-saving.

O-118 NOVEL PREDICTORS OF PERI-OPERATIVE MORTALITY IN A SERIES OF 931 CONSECUTIVE PATIENTS WITH INTACT AORTOILIAC ANEURYSMS MANAGED AT A SINGLE CENTRE

ABDOMINAL AORTIC DISEASES

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Introduction - The aim of our study was to identify preoperative and intraoperative factors associated with in-hospital mortality after repair of intact abdominal aortic or iliac aneurysms.

Methods - This was a retrospective analysis of prospectively collected information on patients undergoing repair of intact aortoiliac aneurysms during a 28-year period. Recorded information included preoperative demographics, risk factors and co-morbidities, aneurysm characteristics, investigations and operative variables including special aneurysm presentation (inflammatory, mycotic/infected, aortocaval fistula) and procedure type (open vs. endovascular repair). Univariate and multivariate logistic regression analyses (with odds ratios, OR) were performed, the latter performed to develop a predictive model using the generated output. The area under the curve of the receiver operating characteristics (ROC) curve of our score, the Glasgow aneurysm score (GAS),[1] and the Vascular Study Group of New England (VSGNE) score,[2] was calculated.

Results - During the study period we operated on 931 patients with intact aortoiliac aneurysms, on an elective (n=882) or urgent (n=49) basis, and an in-hospital mortality of 1.7% and 8.2%, respectively (p=0.015). Endovascular aneurysm repair (EVAR, n=414) was a predictor of lower mortality (0.5% vs. 3.3% for open repair, n=517, p=0.003). Other significant predictors included the presence of abdominal or back pain (7.5% vs 1.3% for no pain, p<0.001), preoperative angiography (6.9% vs 1.6% for no angiography, p=0.01), special aneurysm presentation (10.7% vs 1.5% for 875 ordinary atherosclerotic aneurysms, p<0.001), concomitant major procedures (19% vs 1.6% for the rest, p<0.001), serious intraoperative complications (9.1% vs 1.5% for no such complications, p<0.001), median number of transfused units of blood intraoperatively (2 and 0 for cases with and without mortality, respectively, p<0.001) and duration of the procedure (300min and 150min for cases with and without mortality, respectively, p<0.001). On multivariate analysis, EVAR was an independent predictor of lower mortality (OR=0.22, p=0.05) and special aneurysm presentation (OR=6.45, p=0.001) and concomitant major procedures (OR=14.3, p<0.001) were independent predictors of higher mortality. The area under the ROC curve, and p values for the GAS, VSGNE score and our score was 0.46, 0.62 and 0.81, and 0.59, 0.084 and 0.00003, respectively (Figure). The difference between the VSGNE and our score was significant (p=0.029). Repeat analysis for electively operated cases demonstrated an area under the ROC curve of 0.66 (p=0.029) and 0.80 (p=0.000069), respectively, for the VSGNE and our score, with the difference becoming non-significant.

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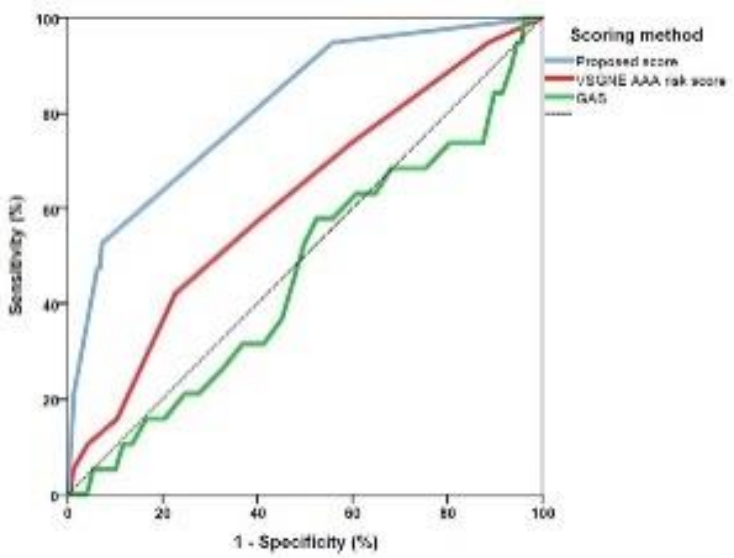

Conclusion - Our study in patients undergoing aortoiliac aneurysm repair has demonstrated novel risk factors for mortality and externally validated VSGNE in different healthcare settings.

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O-119 LONG-TERM EVAR EFFICACY IN YOUNG PATIENTS

ABDOMINAL AORTIC DISEASES

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Introduction - Although endovascular aneurysm repair (EVAR) is considered advantageous to open repair (OR) in aneurysm (AAAs) treatment in most circumstances, its role remains controversial in young patients, due to the possible long-term complications. Aim of the study was to compare early and long-term outcomes of EVAR and open repair (OR) in young patients (≤65-year old at the time of procedure)

Methods - Pre, intra and post-operative data of young patients undergoing infra-renal AAA repair between 2005 and 2013 were retrospectively analyzed from a prospective maintained database. Pre-discharge, 30-day and follow-up outcomes of EVAR and OR cases were evaluated and compared. All EVAR cases included were performed inside the manufactures instruction for uses and all OR cases with an infra-renal aortic cross clamp were considered. Fisher's exact test, Kaplan Meyer and Log rank analysis were used for the statistical evaluation.

Results - One-hundred and fifteen patients (age: 60±3years; M: 98%; AAA-diameter: 58±5mm; ASA score ≥3: 97%) were analyzed. Fifty-eight cases (51%) were treated by EVAR and 57(49%) by OR, respectively. EVAR and OR patients had similar comorbidities, except for COPD (EVAR:17% vs OR: 63% p:.001) and obesity (EVAR:38% vs OR:19% p:.027). EVAR required lower rate of general anesthesia (25% vs 100%; p:.001), intensive care unit (ICU) (19% vs 79%; p:.001), blood infusion (236±31 vs 744±98 mL; p:.001) and post-operative hospitalization days (4±2 vs 9±6 days; p:.034). There were no differences in term of

post-operative cardiac, pulmonary and renal morbidity (EVAR:5% vs OR: 15%; p:.106). Eight patients (4%) required re-interventions within 30-day (EVAR:0% vs OR: 8%; p:.001). The overall 30-day mortality was 1% (EVAR:0% vs OR:2%; p:.301). The mean follow-up was 86±38 months (EVAR:77±36 months vs OPEN:84±38months; p:.813). Overall, onset of post-operative sexual dysfunction was 32% (EVAR:30% vs OR 49%; p:.09) and OR had a higher retrograde ejaculation rate (EVAR:2% vs OR:31%; p:.001). Surgical access related adverse events were reported in 23 (40%) OR (incisional abdominal hernia) and 2 (3%)EVAR (lymphocele) cases (p:.001). Cancer was detected in 19 patients with no difference between EVAR (17%) and OR (16%) (p:.83). Freedom from re-interventions was 93%, 80% and 77% at 1, 5 and 10 years (EVAR: 91%, 81%, 81% vs OR: 94%, 78%, 73%; p:.778). In the EVAR group, 4 (7%) late elective conversions to OR were necessary due to: type I endoleak (1), type II endoleak with sac enlargement (1) and Iliac leg occlusion (2). All conversions were successfully accomplished with no mortality/morbidity. At 27-month, 1 patient of the OR group required graft removal with an axillary-bi-femoral bypass due to primary graft infection and died within 30-postoperative days. Survival at 1, 5 and 10 years was 93%, 85% and 72%, respectively (EVAR: 93%, 83% and 78% vs OR: 93%, 87%, 70%; p:0.94)

Conclusion - Early and long-term survival is not different in EVAR and OR in young patients, with similar re-intervention rates in both groups. EVAR allows shorter hospitalization, lower need of ICU, blood infusion and early re-interventions than OR. Sexual dysfunction and surgical access related adverse events are less frequent in EVAR compared with OR. According with these results, EVAR, can be proposed as a safe, effective and durable option also in patients <65year-old if anatomically fit

O-120 COMBINATION OF MAGNETIC RESONANCE IMAGING AND 18-FLUORO DEOXY GLUCOSE POSITRON EMISSION TOMOGRAPHY IN FUNCTIONAL IMAGING OF MEDIUM TO LARGE ASYMPTOMATIC ABDOMINAL AORTIC ANEURYSMS

ABDOMINAL AORTIC DISEASES

Author(s) - Marek Kuzniar*[1], Gustaf Tegler[1], Anders Wanhainen[1], Håkan Ahlström[2], Tomas Hansen[2], Kevin Mani[1]

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Introduction - Chronic inflammation and proteolysis are characteristics of the aortic wall in abdominal aortic aneurysms (AAA) formation. The aim of this study was to evaluate the feasibility of 18-Fluoro Deoxy Glucose positron emission tomography (18F-FDG PET) in combination with contrast enhanced (CE) magnetic resonance imaging (MRI), fully integrated PET-MRI, to identify inflammation in medium to large asymptomatic AAA. Prevalence of increased FDG uptake and expected MRI findings of inflammatory changes (edema, wall thickening and late gadolinium enhancement (LGE)) in aneurysmal wall were investigated.

Methods -18F-FDG PET-(CE) MRI was performed on 11 patients with asymptomatic infrarenal AAA chosen from the routine AAA surveillance database at the University Hospital. Inclusion criteria were adjusted annual growth rate of > 2mm and AAA size > 45mm. Recent annual AAA expansion was calculated for each patient. Visual and quantitative evaluation of FDG uptake were performed at three levels of the aorta (suprarenal aorta, aneurysm neck area, abdominal aneurysm). FDG hot spots were investigated for prevalence of corresponding morphological abnormalities. (CE)-MRI images were scanned for LGE and wall thickening of the aneurysmal wall.

Results - The mean diameter of AAA was 57 mm (47-63), and mean expansion was 5mm during the last year prior to examination (range 1-13 mm). Overall, maximum FDG uptake in the aneurysmal wall was significantly higher compared to blood pool activity (standard uptake value (SUV)max aneurysmal wall 2.5, standard deviation (SD) 0.5; blood pool 1.0, SD 0.2; p<0.001). Analyses of maximum target to background ratio (TBR) showed that both suprarenal aorta and non-aneurysmal aortic neck had higher TBR compared to adjacent aneurysmal aorta (suprarenal aorta: 3.2 SD 0.7; aortic neck 2.8 SD 0.5; aneurysmal aorta 2.6 SD 0.6 , p<0.001). 28 FDG hot spots were observed in the aneurysmal walls in 10 of the 11 patients (91%). LGE and wall thickening was identified in six of eleven patients (55%). The mean recent annual aneurysm expansion rate was higher in aneurysms with LGE than those without LGE (7.3 SD 3.7 vs 1.6 SD 0.9, p=0.005). Only one patient had hot spots (n=4) with corresponding MRI visual findings of vessel inflammation. This patient had the most rapid recent annual expansion (13mm/y).

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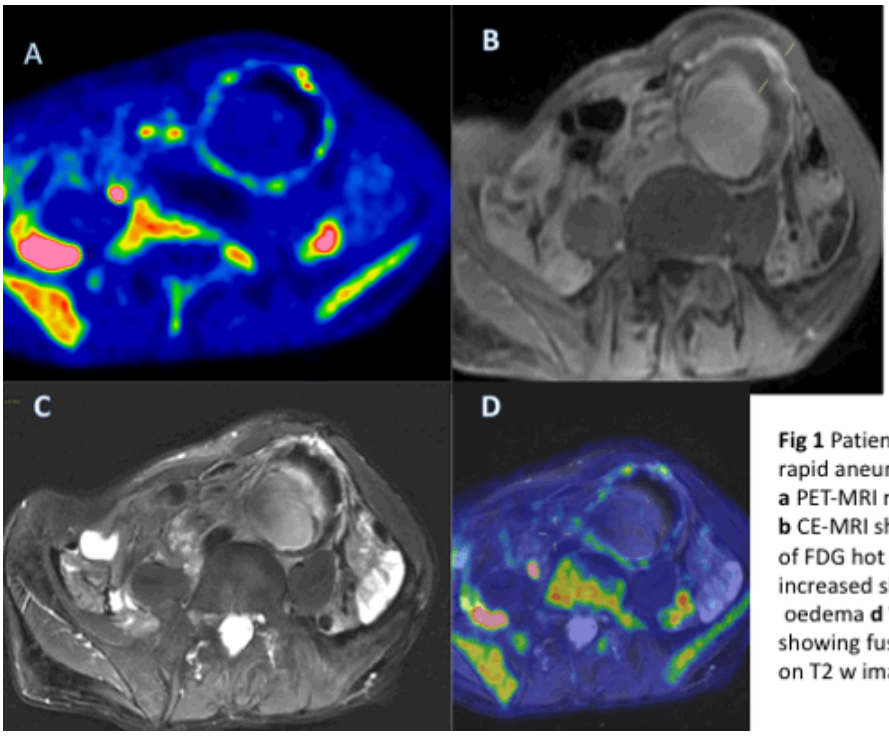

Fig 1 Patient with AAA 63mm and rapid aneurysm sac expansion (13mm/y) **a** PET-MRI reveals focal FDG uptake in aneurysm wall **b** CE-MRI showing contrast enhancement at the site of FDG hot spot **c** MRI T2w images demonstrate increased signal at the same site indicative of oedema **d** Volume – matched MRI-PET FDG images showing fusion between PET and anatomical location on T2 w images.

Conclusion - Fully integrated PET-MRI is feasible in studying asymptomatic AAAs. Heterogenous uptake of FDG in the aneurysmal aortic wall indicates ongoing inflammation. However, these FDG hot spots do not correspond to MRI findings of inflammation, bringing in question the type of cellular activity in these areas. Presence of LGE in the aneurysmal wall may correlate with AAA growth, and merits further evaluation.

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O-121 EXPLANTATION OF INFECTED ENDOGRAFTS AFTER ENDOVASCULAR ABDOMINAL ANEURYSM REPAIR: A 20-YEAR MULTICENTRE EXPERIENCE

ABDOMINAL AORTIC DISEASES

Author(s) - Paolo Perini* [1], Mauro Gargiulo[2], Roberto Silingardi[3], Elio Piccinini[4], Raffaello Bellosta[5], Enrico Vecchiati[6], Patrizio Capelli[7], Massimiliano Gessaroli[8], Vincenzo Gasbarro[9], Emilio Pisano[10], Antonio Freyrie[1] and the CCTER1 multicentre study on Late Open Conversions after EVAR

Institution(s) - [1]Vascular Surgery, Department of Medicine and Surgery, University of Parma, Parma, [2]Department of Experimental, Diagnostic and Speciality Medicine, University of Bologna, Bologna, [3]Vascular Surgery, University of Modena and Reggio Emilia, Modena, [4]Vascular Surgery, AUSL Romagna, Ravenna, [5]Vascular Surgery, Poliambulanza Foundation Hospital, Brescia, [6]Vascular Surgery, AO Reggio Emilia, Arcispedale S. Maria Nuova, Reggio Emilia, [7]General and Vascular Surgery, AUSL Piacenza, Piacenza, [8]Vascular Surgery, AUSL Romagna, Ospedale Infermi, Rimini, [9]Vascular Surgery, University of Ferrara, Ferrara, [10]Vascular Surgery, Maggiore Hospital, Bologna, Italy

Introduction - The incidence of abdominal aortic endograft infection (AEI) is low, but is a devastating complication associated with high mortality. The surgical treatment is challenging, and aims to eradicate the infectious process by complete endograft explantation (EE) and regional tissue debridement, followed by anatomic or extra-anatomic arterial reconstruction. Here we report a multicentre experience of EE for AEI, with the goal of identifying the mode of presentation, technical aspects and outcomes of this cohort of patients.

Methods - A retrospective analysis of EVAR requiring EE from 1996 to 2017 in 10 Vascular Centres was performed. Specifically, patients who presented with AEI were selectively included. Patients' demographics, time interval between EVAR and EE, type of endograft, previous attempts of endovascular correction, operative technique (clamping site, reconstruction), 30-day mortality, post-operative complications and long-term survival were obtained for analysis.

Results - During the study period, 175 patients underwent EE in the participant institutions. Among these, 29 were operated on for AEI and were therefore analysed. Mean age at EE was 73.4±7.2 years; 25/29 (86.2%) were male. The median interval between EVAR and complete EE was 12.8 months (range: 1.3-95.3). A suprarenal fixation was present in the 58.6% of the endografts, and the proximal stent was equipped with hooks in the 55.2%. Eleven patients (37.9%) underwent endovascular re-intervention for endoleak repair prior to EE. AEI was associated with aortoenteric fistula (AEF) in 9 cases (31%) and aneurysm rupture in 4 (13.8%). Proximal aortic cross-clamping site was infrarenal in 10.3% of the cases, suprarenal in 24.1% and supraceliac in 65.6%. The 51.7% of the patients underwent anatomic arterial reconstruction (8 cryopreserved arterial allografts, 6 silver-coated Dacron grafts, 1 femoral vein), while the 48.3% extra-anatomic reconstruction (14/29 endograft removal associated with prosthetic axillo-bi-femoral bypass). Thirteen out of 29 patients (44.8%) underwent bowel resection for AEF or intestinal ischaemia. In the 17% of the cases, AEI was confirmed intraoperatively. The most commonly identified microorganism was Streptococcus spp.; in the 66% of the cases, cultures revealed multiple causative agents.
Overall 30-day mortality was 20.7%. Major renal or gastrointestinal complications occurred in the 44.8% of the patients (17.2% required temporary or permanent haemodialysis). During the median follow-up of 15.6 months (range: 0-143.4), we experienced 4 aneurysm-related deaths (3 cases of anastomotic false aneurysm rupture, 1 rupture of an aortic stump). Infection re-occurred in the 34.8% of the patients. The estimated overall 1- and 5-year survival rates were 53.9% and 17.9%, respectively. Survival rates were significantly lower in patients who underwent extra-anatomic reconstruction (35.7% vs. 71.8% at 1 year, log-rank P=.016).

Conclusion - EE for AEI are technically challenging operations associated with high postoperative mortality rates and poor long-term survival, especially in patients who underwent extra-anatomic arterial reconstructions. The need of complete endograft removal imposes a suprarenal or supraceliac aortic clamping in most of the cases, contributing to the high rates of acute kidney injury and gastrointestinal complications.

O-122 SURVIVAL AFTER ELECTIVE ENDOVASCULAR OR OPEN AAA REPAIR: A SYSTEMATIC REVIEW AND META-ANALYSIS

ABDOMINAL AORTIC DISEASES

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Introduction - Endovascular aneurysm repair (EVAR) has become the preferred strategy for elective AAA repair. However, superiority of EVAR has recently been challenged by reports of impaired longevity in patients who underwent elective endovascular repair. [1, 2] In this context we considered a systematic review and meta-analysis of the available survival data relevant. Possible confounding by age differences between patients receiving EVAR or open surgical repair (OSR) was addressed by estimating relative survival.

Methods - A search using PubMed, Embase, Web of Science and Cochrane for the 1993-2018 interval identified 53 eligible papers that reported short-term and/or long-term mortality of EVAR and OSR. Identified studies included 4 randomized controlled trials (RCTs), 20 reports based on administrative registries, and 29 cohort studies. Pooled overall survival estimates (Hazard ratios with corresponding 95% CIs for EVAR versus OSR) were calculated using a random-effects model. For each study expected survival was calculated based on the matched (age, sex, year of operation and country) general population. Relative survival was consequently calculated as the ratio between observed and expected survival, according to EVAR or OSR. [3, 4]

Results - The analysis includes data of 189.022 patients: 102.053 EVARs and 86.969 OSRs. Pooled 30-day mortality for EVAR was 1.16% (95% CIs 0.92 – 1.39) and 3.27% (95% CIs: 2.71 – 3.83) for OSR. Combined (overall) 3, 5, and 10-year survival rates were similar for EVAR and OSR. However, data from cohort studies indicated superior survival after OSR at 3 years and a trend towards superior survival at 5 and 10 years. Yet, EVAR patients included in these cohort studies were older (73.7 years) compared to OSR patients (71.4 years). Correction of age inequality through relative survival analysis showed comparable 3, 5, and 10 years survival for EVAR and OSR among all types of studies.

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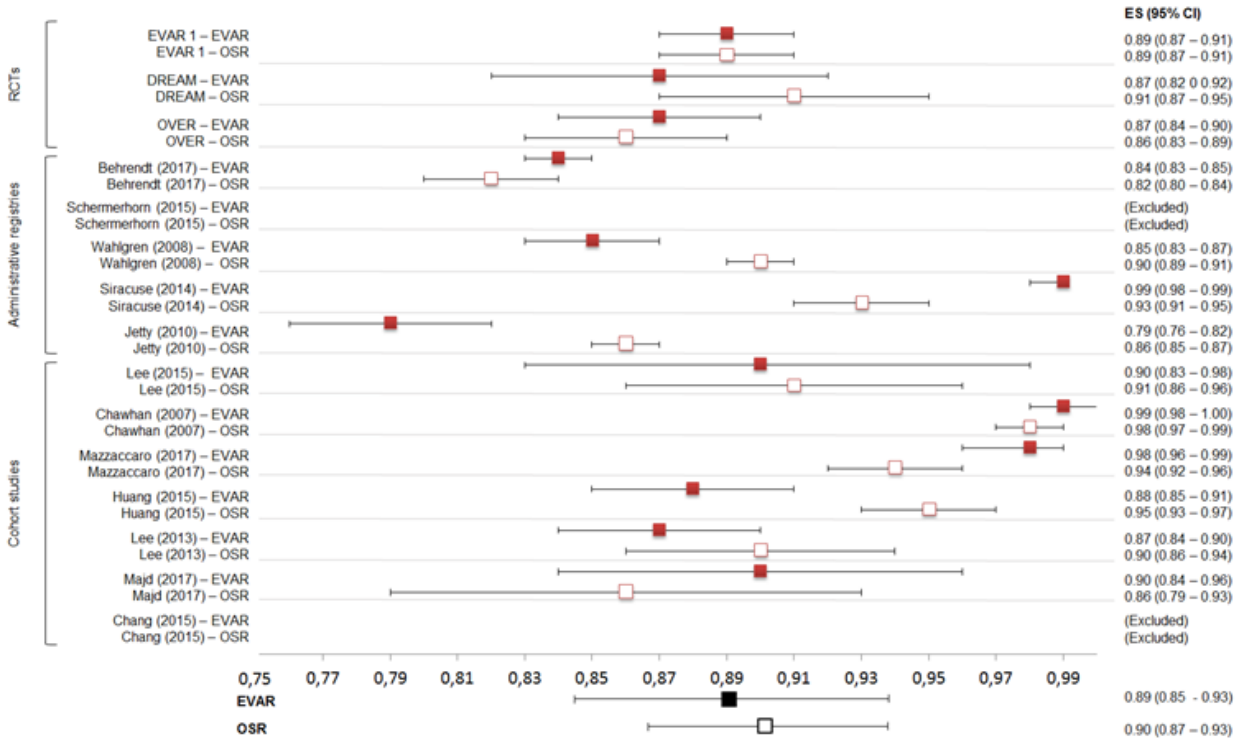

Conclusion - Pooled data confirm superior 30-day survival of EVAR over OSR, but long-term survival up to 10 years is equivalent, when corrected for age inequality. Asymmetrical medical decision making with regard to EVAR and OSR may result in confounding by indication in the cohort and registry studies. Although relative survival estimates reduce the impact of age differences, it is plausible that fitter patients or patients with more complex AAA morphologies are more likely to receive OSR. Published data do not allow for extension beyond the 10-year survival window or for analysis of specific subgroups (women, young patients).

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O-123 DUPLEX AND 3-D TOMOGRAPHIC ULTRASOUND MEASURES THAT PREDICT ABDOMINAL AORTIC ANEURYSM GROWTH

ABDOMINAL AORTIC DISEASES

Author(s) - Maria Khan* [1], Steven Rogers[1], Charles McCollum[1]

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Introduction - Abdominal aortic aneurysms (AAAs) are increasingly screen detected with most entering surveillance. Predicting future AAA growth rates would allow individualised patient care with optimal surveillance intervals.
AAA geometry including diameter, cross-sectional area, volume, intraluminal thrombus (ILT) volume and distensibility all potentially influence AAA growth[1-6]. Although finite element analysis of computed tomography images has been used to predict AAA growth[7,8], ionising radiation and nephrotoxic contrast prohibit use in surveillance patients.
We investigated whether duplex and 3D tomographic ultrasound (tUS) measures of AAA geometry, including wall volume as a measure of wall thickness, were associated with growth rate in AAA surveillance patients.

Methods - Standard and tUS duplex imaging were performed by two vascular scientists in 128 AAA surveillance patients with previous data on growth rates over more than 2 years. AAA diameter, cross-sectional area, volume, wall thickness, wall volume, and volume of ILT were all measured using specialist ImFusion suite software. Wall and ILT volumes were corrected for aneurysm volumes. Maximum systolic and minimum diastolic diameters, corrected for diameter, were used to calculate pulsatility. Distensibility was calculated using formulas for strain and elastic distensibility[9]. Intra-observer variability and the relationship between the above US measures with AAA growth was analysed using Spearmans's correlation coefficient. The independent effect of each US measure was then analysed using multivariate linear regression.

Results - Intra-observer variability for wall thickness using standard duplex was poor at r=0.24 but was excellent for other tUS measures at better than r=0.80. AAA diameter (r=0.43), cross-sectional area (r=0.42) and volume (r=0.46) ($p<0.01$) all correlated significantly with AAA growth rates. Wall volume (corrected for AAA volume) could be measured more accurately than wall thickness and inversely related to growth (r=-0.43, $p<0.01$). Diameter with wall volume ($r^2_{adjusted}=0.215$, $p<0.01$) and AAA volume ($r^2_{adjusted}=0.187$, $p<0.01$) were both independent predictors of AAA growth on multi-variable analysis. ILT volume corrected for AAA volume weakly correlated with growth (r=0.27, p=0.02) and did not inhibit pulsatility (r=-0.08, p=0.49). Strain distensibility (r=0.09, p=0.35) and elastic distensibility (r=0.09, p=0.32), previously reported to be important[9], failed to correlate with growth. Pulsatility (r=0.10, p=0.27) also failed to significantly relate to AAA growth rates.

Image -

Table 1: *Correlation between ultrasound characteristics and growth rate of abdominal aortic aneurysms (cm/year).*

Characteristic		r-value	p-value
Diameter		0.43	<0.01
Volume		0.46	<0.01
Wall volume		-0.43	<0.01
Cross-sectional area		0.42	<0.01
Thrombus area		0.27	0.01
Thrombus volume		0.27	0.02
Pulsatility		0.01	0.27
Distensibility	strain	0.09	0.35
	stiffness	0.09	0.32

Conclusion - AAA growth most strongly related to AAA volume, diameter and inversely to AAA wall volume, with these being independent variables. Pulsatility and distensibility failed to influence AAA growth. tUS appears to be a safe, practical and reliable method for measuring AAA geometry that may be predict growth rate and risk of rupture.

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O-124 SUPRA-AORTIC REMODELING AFTER EVAR DURING ONE-YEAR FOLLOW-UP: COMPARISON BETWEEN THREE DIFFERENT FIXATION TYPES OF ENDOGRAFTS

ABDOMINAL AORTIC DISEASES

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Introduction -The remodeling of the supra-renal aorta after endovascular aortic aneurysm repair (EVAR) in relation to different endograft design has not been fully investigated. The aim of this study was to assess the anatomic changes in supra-renal aorta post-EVAR with the use of different types of endografts during the first year.

Methods - In total 100 patients undergoing EVAR with 3 types of endografts having different proximal fixation system were retrospectively analyzed. Fifty consecutive patients were treated with Ovation (supra-renal fixation and infra-renal sealing with polymer ring; Endologix, Irvin, CA, USA), 25 with Endurant (supra-renal fixation; Medtronic Cardiovascular, Santa Rosa, Calif, USA), and 25 with Excluder (infra-renal fixation; W.L. Gore & Associates, Flagstaff, AZ, USA). Baseline calcification (0 to 2) and thrombus (0 to 2) at the neck, co-morbidities and anatomical variables were recorded. Anatomic variables were AAA maximum diameter, supra-renal neck angulation, and diameters of the supra-renal aorta at 5mm, 15mm, 25mm, and 35mm above the most cephalad renal artery. Computed tomography angiography (CTA) was obtained pre-operatively at 1 and 12 months post-EVAR.

Results - The mean AAA diameter was 56.5mm, 57mm and 55mm in Ovation, Endurant and Excluder group, respectively. Co-morbidities were not different across the 3 groups. Presence and amount of neck calcification (p=0.139) and thrombus (p=0.116) was similar among groups. Maximum aortic diameter showed significant reduction from pre-operative to 12-month post-operative CT scan for all 3 groups. (Ovation group: 56.5mm to 53mm; p<0.001, Endurant group: 57mm to 51mm; p<0.001, Excluder group: 55mm to 50mm; p<0.001). Regarding supra-renal aortic diameter changes, only the Ovation group showed a significant increase at all levels (mean increase of 1mm), except at 15mm which remained stable. Changes in supra-renal angulation were also significant only in the Ovation group (10^0, 8^0, 7^0; p<0.001) and Excluder group (22^0, 20^0, 18^0; p=0.05). Among the three different endografts, maximum diameter decrease, was not different (p=0.99), supra-renal aortic diameter increase, was significantly higher only in Ovation group at levels of 5mm (p=0.02) and 25mm (p=0.01) while there were no differences observed at the level of 15mm (p=0.12) and 35mm (p=0.25) and supra-renal angulation reduction was not different (p=0.7). No migration or endoleak type I was observed in any patient. Endoleak type II was observed in 18/50, 6/25 and 7/25 in Ovation, Endurant and Excluder group, respectively, (p=0.532).

Conclusion - The type of endograft fixation system appears to have different impact on supra-aortic anatomy in terms of supra-renal aortic diameter and anglulation, but without any clinical effect in the first post-EVAR year. Longer follow up is needed to clarify future remodeling and clinical impact of these observations and whether any type of endograft requires more intense follow up.

O-125 CURRENT REPORTING OF COMPLICATIONS FOLLOWING AORTIC ANEURYSM SURGERY: A SYSTEMATIC REVIEW

ABDOMINAL AORTIC DISEASES

Author(s) - Sylvana M. L. de Mik*[1], Reza Indrakusuma[1], Dink A. Legemate[1], Ron Balm[1], Dirk T. Ubbink[1]

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Introduction - Surgeons must be able to easily interpret complication risks reported in publications, and then present these risks in a manner that is best understood by patients. For instance, patients understand differences in harms between treatment options better when absolute risk differences are used. Few studies have looked at whether such information is actually obtainable from literature, despite the focus on evidence-based surgery. Perhaps improvements are necessary to make it easier for surgeons to directly use and discuss these risks with their patients. Therefore, this systematic review aims to study the current reporting quality of complications in publications of aortic aneurysm surgery.

Methods - A systematic review was done in accordance with the PRISMA guidelines. Medline, Embase and Central were searched for studies that reported complications in patients with aortic aneurysms who received primary treatment. Randomised controlled trials, comparative cohort studies and registries were included. Risk of bias was assessed using checklists from the Dutch Cochrane collaboration. Reporting quality of complications was assessed by scoring selected items from the reporting standards of the Society of Vascular Surgery and the CONSORT statement. In addition, we noted whether absolute risk differences or a 2x2

table were given. Thus, we focused on scoring items we deemed necessary for risk communication between surgeons and patients. Overall reporting quality across publications is presented as the percentage of publications that received a full, partial or zero score for each item.

Results - Seventy-seven publications were included, comprising 15 randomised controlled trials, 12 comparative cohorts and 50 registries. Risk of bias was low, except for blinding of patients and surgeons in the RCT group and blinding of assessors and funding in the other two groups. Figure 1 shows the overall scores of the included items. Definitions were given for all complications in 14 publications, whereas 17 publications provided no definitions. Forty publications provided some or complete information on the severity of complications. In 24 publications it was unclear whether number of adverse events or number of patients with adverse events were presented. Overall number of patients with complications was reported in 40 publications. Absolute risk difference was used in two studies which was less often than odds, hazard or risk ratios. In 41 publications it was possible to calculate the absolute risk difference with the information provided (2x2 table).

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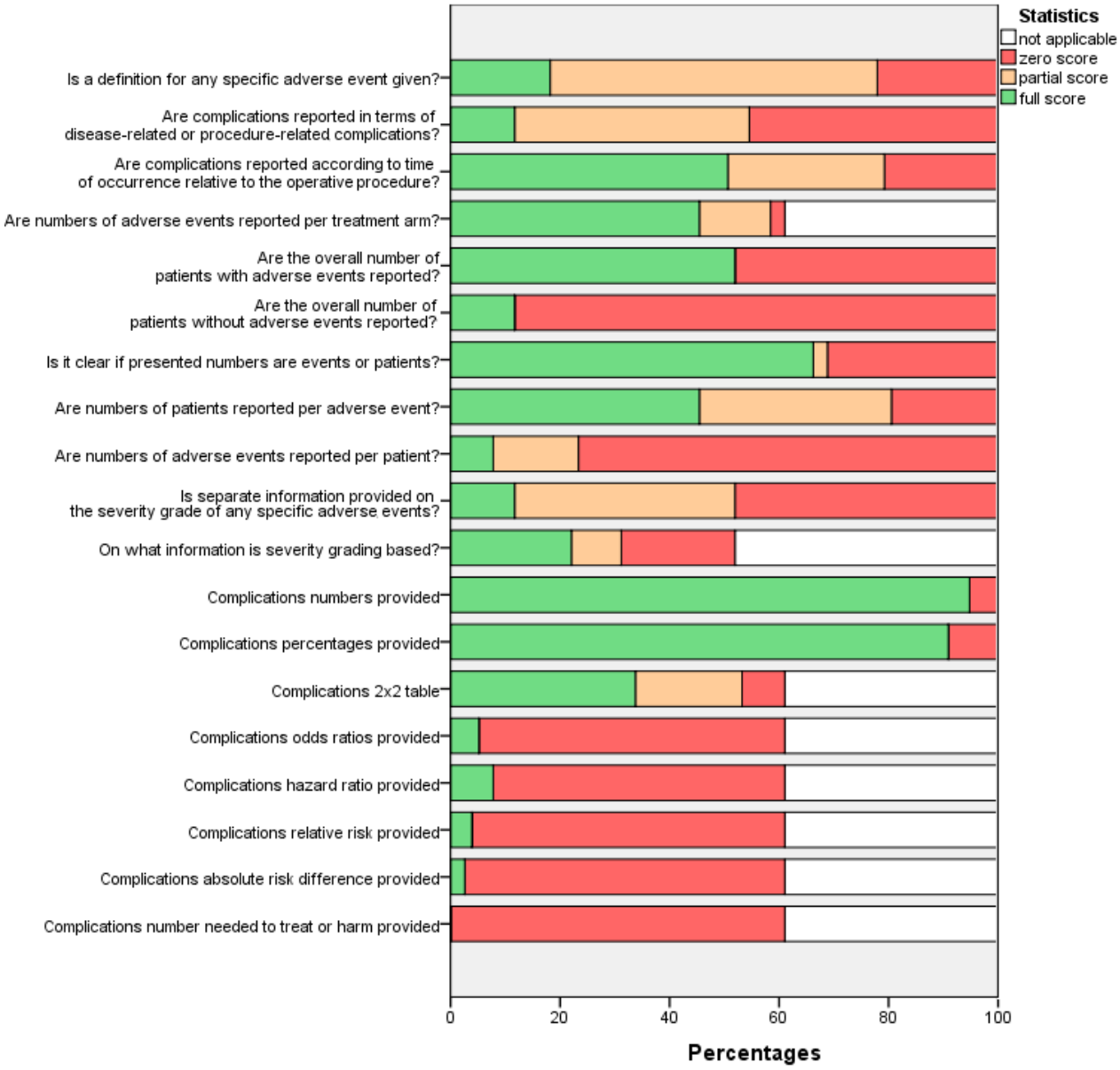

Conclusion - The reporting quality of complications from aortic aneurysm surgery shows that there is room for improvement. Better adherence to reporting standards and the CONSORT statement is necessary, such as using clear definitions with severity grading. In addition, absolute risk differences should be used. This may make it easier for surgeons to directly discuss the presented information during their consultation with patients.

O-126 INTRAVASCULAR ULTRASOUND FOR ENDOVASCULAR ANEURYSM REPAIR COMPARED TO PEROPERATIVE ANGIOGRAPHY. A PILOT STUDY

ABDOMINAL AORTIC DISEASES

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Introduction - The aim of this study was to compare intravascular ultrasound (IVUS)-assisted procedures for endovascular aneurysm repair (EVAR) and thoracic endovascular aneurysm repair (TEVAR) with standard angiography-assisted procedures.

Methods - From June 2015 to June 2017, 90 consecutive patients underwent endovascular aneurysm repair. Forty procedures were IVUS-assisted (35 EVAR and 5 TEVAR) with X-ray exposure limited to completion angiography for security because IVUS probe does not incorporate a duplex probe. Fifty procedures were angiography-assisted (45 EVAR and 5 TEVAR). The IVUS-assisted procedures were performed by vascular surgeons following a basic Duplex Ultrasound training. The primary study endpoints were the median duration of X-ray exposure, the median duration of the procedure and the amount of contrast medium administered. Secondary endpoints were the operative mortality and morbidity, arterial access complications and incidence of endoleaks. The median length of follow-up was 9 months [6-30 months].

Results - IVUS-assisted procedures required fewer contrast media compared to standard angiography assisted procedures (60 ± 20 ml vs. 120 ± 40 ml, $p < .01$). Median duration of X-ray exposure was significantly lower in IVUS-assisted procedures (24 ±15 minutes vs 40 ±30 minutes, $p < .01$). The median duration of the procedure was comparable in both groups (120 ± 30 minutes vs. 140 ± 30 minutes, $p = 0.7$). No change in renal clearance was observed for IVUS-assisted procedures (97.85ml/min preoperative vs 97.8 ml/min postoperative, $p = 0.8$) . No postoperative mortality, morbidity and arterial access complications occurred. Early type II endoleaks were observed in 10 patients (11%), 6 in the angiography-assisted group (12%) and 4 in the IVUS-assisted group (10%). These endoleaks were not associated with sac enlargement ≥ 5 mm diameter and did not require any additional treatment.

Conclusion - Compared to standard angiography-assisted EVAR, IVUS-assisted EVAR significantly reduces renal load with contrast media as well as X-ray exposure time, while preserving the high efficiency of endovascular aneurysm repair. IVUS allows for precise device sizing and identification of critical vessel origins. Confirmation from large prospective studies with improved IVUS-Duplex probes is needed before IVUS-assisted EVAR could become a solo standard practice.

O-127 SUPRARENAL FIXATION IMPAIRS LONG TERM RENAL FUNCTION FOLLOWING ENDOVASCULAR ABDOMINAL AORTIC ANEURYSM REPAIR

ABDOMINAL AORTIC DISEASES

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Introduction - Several reports indicated that suprarenal fixation may impairs renal function after endovascular abdominal aortic aneurysm repair (EVAR). However, all are short-term or maximum 1-year observational studies, and therefore its long-term effects

on renal function remain unclear. This study aimed to identify predictors of long-term renal dysfunction after EVAR and to compare renal outcomes in patients after EVAR with supra- and infra-renal fixation.

Methods - Patients who underwent EVAR of non-ruptured infrarenal AAA between 2007 and 2014 were reviewed. Patients on hemodialysis preoperatively were excluded. Patient demographics, comorbidities, serum creatinine, estimated glomerular filtration rate (eGFR), operative details, and outcomes were compared using univariate analysis between those with and without severe renal function decline (RFD) (defined as eGFR decline >4ml/min/1.73m2 per year). Multivariable logistic regression identified independent predictors of severe RFD. The change of eGFR at 3 years were compared between the groups with supra- and infra-renal fixation

Results - We identified 450 patients who underwent EVAR during the study period. Of those, 311 patients were followed by laboratory test more than 1 year (median follow up duration: 4.5 years). 101 (32.5%), 77 (24.8%), 133 (42.8%) experienced mild (eGFR decline of 0 to 1 ml/min/1.73m2 per year), moderate (1 to 4 ml/min/1.73m2 per year), and severe RFD, respectively. Diabetes (odds ratio [OR], 2.14; 95% confidence interval [CI], 1.01-4.55) [p = .048] and suprarenal endograft fixation (OR, 1.83; 95% CI, 1.14-2.92) [p = .012] were statistically associated with severe RFD. At 3 years, eGFR significantly dropped in the groups underwent EVAR with suprarenal fixation (n=133) compared with infrarenal fixation (n=100) (p = .013).

Conclusion - This study suggests that EVAR with suprarenal fixation devices leads faster rate of decline and worse outcomes on renal function in the longer term (at 3 years) than previous studies.

O-128 THE VOLUMETRIC MORPHOLOGY OF INTRALUMINAL THROMBUS INFLUENCES TYPE II ENDOLEAK AFTER ENDOVASCULAR REPAIR OF ABDOMINAL AORTIC ANEURYSMS

ABDOMINAL AORTIC DISEASES

Author(s) - Zachary L. Whaley[*1], Ismail Cassimjee[2], Zdenek Novak[1], John Finney[2], David Rowland[2], Benjamin Pierce[1], Adam Beck[1], Ashok Handa[2], Regent Lee[2] and Oxford Abdominal Aortic Aneurysm Study (OxAAA)

Institution(s) - [1]Division of Vascular Surgery and Endovascular Therapy, University of Alabama at Birmingham, Birmingham, United States, [2]Nuffield Department of Surgical Sciences, University of Oxford, Headington, United Kingdom

Introduction - Type 2 endoleaks (T2E) after endovascular repair (EVAR) of abdominal aortic aneurysm (AAA) may lead to sac expansion or failure of sac regression, and often present as a management dilemma. Intraluminal thrombus (ILT) may influence the likelihood of endoleaks after EVAR and can be characterized using routine pre-operative imaging. We aimed to examine the relationship between preoperative volumetric morphology of ILT and the incidence of postoperative T2E.

Methods - All patients who underwent EVAR at John Radcliffe Hospital (Oxford, UK) were prospectively entered in a clinical database (Oxnet Janus). Triple phase (pre-contrast, arterial, venous) computerized tomography angiograms (CTAs) were performed as part of routine clinical care. The ILT morphology of each patient was determined using the pre-operative CTA. Thin cut arterial phase cross sectional images of the AAA were analysed according to the presence and morphology of thrombus in each quadrant (Figure 1-A). The overall ILT morphology was defined by measurements obtained over a 4cm segment of the AAA (2cm segments on each side of the CTA cut with the maximal anteroposterior diameter) (Figure 1-B). The diagnosis of T2E during EVAR surveillance was confirmed by CTAs, reported independently by radiologists, taking into consideration both the arterial and venous phase images. The relation between ILT morphology and T2E was assessed using logistic regression.

Results - Between September 2009 and July 2016, 271 patients underwent EVAR for infra-renal AAAs (male: 241, average age = 79±7). ILT was present in 265 (98%) of AAAs. Mean follow up was 1.9±1.6 years. T2E was observed in 77 cases during surveillance. 61% of T2E was observed within the 1 week of surgery. ILT morphology did not affect the timing of T2E onset. T2E was observed in 50% (3/6) of cases without ILT (no-ILT). Compared to no-ILT, the presence of circumferential or posterolateral ILTs was protective from T2E (odds ratio= 0.33 and 0.37, p=0.002 and p=0.047, respectively).

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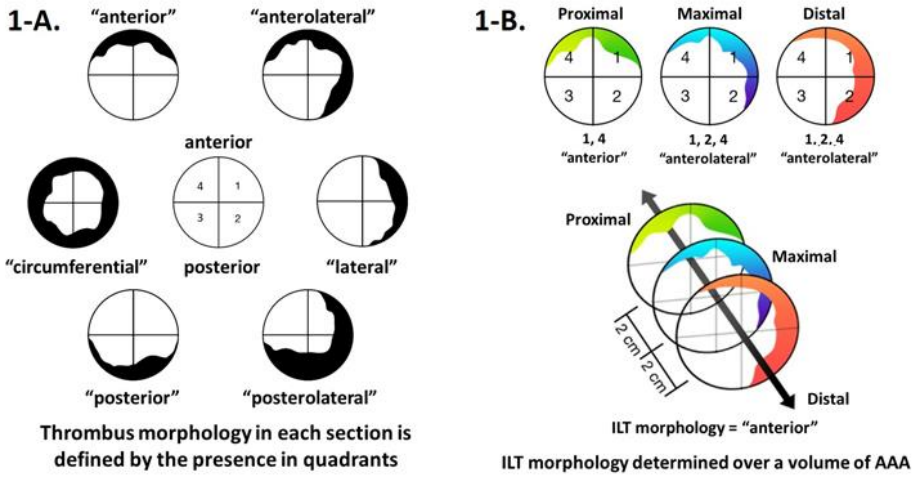

Conclusion - ILT morphology on routine pre-operative CTA imaging can be a biomarker for post EVAR T2Es. Importantly, ILTs that cover the posterolateral aspects of the lumen, or circumferential ILTs, are protective of T2Es. This information may be useful in the pre-operative planning of EVARs.

O-129 STENT MIGRATION FOLLOWING ENDOVASCULAR SEALING OF ABDOMINAL AORTIC ANEURYSMS

ABDOMINAL AORTIC DISEASES

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Introduction - We investigated the incidence and extent of stent migration after endovascular sealing of abdominal aortic aneurysms (EVAS), its relationship with adherence to the instructions for use of the Nellix endograft and its association with aneurysm growth.

Methods - In this retrospective single centre study, we reviewed clinical data and follow-up CT images of patients undergoing infra-renal EVAS with a minimum follow-up of 1 year. The first postoperative CT scan at one month and the subsequent scans were used to measure the distances between the proximal end of the stent and reference visceral vessels using a previously validated technique. Device migration was based on both the Society of Vascular Surgery definition of ≥10mm and a specific EVAS migration definition of ≥4mm. Patients were categorised according to adherence to the old (2013) or new (2016) Nellix IFU. Aneurysm diameter was measured for each scan and a change of ≥5mm was deemed indicative of aneurysm growth.

Results - Seventy-six patients were eligible for inclusion in our study. Over a 4-year period, migration ≥4mm occurred in 42 (55%) patients and migration of ≥10mm in 16 (21%), with similar incidence in right and left stents. Migration was significantly more frequent among patients whose anatomy did not conform to any IFU (p=0.025). Presence of aneurysm growth ≥5mm was significantly associated with migration ≥4mm (p=0.03).

Conclusion - Infra-renal EVAS is prone to migration, particularly when performed outside IFU. The definition of migration used for EVAR is inappropriate for EVAS; a new consensus on definition and measurement technique is necessary.

O-130 ABDOMINAL AORTIC ANEURYSM RUPTURE RISK PREDICTION BASED ON COMPUTER-AIDED VASCULAR WALL STRESS ASSESSMENT USING FINITE ELEMENT METHOD – THE FUTURE OF DECISION MAKING PROCESS

ABDOMINAL AORTIC DISEASES

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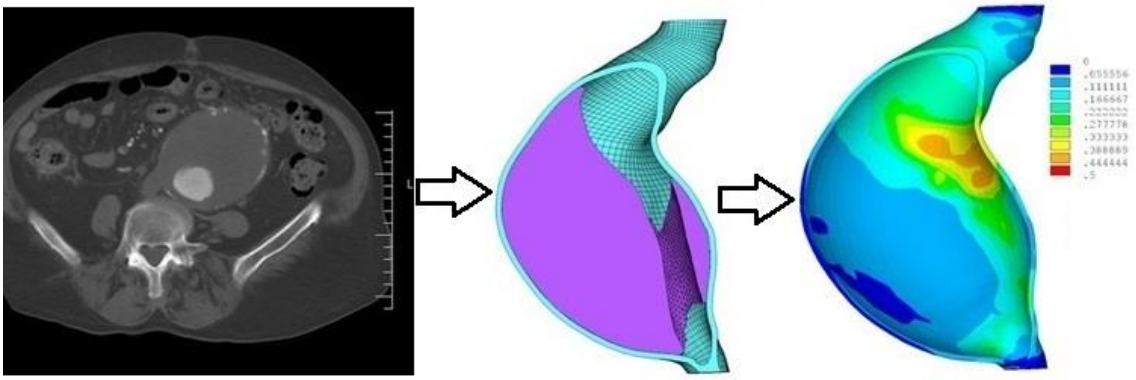
Introduction - Abdominal aortic aneurysm (AAA) is one of the most important conditions in vascular surgery[1]. Since in majority of cases AAA is asymptomatic often the first sign of AAA is its rupture with very high mortality, even when patient is urgently treated[2]. According the European guidelines[3] when an asymptomatic AAA is identified the next course is directed only by its maximal diameter – if it is more than 5.5 cm an intervention is indicated. Despite the guidelines the literature says that 10-24 % of ruptured AAAs is less than 5.5 cm in diameter (small AAA)[4]. Clinical goal of this work was to determine a number of small ruptured AAAs and identification of possible risk factors leading to rupture small AAAs. Main goal of the project was to create an auxiliary diagnostic tool for AAA rupture risk assessment using 3D computer-aided modeling of AAA with vascular wall stress analysis using finite element method[5] (FEM).

Methods - The portion of small ruptured AAA was assessed in our center between years 2009-2016 together with possible risk factor for small AAA rupture. In the experimental part we describe the FEM and its use in vascular wall stress assessment of AAA. 3D computer model of AAA is created from CT angiographic images and wall stress is assessed using FEM and afterwards rupture risk is derived. Data gathered from mechanical tests of AAA wall specimens[6] are used for making original mathematical more precise. This process was repeated with more than one hundred samples to get a model with the highest efficiency. Efficiency of the method was evaluated in blinded test confirming its ability to identify AAA with high risk of rupture (the set of CT images of both asymptomatic AAAs and ruptured AAAs from the time before the rupture was used).

Results - Out of 90 patients with AAA rupture there were 15 with small AAA (16.7 %). Risk factors for AAA rupture were tested in our patient population and compared with literature. Female gender was not confirmed as a risk factor for small AAA rupture (contrary to literature)[7], role of chronic obstructive pulmonary disease remains controversial and there was a significant correlation between number of ruptured AAA and the season of the year. Main outcome of the project is a functional diagnostic tool capable of AAA vascular stress analysis from CT findings and determination of rupture risk of particular AAA (Picture 1). Three criteria were compared according the efficiency and usefulness for clinical praxis (Peak Wall Rupture Risk, Probabilistic Rupture Risk Index and maximal diameter). Proving the Probabilistic Rupture Risk Index to be the best criterion according to efficiency and applicability. The discriminative powers of the predictors were 0.878, 0.859 and 0.789 respectively for PRRI, PWRR and the maximum diameter[8].

Image -



Conclusion - Portion of small ruptured AAA is clinically significant due to a high mortality of this condition. Current guidelines estimate the rupture risk based only on AAA diameter, but this criterion is not suitable for all AAA cases. Particular risk factors are describe in literature with controversial impact on AAA rupture risk, the same conclusion can be found in our patient population. New methods of vascular wall stress assessment using the 3D computer-aided modeling and FEM analysis have a strong potential to improve AAA rupture risk assessment and thus improve diagnostic and decision making process in clinical praxis.
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O-031 EFFECT OF REMOTE ISCHEMIC PRECONDITIONING ON THE INCIDENCE OF CONTRAST INDUCED NEPHROPATHY IN PATIENTS UNDERGOING EVAR (RIP-EVAR STUDY)

ABDOMINAL AORTIC DISEASES

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Introduction - Contrast induced nephropathy (CIN) is a major inconvenience when using iodinated contrast media (ICM) and associates significantly increased morbimortality and costs of hospitalization[1]. Remote ischemic preconditioning (RIP) is a non-invasive tissular protection technique believed to decrease renal insult produced by ICM[2,3]. The primary outcome of this study is to evaluate the impact of RIP on the incidence of CIN in patients undergoing EVAR.

Methods - Patients undergoing elective EVAR were recruited prior to receiving ICM and randomized into the control/RIP groups. Biochemical parameters determined renal function before and after surgery in immediate (24-72 hours) and at 30 days' follow-up.

Results - Of the 49 patients included in the study, 98% were male. Mean age was 73 years (range 56-87). Diabetes (22,4%) and chronic renal failure (30,6%) was present prior to administration of ICM. RIP was applied in 44,9% of the patients. 18,4% developed CIN despite renal protection strategies. RIP did not influence outcome in terms of incidence of CIN, seric creatinine, urea or estimated glomerular filtration (eFG) in immediate postoperative period. However, when ≥50ml of ICM were used, the group of RIP patients showed a statistically significant improvement in seric creatinine (1.02±0.3mg/dl vs 1.61±0.6mg/dl; p=0,027), urea (43.1±14.9mg/dl vs 69.25±30.8mg/dl; p=0,007) and eFG (74.23±18.3ml/min/1.73m2 vs 48.74±22.1ml/min/1.73m2; p=0,026) at 30 days follow-up.
Conclusions: In short-term follow-up, RIP seems to be an effective way of alleviating effects of ICM on the renal parenchyma in EVAR procedures in which more than 50ml of ICM are used. Larger studies should be conducted in order to consolidate these results.
Of the 49 patients included in the study, 98% were male. Mean age was 73 years (range 56-87). Diabetes (22,4%) and chronic renal failure (30,6%) was present prior to administration of ICM. RIP was applied in 44,9% of the patients. 18,4% developed CIN despite renal protection strategies. RIP did not influence outcome in terms of incidence of CIN, seric creatinine, urea or estimated glomerular filtration (eFG) in immediate postoperative period. However, when >50ml of ICM were used, the group of RIP patients showed a statistically significant improvement in seric creatinine (1.02+/-.3mg/dl vs 1.61+/-.6mg/dl; p=0,027), urea (43.1+/-14.9mg/dl vs 69.25+/-30.8mg/dl; p=0,007) and eFG (74.23+/-18.3ml/min/1.73m2 vs 48.74+/-22.1ml/min/1.73m2; p=0,026) at 30 days follow-up.

Conclusion - In short-term follow-up, RIP seems to be an effective way of alleviating effects of ICM on the renal parenchyma in EVAR procedures in which more than 50ml of ICM are used. Larger studies should be conducted in order to consolidate these results.

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O-132 NOVEL MARKERS OF RUPTURE IN SMALL ABDOMINAL AORTIC ANEURYSMS: SUPRA-RENAL AORTIC SIZE INDEX AND PEAK WALL RUPTURE INDEX

ABDOMINAL AORTIC DISEASES

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Introduction - Surveillance and treatment of abdominal aortic aneurysms (AAAs) is guided by repeated maximal diameter measurements (Dmax). The recommendation to treat men at 55mm is based on randomized controlled trials. Some small AAAs, however, are known to rupture and many AAAs may grow large without rupture. This indicates that Dmax alone may not be a sufficient rupture or growth predictor for AAAs. This study aims to investigate other possible factors that can predict an increased risk of rupture.

Methods All patients that presented to an emergency room within the Stockholm County Council 2009-2013 where a CT examination could be retrieved were include (n = 192). A cohort of small ruptured AAAs (rAAAs; Dmax ≤ 60 mm) was selected (n = 27, 14%), and these were matched 2:1 by Dmax, sex and age to intact AAAs (iAAAs). For these aneurysms morphology and finite element analysis-derived biomechanics were assessed.

Results - The mean Dmax for all rAAAs was 80.8 mm (SD = 18.9 mm, range 35.9-157.0 mm). Women had smaller Dmax at rupture (73.4 ± 18.4 vs 83.1 ± 18.5, p = 0.003). Women also had smaller neck diameters and iliac diameters compared to men. In analysis between small rAAAs and iAAAs, supra-renal aortic size index (14.8 ± 3.3 vs 13.0 ± 1.9, p = 0.024) and peak wall rupture index (PWRI, 0.35 ± 0.08 vs 0.43 ± 0.11, p = 0.015) was higher for rAAAs. Aortic Size index, peak wall stress or aneurysm volume did not differ.

Conclusion - Increased supra-renal aortic size index and PWRI are potential markers for rupture in small AAAs, and patients with these markers may benefit from increased attention and potentially early aneurysm repair.

O-133 IMPACT OF ABDOMINAL AORTIC ANEURYSM (AAA) REPAIR IN EUROPEAN AND NON-EUROPEAN COUNTRIES

ABDOMINAL AORTIC DISEASES

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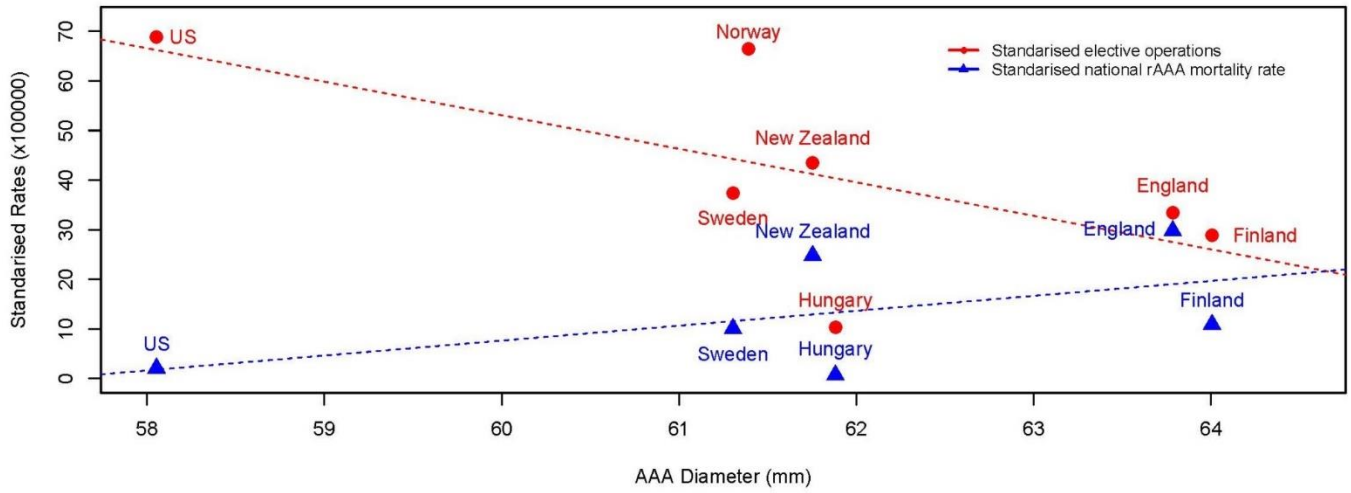
Introduction - Guidelines regarding the management of infrarenal aortic aneurysms recommend that intervention should be considered once the maximum diameter reaches 55 mm in men and 52 mm in women(1). However considerable international variation exists in clinical practice. The proportion of AAAs that are repaired at a diameter of less than 55 mm has been reported to range from 6.4 to 29.0% in various countries(2). This study aimed to analyse the current AAA practice in different European and non-European countries, to determine variation in threshold for AAA repair and its relation to aneurysm-related mortality.

Methods - Data on intact (iAAA) and ruptured AAA (rAAA) for the years 2010-2012 were collected from ten countries (Denmark, England, Finland, Germany, Hungary, Italy, New Zealand, Norway, Sweden, and USA) based on two sources:
The outcomes included an assessment of the relationship between the rate of iAAA repair per 100,000 inhabitants over 59 years old, AAA diameter at time of repair, and the national rates of rAAA.
Direct standardisation methods were applied to the national mortality data using the over 59 years-old English population in 2012 as a reference. Logistic regression models were applied based on frequency country data by 10-year age groups, sex and year. An ANOVA model was fitted to look at the differences in mean AAA diameter between countries, adjusted by age groups and gender.

Results - During the period 2010-2012 there was a variation in the mean threshold diameter of iAAA repair across the countries (range from 58mm in USA to 64mm in Finland). There was some evidence to suggest that in countries where the mean diameter of iAAA repair was closer to 55mm threshold, a higher rate of iAAA repair per 100,000 inhabitants above 59 years of age was carried out, however this did not reach statistical significance (p=0.18) [Figure 1]. With the exception of Hungary and Finland, there was some evidence to suggest that in countries where the mean diameter of iAAA repair was closer to 55mm threshold, lower rates of death from rAAA were observed, however this did not reach statistical significance (p=0.35) [Figure 1] [Table 1].

Country	AAA diameter (mm)	iAAA repair rate / 100,000	rAAA repair rate / 100,000	deaths from rAAA (national rate) / 100,000
USA	58	61.4	5.8	1.7
Sweden	61	37.5	9.7	10.1
Norway	61	66.5	13.1	
New Zealand	62	43.5	9.8	24.8
Hungary	62	10.4	2.7	0.7
England	64	33.5	16.9	29.8
Finland	64	29.0	7.9	10.9

Image -



Conclusion - Despite the recommended AAA diameter threshold of 55mm, considerable variation of mean AAA diameter was noted in the countries analysed. Variation between rates of iAAA repair, rAAA repair and death from rAAA exist amongst these countries. The analyses above are subject to selection bias due to registry-based analysis and differences in prevalence of disease in different countries. Furthermore, aneurysm-related mortality figures are highly uncertain, as post-mortem examinations are not performed routinely leading to potential misdiagnosis of the cause of death (3). Therefore, results need to be interpreted with caution.

Given this observation from real-world practices, further research is indicated to identify best practices of AAA repair, particularly with regard to threshold for surgery.

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O-134 ABDOMINAL AORTIC ANEURYSMS IN THE AGEING: OUTCOMES OF ANEURYSM SURVEILLANCE IN 85 YEAR OLDS

ABDOMINAL AORTIC DISEASES

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Introduction - By 2036 it is estimated that the number of people over the age of 85 years will double from present levels.[1] This will have a profound impact on the management of complex vascular pathologies, such as abdominal aortic aneurysms (AAA). Despite this, the evidence relating to AAA surveillance was performed on patients aged less than 80 years and subsequently there is a paucity of evidence relating to the continued surveillance of this cohort.[2] We aim to assess the outcomes of patients of 85 year olds who are under surveillance for small AAAs (3.0-5.5cm).

Methods - A single-centre, retrospective analysis of all patients, aged 85 or over, undergoing active surveillance of small AAAs between January 2007-January 2018. Patients were stratified into four groups according to AAA diameter (≤4.0, 4.0-4.5, 4.6-5.0, >5.0cm) at the age of 85 years (index scan), or older if first scan after this age. A comparison between the groups was performed to identify the rates of patients reaching threshold (≥5.5cm), subsequent management and mortality (ruptured AAA and other cause mortality). Follow-up was continued from index scan to death or 01/01/2018 (whichever sooner).

Results - 101 patients were identified (male=88) with a mean AAA diameter of 4.5cm (SD=0.92) at index scan. Mean follow-up was 1078 days (SD=739). 28 patients (27.7%) reached threshold size for repair, of which 8 (28.6%) underwent elective surgical repair. Of patients undergoing repair, 6(75%) had an AAA of >5cm at index scan. In patients with an AAA of <4.0cm at index, only 1 (3.4%) reached threshold and none underwent repair. Standard endovascular aneurysm repair was the modality of choice (62.5%). No patients underwent emergency repair. Comparison of outcomes between groups is shown in table 1. Overall mortality in the cohort was 26 (25.7%). Acute lower respiratory tract infection (42.3%) and cerebral vascular accident (23.1%) were the leading causes of death. Only 2 deaths occurred from ruptured AAAs (7.7%), both having an AAA of >5cm at index. No 30-day post-operative mortality was recorded.

Table 1 - Comparison of patients reaching threshold and undergoing repair

Aneurysm diameter at aged 85 (cm)	Total	Total reaching threshold (% total)	Surgical repair (% threshold)	Mortality - ruptured aneurysm (% total)
<4.0	29	1 (3.4)	0 (0.0)	0 (0.0)
4.0-4.5	26	4 (15.4)	1 (25.0)	0 (0.0)
4.6-5.0	17	1 (5.9)	1 (100)	0 (0.0)
>5.0	29	22 (75.9)	6 (27.3)	2 (6.9)

Conclusion - At the age of 85 years, it is very unlikely that patients with AAAs of <4cm will reach a threshold size for repair and discontinuation of surveillance can be considered. In our experience, the risk of death for a rupture in patients with AAAs 3.0-5.5cm at the age of 85 years remains relatively low and occurred only in patients with AAAs >5cm at index scan.

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O-135 RISK FACTORS OF POSTOPERATIVE INTESTINAL ISCHEMIA AFTER ABDOMINAL AORTIC ANEURYSM REPAIR

ABDOMINAL AORTIC DISEASES

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Introduction - Intestinal ischemia remains a complication following abdominal aortic aneurysm (AAA) repair associated with a high mortality.[1-6] The influence of possible risk factors for developing postoperative intestinal ischemia needs clarification. We sought to define predictors as well as the related mortality and to form a prediction model with the predictiors found.

Methods - A nationwide population-based cohort study of 9433 patients who underwent an AAA operation between 2014 and 2016 was conducted. Potential risk factors were determined by reviewing prior studies and univariate analysis. With logistic regression analysis independent predictors of intestinal ischemia were established. These variables were used to form a prediction model.

Results - Intestinal ischemia occurred in 267 patients (2.8%). Rupture of AAA was the most important predictor of developing intestinal ischemia (odds ratio [OR], 5.9, 95% confidence interval [CI]4.4-8.0), followed by having a suprarenal AAA (OR 3.4; CI 1.1-10.6). Associated procedural factors were open repair (OR 2.8; 95%CI 1.9-4.2), blood loss >1L (OR 3.6; 95%CI 1.7-7.5) and prolonged operating time (OR 2.0; 95%CI 1.4-2.8). Patient characteristics included having peripheral arterial disease (OR 2.4; 95%CI 1.3-4.4), female gender (OR 1.7; 95%CI 1.2-2.4), renal insufficiency (OR 1.7; 1.3-2.2) and pulmonary history (OR 1.6; 95%CI 1.2-2.2). Age <68 proved to be a protective factor (OR 0.5; 95%CI 0.4-0.8). Associated mortality was higher in patients with intestinal ischemia versus patients without (50.6% vs 5.1%, p<.001). A prediction model with an excellent AUC=0.878 (95% CI 0.860-0.896) could be formed.

Conclusion - The prediction model can be used to identify patients at high risk for developing intestinal ischemia and possibly lower the mortality risk.

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O-136 THE RESULTS OF ELECTIVE OPEN SURGICAL ANEURYSM REPAIR IN THE ERA OF EVAR; LESSONS LEARNED FROM THE DUTCH SURGICAL ANEURYSM AUDIT

ABDOMINAL AORTIC DISEASES

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Introduction - Endovascular aneurysm repair (EVAR) has become standard of care in the treatment of elective abdominal aortic aneurysms (AAA). There is even a decrease in postoperative mortality since the landmark trials to <1%. This is in contrast to elective open surgical repair (OSR) where mortality seems to increase. The questions arise: what causes this difference (decreased volume?) and how to improve the outcomes (better patient selection?) of OSR? The aim of our study was first to design a prediction model for postoperative mortality after elective OSR in the current Dutch population to support shared decision-making for OSR and to improve selection of patients for OSR. Secondly, the association of hospital volume of OSR and postoperative mortality was investigated.

Methods - All patients undergoing elective OSR for an abdominal aortic aneurysm (AAA) between 2013-2016 in the Netherlands and prospectively registered in the compulsory Dutch Surgical Aneurysm Audit (DSAA) were used. The primary outcome was postoperative mortality (30-days/in-hospital). A prediction model was performed through multivariable logistic regression with backward elimination at $p<0.10$. Al candidate predictors are shown in table 1. The discriminative ability of the model was quantified with the area under the curve (AUC) and internally validated through a bootstrapping procedure (500 iterations). Additionally, the association between hospital volume of OSR and postoperative mortality was evaluated with a multivariable logistic regression analysis, adjusted for patient characteristics.

Results - 2234 patients with AAA undergoing elective OSR were included. The overall postoperative mortality was 5.4% (n=121). Patient characteristics identified as predictors for postoperative mortality were: sex, age, maximal aneurysm diameter, pulmonary state, preoperative systolic blood pressure, preoperative hemoglobin and preoperative potassium (Table 1.). The discriminative ability was moderate (AUC 0.72; optimism corrected AUC 0.67). A mean hospital volume of >8 elective OSR per year was significantly associated with lower postoperative mortality (odds ratio 0.621, 95% confidence interval 0.404-0.955), compared to hospitals with a mean volume of ≤8/years.

Image -

Table 1. Prediction model for postoperative mortality in elective OSR.

	Beta	S.E.	P
Intercept	-4.960	1.435	0.001
Gender (Female)	0.518	0.228	0.023
Age (years)	0.051	0.015	0.001
Aneurysm diameter			
55-59 mm			
<55 mm	-0.653	0.318	0.039
60-64 mm	0.213	0.267	0.425
>65 mm	-0.014	0.247	0.953
Systolic blood pressure			
100-140mmHg			
Hypotension <100 mmHg	1.527	0.467	0.001
Hypertension >140mmHg	0.162	0.201	0.421
Preoperative Potassium			
Normal (3.5-5.0)			
Hypokalemia (<3.5)	0.417	0.508	0.412
Hyperkalemia (>5.0)	0.874	0.334	0.009
Preoperative hemoglobin			
Hemoglobin	-0.234	0.095	0.014
Pulmonary state			
No abnormalities			
Mild dyspnea	0.675	0.208	0.001
Severe dyspnea	0.601	0.458	0.189

Candidate predictors: gender, age, maximal aneurysm diameter, pulmonary state, cardiac state, results of last preoperative electrocardiogram, preoperative heart rate, preoperative systolic blood pressure and preoperative hemoglobin, preoperative sodium, preoperative potassium and preoperative creatinine

Conclusion - Our prediction model can serve as a decision-aid for selecting patients for elective OSR in the Dutch population. Especially in patients with a high age, female gender and pulmonary comorbidity the operative risk has to be balanced to the rupture risk. A minimum number of 9 OSR per year is associated with less postoperative mortality.

O-137 LONG TERM RESULTS AFTER ENDOVASCULAR AORTO-ILIAC REPAIR IN PATIENTS WITH ABDOMINAL AORTIC ANEURYSMS AND ECTATIC ILIAC ARTERIES

ABDOMINAL AORTIC DISEASES

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Introduction - Previous works have shown that endovascular aortic repair (EVAR) of abdominal aortic aneurysms (AAA) is durable, although complications requiring reinterventions contribute significantly to morbidity in the long-term. The present study investigates the long term results of EVAR in patients with AAA and ectatic common iliac arteries (CIAs).

Methods - Between 2000 and 2011, 475 patients underwent elective EVAR using the Zenith endograft (Cook Inc, Bloomington, Ind) at our institution. Data were retrieved from a prospective database, and analyzed retrospectively. Iliac branched devices (IBD), intraoperative conversions, or cases lacking information on preoperative iliac diameters were excluded from the present analysis. For the purposes of this study, two subgroups were defined, one including patients with at least one common iliac artery (CIA)

diameter ≥18 mm (CIA≥18); the other including patients with both CIA diameters < 18 mm (CIA<18). Primary outcomes were: incidence of late reinterventions and conversions, incidence of late EVAR failure, defined as a composite of late AAA-related death, AAA rupture, AAA growth >5 mm, and any reintervention or conversion. Secondary outcomes were incidence of AAA-related death and overall survival.

Results - Mean age was 73 years (range 48-94); and 442 (93.1%) patients were male. Of the 475 patients, 228 (60.6%) had a CIA diameter <18 mm, and 187 (39.3%) ≥18 mm. CIA ≥18 patients showed higher incidence of preoperative cardiac, pulmonary and renal disease. In the CIA≥18 vs CIA<18 group the need of distal iliac endograft extensions was significantly higher (n = 18, 9.6% vs n = 5, 1.7%, p = .001).
After a mean follow-up of 68 months (range 0 to 175 months), there were 60 late EVAR failures, of which 25 (17.0%) in the CIA≥18 group, and 35 (10.7%) in the CIA<18 group, all leading to reintervention or conversion (p=0.09). Overall, freedom from reinterventions and EVAR failure, estimated by Kaplan-Meier (K-M) analysis, was 98.5±.6 at 12 months, 88.5±1.7 at 60 months, 79.3±3.2 at 120 months, and 73.2±5.3 at 156 months. At K-M analysis, in the CIA>18 group there was a significantly higher incidence of EVAR failure and late reinterventions and conversions (p = .034) compared to patients in the CIA≤18 group.
According to lower incidence of preoperative comorbidities, overall survival was higher in patients with smaller CIA diameters.
Multivariate analysis confirmed that CIA diameter ≥18 mm was a major risk factor for late reinterventions and EVAR failure, even after adjustment for age, sex, graft related endoleak, basal AAA diameter, proximal neck diameter and neck length.

Conclusion - Our data show that patient with ectatic iliac arteries (>18 mm) have a significantly higher long-term risk of iliac-related complications, endoleak and reinterventions, as compared to patients with iliac arteries < 18 mm. These findings should prompt alternative surgical strategies and search for more stable endovascular iliac fixation zones in patients with larger iliacs and long life expectancy

O-138 ENDOVASCULAR ABDOMINAL AORTIC ANEURYSM REPAIR IN PATIENTS WITH MARFAN SYNDROME

ABDOMINAL AORTIC DISEASES

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Introduction - Patients with Marfan syndrome (MFS) are at risk for aortic degeneration which can lead to dissection, aneurysm and rupture. Repair is traditionally performed with open surgical techniques as this is deemed more durable. Endovascular aneurysm repair (EVAR) remains controversial given the underlying connective tissue disorder. We report on the largest series to date on outcomes of MFS patients with abdominal aortic aneurysms (AAA) undergoing EVAR.

Methods - The Vascular Quality Initiative registry identified 35,889 patients, including 29 with MFS, treated with EVAR from January 2003 to December 2017. We analyzed EVAR outcomes in this cohort per the Society for Vascular Surgery reporting standards.

Results - Median age was 70.0 years (interquartile range [IQR], 57.0-75.0 years), and 22 (75.9%) were male. Median aneurysm diameter was 5.3cm (IQR, 4.9-6.3cm), with an aortic neck diameter and length of 2.0cm (IQR, 1.6-2.8cm) and 2.5cm (IQR, 2.1-2.7cm) respectively. Twenty-one (72.4%) patients were asymptomatic, seven (24.1%) were symptomatic, and one (3.4%) presented with rupture. Ten (34.5%) patients had prior aortic surgery, including one open AAA, three open thoracic aneurysm, four TEVARs, and three thoracoabdominal aortic aneurysm repairs. Six (20.7%) were deemed unfit for open surgical repair. Length of stay was 2.0 days (IQR, 1.0-3.0 days). Percutaneous femoral access was performed in 15 (51.7%) patients, with no complications of hematoma or thrombosis. Fluoroscopy time was 21.4 minutes (IQR, 15.4-33.8 minutes). A type IA endoleak was present in one (3.4 %), type IB endoleak in one (3.4%), and type II endoleak in two (6.9%) patients. There were no postoperative pulmonary, cardiac or neurological complications. In-hospital mortality occurred in one (3.4%) patient who presented with a rupture and had been deemed unfit for an open repair. A conversion to open repair was required. The patient expired on post-operative day 0. There were no other conversions to open repair. Re-intervention was required in two (6.9%) patients. Early clinical success was achieved in 26 (89.7%) patients. Follow-up was available for 15 (51.7%) patients at a median time of 766 days (IQR, 653-937 days).

Median change in sac diameter was -0.6cm (IQR, -1.1 to -0.2cm). On follow up imaging, there were no Type I or Type III endoleaks. One (6.7%) patient had a Type II endoleak. There were no reinterventions performed, and no mortalities during follow-up.

Conclusion - EVAR for patients with MFS is feasible, and can be performed safely with excellent short-term results. Mid-term outcomes suggest this technique is durable, however more robust long-term follow-up is needed.

O-139 LONG-TERM OUTCOMES OF ELECTIVE ENDOVASCULAR REPAIR OF ASYMPTOMATIC INFRARENAL AORTIC ANEURYSMS WITH THE ZENITH STENTGRAFT

ABDOMINAL AORTIC DISEASES

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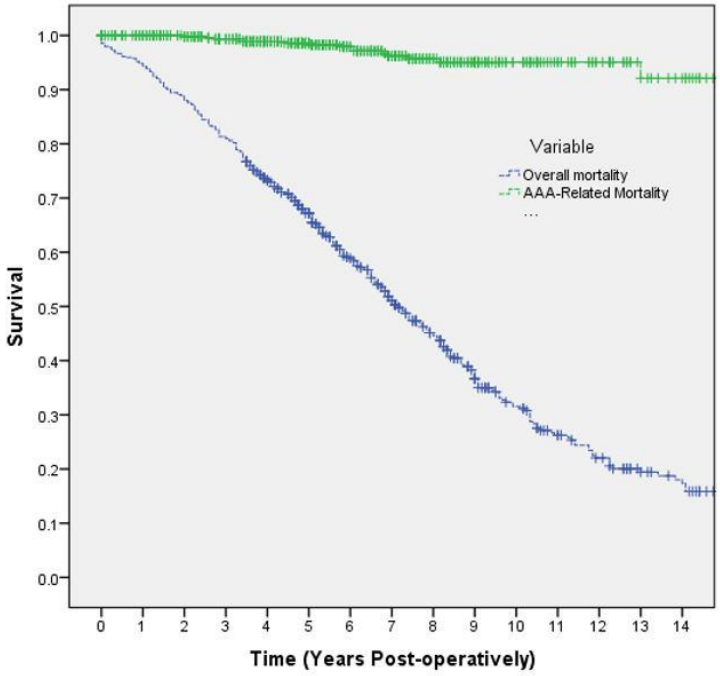
Introduction - The long-term durability of infrarenal EVAR has been questioned. However, the results for currently available stentgrafts are scarce. The aim of this study was to assess the long-term results of elective AAA repair with Cook-Zenith™ stentgraft.

Methods - Patients undergoing elective, infrarenal EVAR with the Cook-Zenith™ stentgraft system between 1998 and 2012 were analysed retrospectively registering pre-, intra-, and postoperative data. Instructions for use (IFU) were defined as neck diameter < 32 mm and length > 15 mm, and measured when image quality was sufficient. All available post-operative imaging, was reviewed by one observer including abdominal CTs done for reasons other than EVAR follow-up. Clinical success was defined according to the reporting standards. Data is presented as median and interquartile range when not stated otherwise. Life tables were used to estimate survival, clinical success and freedom from endoleaks during follow-up

Results - Five-hundred forty-one patients were included (474 male and 74 (69 – 79) years). Technical success was achieved in 521 (96.3 %) patients. Eight (1.5 %) patients died peri-operatively. Median survival was 7.17 ± 0.33 years and Median imaging follow-up duration was 4.92 (2.92 – 6.75) years. Reinterventions were necessary in 109 (20.1 %) patients (164 reinterventions) mainly to correct iliac limb issues (88 reinterventions, 53.7 %). The freedom from reintervention was 75 ± 2 % at 10-years post-operatively. Secondary Clinical success was up to 75 ± 3 % 10-years postoperatively. Late secondary clinical failure occurred in 69 (12.7 %) patients, mainly related to the proximal sealing zone (19 patients; 27.5 %). Most of the late failures (55.1 %) occurred in patients that were either unfit (34 patients) or refused (4 patients) re-interventions. Sixteen patients (3.0 %) had late AAA-related deaths. Freedom from late AAA-related death was 95 ± 1 % at 10 years post-operatively (Figure 1). Open conversion was needed in 5 (0.9 %) patients 2.67 (2.67 –3.50) years after EVAR. No conversions have been necessary since year 2008. Being within IFU conferred higher clinical success and freedom from type I/III endoleaks ($p < 0.001$) and freedom from AAA-related death rates ($p = 0.003$).

Image -



Year	0	1	3	5	10	15
Nrs at risk-Overall	541	513	430	302	77	11
Nrs at risk-AAA related	541	497	411	285	71	11

Conclusion - Elective EVAR of asymptomatic infrarenal AAA with Cook-Zenith™ stentgrafts has sustainable long-term results, especially when the aneurysm neck anatomy is favorable. AAA-Rupture, AAA-related death and conversion to open repair are very rare events during the follow-up, while late overall survival is low. The majority of the patients with persistent failures were either unfit or refused re-interventions. Good patient selection and further technical improvements may reduce the need for adjunctive procedures and improve further the long-term results.

O-140 AORTOILIAC ANEURYSM ROBOTIC REPAIR - A LESS INVASIVE ALTERNATIVE TO THE OPEN TECHNIQUE: EARLY EXPERIENCE ABOUT 46 CASES

ABDOMINAL AORTIC DISEASES

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Introduction - Endovascular repair of aortoiliac aneurysms (AAA) carries low postoperative morbidity but is associated with a high reintervention rate, while open repair despite its invasiveness, presents with a low risk of reintervention, and still remains, the option of choice for young and fit patients. Total robotic technique is presented as a less invasive approach with long-term results mimicking those of open repair. The aim of this study was to assess the outcomes of patients with AAA undergoing total robotic repair and the learning curve related to this innovative technique.

Methods - From 2012 to 2017, all patients with an AAA receiving a total robotic repair were entered in a prospective study. AAA exposure, control, opening of the AAA, and aorto-iliac reconstruction were performed with the Da Vinci robotic system. Technical

success was defined as a patent graft without conversion to open repair. Primary outcomes were survival, primary and secondary patency, and reintervention rates at 4 years. Secondary outcomes were 30 days morbidity-mortality and length of hospital stay. Results of the first operated patients (Group A: 23 cases) were compared to the later one (Group B: 23 cases) in order to evaluate the learning curve of the total robotic repair.

Results - From 2012 to 2017, 46 patients (44 males and 2 females, median age: 67 years; median BMI: 27) underwent total robotic repair including 24 aorto-aortic bypasses, 22 aorto-bi-iliac bypasses with two reconstructions using hybrid stents for associated aneurysms of the hypogastric arteries. Technical success was 92% (n=42). Four conversions occurred, two for bleeding, one for iliac dissection due to a laparoscopic clamp, and one due to failure of the laparoscopic insufflator. Median total operative time was 309 minutes. Median clamping time was 138 minutes. Median hospital stay was 7 days. Thirty-day mortality was nil. Thirty-day morbidity was 13% including three reinterventions for hemostasis, one for colon necrosis, one for urinoma, and one for acute limb ischemia. Thirty-day morbidity was higher but not significantly different in group A, compared to group B (17% vs 8%, p=.66). Mean follow-up was 26 months. Four-year survival rate was 100%; primary and secondary patency were 97.7% and 100% respectively. Total median operative time was not significantly different in the early and late groups (321 minutes in group A vs. 292 minutes in group B, Mann-Whitney test, p=.07). Median clamping time was also comparable in both groups with 137 minutes in group A vs. 124 minutes in group B, p=.90), but with more challenging procedures in Group B than in Group A.

Conclusion - These preliminary results show that total robotic repair of AAA appears to be safe with the advantages of a less invasive approach and the durability of the open technique. The learning curve does not show a significant difference between both groups but there is a trend for improvement in group B despite the more challenging procedures. In hands of surgeons already trained in aortic procedures, robotic surgery is a feasible technique.

O-141 COST-EFFECTIVENESS ANALYSIS OF A RANDOMIZED CONTROLLED TRIAL (SUPER): ENDOVASCULAR REVASCULARIZATION OR SUPERVISED EXERCISE THERAPY FOR INTERMITTENT CLAUDICATION DUE TO ILIAC ARTERY OBSTRUCTION

ABDOMINAL AORTIC DISEASES

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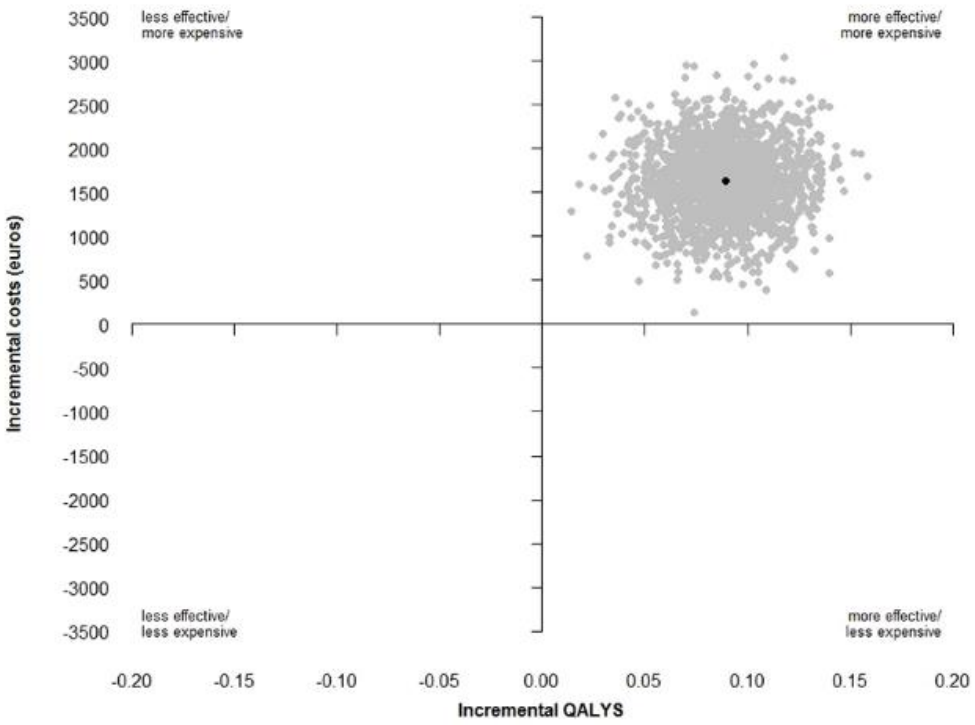
Introduction - Treatment of intermittent claudication (IC) is aimed at reducing pain, increasing walking distance and improving quality of life. Current guidelines advise supervised exercise therapy (SET) as primary treatment of IC. The role of percutaneous transluminal angioplasty (PTA) as primary treatment for iliac artery obstruction remains ambiguous. The aim of this study was to compare cost-effectiveness of PTA and SET as primary treatment for IC during 12 months of follow up.

Methods - Cost-effectiveness analysis of a multicentre randomized controlled trial (SUPER) which compared the effectiveness of PTA and SET as primary treatment of IC due to iliac artery obstruction. Patients were included between November 2010 and May 2015 and had a follow-up of 12 months. Health status was measured using the EQ-5D-3L, and the incremental costs were determined per allocated treatment and additional usage of health care during 12 months of follow-up. The effectiveness of treatment was determined in Quality-adjusted Life Years (QALY's) and the difference between treatment groups was calculated by the incremental-cost-utility ratio (ICR).

Results - A total of 240 patients were included. Complete follow-up of 12 months was available in 206 patients, of whom 115 patients were allocated to PTA while 95 were allocated to SET. Mean EQ-5D-3L during the 12 months of follow-up for patients treated with PTA was 0.837 (95% CI 0.801 – 0.872), and 0.774 (95% CI 0.733 - 0.814) for patients treated with SET. The mean costs during 12 months for PTA was €4005 and €2375 for SET. The mean difference in cost between treatments was €1630 (95% CI 830 - 2454). The QALY's for the treatment groups during follow up were 0.82 for PTA and 0.73 for SET, the difference between treatment groups was 0.09 (95% CI 0.04 – 0.13). De ICR per QALY was €18312 (95% CI 8689 - 39734).

Image -



Conclusion - PTA resulted in a slightly better health outcome and higher QALY's during 12 months after primary treatment. Although these differences were statistically significant, the clinical relevance must be discussed due to the small differences and relatively high cost of PTA as primary treatment.

O-142 HIGH ON-TREATMENT PLATELET REACTIVITY AND LOW PLATELET RESPONSE TO ASPIRIN IN PATIENTS WITH PERIPHERAL ARTERIAL DISEASE UNDERGOING PERCUTANEOUS TRANSLUMINAL ANGIOPLASTY OF THE ARTERIES OF THE LOWER LIMBS

PERIPHERAL ARTERIAL DISEASE

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Introduction - Patients with peripheral arterial disease (PAD) following peripheral percutaneous transluminal angioplasty (PTA) are prone to complications following the procedure, including stent thrombosis and arterial thrombosis, despite treatment with aspirin. High on-treatment platelet reactivity to aspirin is associated with increased risk of ischemic events and other vascular complications in patients following coronary interventions or PTA. We sought to assess platelet responsiveness to aspirin in patients with PAD following PTA of the arteries of lower limbs.

Methods - 140 patents with PAD undergoing PTA of the arteries of the lower limbs were included in the study. 29 patients (group 1) were not treated with aspirin therapy prior to the admission and all 29 of them started aspirin treatment (75mg per day) on the day of admission. 111 patients (group 2) were treated with aspirin therapy prior to the admission and the treatment was continued during the study period. Two blood samples were collected from each of the patient in both groups (1 and 2) included in the study:

one sample on the day of admission to the hospital, and the second sample one week (7 days) after the first blood collection respectively. We assessed platelet activation pathways involving the arachidonic acid receptor (ASPI). ASPI-tests using multiple electrode aggregometry (MEA) were performed in all blood samples collected in the study. 'Low responders' were patients with an ASPI-test value greater than or equal to a pre-established normal range.

Results - ASPI levels in blood samples obtained on the day of admission were between 61 and 1837 (mean 771). Among the patients, who started aspirin treatment on the day of admission (group 1), ASPI levels were from 244 to 1357 (mean 1002) on the day of admission. After a week on aspirin treatment, ASPI levels among them were from 33 to 1057 (mean 368). Therefore, significant ($p<0,05$) decrease of ASPI levels after a week from the beginning of aspirin treatment was observed. (mean ASPI decrease from 1002 to 368 (= of 634)). There were 3 'low responders' among the patients in group 1 - ASPI levels on the 7th day from admission: 828, 856 and 1057. ASPI levels on the day of admission among them were: 1267, 1306 and 1188, and there were one of the highest ASPI levels obtained in the whole study. Among the patients in group 2 (patients treated with aspirin therapy prior to the admission), changes in ASPI levels were not statistically significant (however, both increases and decreases in ASPI levels were observed between 1st and 7th day of the study). Moreover, the assessment of ASPI levels prior to the beginning of aspirin intake among patients in group 2, including 'low responders', was not possible, while all of the patients in that group were treated with aspirin therapy prior to the first blood sample collection.

Conclusion - High on-treatment platelet reactivity and low platelet response to aspirin in patients with peripheral arterial disease (PAD) following peripheral percutaneous transluminal angioplasty (PTA) of the arteries of the lower limbs may be the result of their platelets' high reactivity in general. Greater doses of aspirin or other antiplatelet drugs may be required for these patients to avoid postoperative complications.

O-143 EXPERIMENTAL MODEL TO ASSESS THE EFFICACY AND SAFETY OF VESSEL SEALING DEVICES IN BY-PASS SURGERY

PERIPHERAL ARTERIAL DISEASE

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Introduction - Energy sealing devices achieve hemostasis of blood vessels through sequential coagulation and tissue transection. The most frequently used ones are: Electrothermal Bipolar Tissue Sealing System (EB) and Harmonic Scalpel (HS). Both methods are based on denaturation and fusion of proteins of the vessel wall (mainly collagen and elastin) by controlled delivery of energy: electrothermal by radiofrequency and impedance feed-back (EB) or high frequency ultrasound vibration (HS). Although its use has been widely spread in multiple surgical fields, most vascular surgeons are not confident enough about its safety for sealing collaterals of autologous grafts during by-pass surgery.
The aim of this study was to compare the efficacy and safety of EB and HS with conventional vessel ligation of saphenous vein (SV) collaterals in an experimental model.

Methods - Twenty-five fragments of SV were extracted from cadaver donor (n=6) or from residual fragments during amputation or lower limb revascularization procedures (n=19). To simulate physiological conditions, a pulsatile flow circuit was performed with a roller pump, and intravascular pressure was recorded by a pressure gauge and a pressure monitor. In each fragment, two venous collateral seals were made, one by conventional ligation with 3/0 silk (control) and the other one with EB (N= 13) or HS (N= 12), after sequentially consecutive assignment. Each venous fragment was then incorporated into the pulsatile flow circuit, and the pressure was progressively increased until 300 mmHg (supraphysiological) was reached, or until sealing breakage occurred. Collateral vein diameter, burst pressures, and leakage points were recorded. A histological study with hematoxylin-eosin and Masson's trichrome stain was also performed for each energy-sealing device. A descriptive analysis and analytical statistical tests (U-Mann Whitney, Chi-square) were performed.

Results - The mean diameter of the venous collaterals was 2.42±0.7mm and 2.38±0.6 mm, p = NS, for EB and HS, respectively. The mean burst pressure was slightly higher for EB than for HS (788.9±455.0 mmHg vs 602.5±363.1 mmHg, p = 0.268). In only

one case (HS) the outbreak occurred in the sealing zone at pressures below 300 mmHg. In all cases for EB, the rupture occurred at supraphysiological pressures.The leakage point for HS occurred in sealed collateral in all cases (12/12). For EB, the leakage point occurred in its sealing zone in 8 of 13 fragments, and in the conventional ligation (control), in the remaining 5 fragments (p=0.016). The histological study showed no differences in the tissues coagulated by both devices.

Conclusion - Vessel sealing devices are as effective and safe for the hemostasis of saphenous vein collaterals as conventional ligation. These devices may be useful given their fast sealing time and easy handling during surgical venous graft preparation for lower limb revascularization. In our study, the EB showed greater strength in the sealing of saphenous vein collaterals compared to HS, however the outbreak occurred at supraphysiological pressures, so this fact may not have clinical relevance.

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O-144 RISK FACTORS FOR IN-HOSPITAL MORTALITY FOLLOWING MAJOR LOWER LIMB AMPUTATION: ANALYSIS OF 10,000 PATIENTS' DATA FROM THE UK NATIONAL VASCULAR REGISTRY

PERIPHERAL ARTERIAL DISEASE

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Introduction - Major lower limb amputation is the highest-risk lower limb procedure in Vascular Surgery, with in-hospital mortality rates in the UK reported to be 8.3%. Despite this, little high-quality work has been done to look at the modifiable factors which contribute to mortality risk in these patients. The aim of this project was to identify the key independent risk factors for peri-operative morbidity and mortality, and to develop reliable models for estimation of peri-operative risk.

Methods - All patients undergoing major lower limb amputation (defined as amputation above the ankle joint) who were entered into the UK National Vascular Registry from January 2014 until December 2016 were included. Missing data were handled using rigorous multiple imputation methodology. Models were developed to evaluate independent risk factors for adverse outcomes using logistic regression modelling, minimising the Bayesian information criterion to balance complexity and model fit. The project was granted full ethical approval by Wales REC 3 reference number 16/WA/0353.

Results - There were 12,593 amputations entered into the registry during the study period, of which 9549 were above the ankle joint. Of these 4516 (47%) were trans-tibial, 4369 (46%) trans-femoral, 442 (5%) through-knee, 32 (0.3%) hip disarticulation and 190 (2%) were bilateral procedures. Overall, 865 patients (9.1%) died before leaving hospital. Regression modelling revealed that independent factors associated with in-hospital mortality were emergency admission (Odds Ratio (OR) 2.47, 95% Confidence Interval (C.I.) 1.89-3.24), bilateral operation (OR 2.19, 95% C.I. 1.48-3.25), age (OR per 10 year increase 1.21, 95% C.I. 1.13-1.29), ASA grade (OR per unit increase 2.60, 95% C.I. 2.27-2.98), abnormal ECG (OR 1.52, 95% C.I. 1.28-1.79), and increased white blood cell count(OR per 10^9 cells/L increase 1.02, 95% C.I. 1.01-1.03) or serum creatinine (OR per 10 µmol/L increase 1.02, 95% C.I. 1.02-1.03).
Independent protective factors included trans-tibial operation (OR 0.61, 95% C.I. 0.52-0.72), increased serum albumin (OR per g/L increase 0.97, 95% C.I. 0.95-0.98), previous procedures to the amputated limb (OR 0.79, 95% C.I. 0.68-0.92), and increased

patient weight (OR per 10kg increase 0.95, 95% C.I. 0.91-0.99). A multivariate model for risk incorporating these factors had good discrimination (area under ROC curve 0.79, 95% C.I. 0.77-0.80).
There was also a high rate of morbidity in the cohort, with 6.6%, 9.7% and 4.3% of patients suffering cardiac, respiratory and renal complications respectively. The model for mortality was also predictive of morbidity outcomes (area under ROC curve 0.74, 0.69 and 0.74 respectively).

Conclusion - Morbidity and mortality after major lower limb amputation remain high, but modelling has revealed potentially modifiable factors. We have also developed accurate predictive models to aid patient counselling prior to surgery. Prior procedures to the amputated limb and below knee operations appear to have a protective role, implying that proximal revascularisation to facilitate healing at the below knee level may be a worthwhile strategy. Increased patient weight and serum albumin have similar, though smaller, protective effects, reinforcing the importance of nutrition in this patient population.

O-145 ANTIPLATELET THERAPY IN PERIPHERAL ARTERIAL DISEASE: AN UMBRELLA REVIEW AND META-ANALYSIS OF PREVENTATIVE AND TREATMENT OUTCOMES

PERIPHERAL ARTERIAL DISEASE

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Introduction - Antiplatelet therapy is recommended for all patients with peripheral vascular disease. Meta-analyses and guidelines have come to different conclusions about the comparative benefit of different antiplatelet or anticoagulant regimes. This is due to incomplete inclusion of the available literature and a focus on a small group of specific outcomes or antiplatelet therapies. We performed an Umbrella review to provide a comparison of published outcomes and a critical appraisal of effect sizes of all antiplatelet therapy outcomes in peripheral arterial disease. The review aimed to quantify the relative strengths of the literature and identify areas for future research.

Methods - MEDLINE, EMBASE, DARE, PROSPERO and Cochrane databases were searched for meta-analyses involving patients with peripheral arterial disease on any antiplatelet therapy for any treatment outcome. Reference lists of included studies were also hand searched. The AMSTAR tool was used to assess the quality of included meta-analyses. Individual study data were extracted and re-analysed using random effects models, with meta-regression performed where significant between-study variability persisted.

Results - The search identified 94 eligible meta-analyses, of which 27 provided unique trial data. Data were extracted from 126 individual studies recruiting 73,767 patients on 18 different outcomes including all-cause mortality, total cardiovascular events, amputation rates and major bleeding, as well as bypass and endovascular intervention patency rates at multiple time points. In total there were 41 different antiplatelet comparisons.
While there was a trend towards benefit for secondary prevention of total cardiovascular events (55 studies, 24428 patients, relative risk (RR) = 0.91, 95% confidence interval (C.I.) 0.82-1.00, P=0.05), there was also significant harm in terms of major bleeding events (46 studies, 21839 patients, RR 1.35, 95% C.I. 1.08-1.69, P=0.01). The same was true of comparisons of dual versus single antiplatelet therapy: 9 studies, 19517 patients for total cardiovascular events, RR 0.89, 95% C.I. 0.78-1.01, P=0.07; 7 studies, 20914 patients for major bleeding, RR 1.35, 95% C.I. 1.05-1.75, P=0.02.
Benefit for single antiplatelet therapy vs. placebo/nothing was clearer for 12 month graft patency in patients undergoing bypass surgery (7 studies, 1195 patients, RR 0.56, 95% C.I. 0.38-0.83, P=0.003). Patients with vein bypasses benefited even more from anticoagulation over antiplatelet therapy (2 studies, 1637 patients, RR 1.45, 95% C.I. 1.15-1.83, P=0.002), whereas patients with prosthetic bypasses and those treated endovascularly were worse off with anticoagulation over antiplatelet therapy (RR 0.81, 95% C.I. 0.67-0.98, P=0.03 for prosthetic bypass, RR 0.74, 95% C.I. 0.57-0.96, P=0.03 for endovascular therapy).

Conclusion - The literature on antiplatelet therapy in peripheral arterial disease is extensive but highly heterogeneous. There is a lack of clear benefit for antiplatelet therapy and some evidence of harm for patients treated for secondary cardiovascular prevention. Antiplatelet therapy is more beneficial for maintaining patency in patients undergoing intervention, though patients

undergoing bypass surgery with a vein conduit benefit more from anticoagulation. There remains a need for further high quality studies to clarify the benefits of antiplatelet agents in specific cohorts.

O-146 GENETIC VARIANTS IN SELENOPROTEIN GENES SELENOS, GPX4, AND SEPP1, BUT NOT SELENOPROTEIN LEVELS, ARE ASSOCIATED WITH THE DEVELOPMENT OF PERIPHERAL ARTERY DISEASE AND THE INTER-INDIVIDUAL VARIATION IN THE ANKLE-BRACHIAL INDEX

PERIPHERAL ARTERIAL DISEASE

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Introduction - Selenium (Se) is an essential micronutrient with important functions in human health and relevance to several pathophysiological conditions. The biological effects of Se are largely mediated by Se-containing proteins, referred to as selenoproteins. To date, a total of 25 selenoproteins have been identified in humans. The concentration of selenoproteins has been documented to correlate with a range of inflammatory markers and glucose homeostasis, which suggests their role in the pathogenesis of atherosclerotic peripheral arterial disease (PAD). In this study we analyze the relationships of single nucleotide polymorphisms (SNPs) in *SEPP1, SELENOS, TXNRD1, TXNRD2, GPX4,* and *SOD2* genes as well as selenoprotein P (SeP) and thioredoxin (Trx) concentrations with the development of PAD and the values of ankle-brachial pressure index (ABI), a noninvasive marker of this disease.

Methods - The two study samples were evaluated: 503 PAD patients and 594 controls in the discovery phase, and 408 PAD patients and 933 controls in the replication phase. All individuals were of Caucasian origin. SNPs were ascertained using pre-designed TaqMan SNP assays, and plasma selenoprotein levels with the ELISA immunoassay method. The main effects of each SNP and SNP-covariate interactions were assessed.

Results - The *SELENOS rs34713741T* (recessive model: OR=1.49, 95%CI: 1.01-2.18, *P*=.043) and *GPX4 rs713041T* (dominant model: OR=1.31, 95%CI: 1.02-1.68; *P*=.035) alleles were associated with PAD, with a stronger effect in type 2 diabetes mellitus (T2DM; respective ORs: 2.77 95%CI: 1.00-7.68, *P*=.043 and 2.05, 95%CI: 1.19-3.53; *P*=.009). T2DM was related to 2.09-fold (95%CI: 1.56-2.78; *P*<.0001) increase in PAD risk. The association of the *GPX4* SNP with PAD was confirmed in both a replication (*P*=.049) and a combined analysis (the discovery plus replication samples; *P*=.002), while the *SELENOS* SNP in a combined analysis only (*P*=.039). The influence of these SNPs on PAD risk suggested SNP-T2DM interaction (*SELENOS x* T2DM: $OR_{Observed}$=5.47 > $OR_{Expected}$=2.32; *GPX4* x T2DM: $OR_{Observed}$ =2.87 > $OR_{Expected}$= 1.53). The simultaneous presence of both risk genotypes with T2DM resulted in a 9.71-fold increase in PAD risk (95% CI: 2.21-42.45; *P*=.0002). Additionally, the *SEPP1 rs7579A* allele was associated with the presence of T2DM in PAD. All these associations, were independent of the influence of conventional cardiovascular risk factors distribution, except for the influence of *GPX4* SNP on PAD, as this effect became nonsignificant after adjustment for T2DM. The *SELENOS rs34713741T* and *SEPP1 rs7579A* alleles, were the independent predictors of ABI in PAD in a multivariable analysis (allele dose: β= - 0.250, *P*=.003 and β= - 0.232, *P*=.006, respectively), explaining a total of 12.4% of the inter-individual variation in ABI. SeP concentration was decreased in T2DM (5.20 ±2.45 mg/ml, N=50 vs 3.99 ±2.51 mg/ml, N=26; *P*=.049), while being positively correlated with blood cholesterol levels, especially HDLC (*r*= 0.422, *P*=.0001).

Conclusion - We found a link between the SeP levels and the occurrence of a more favorable profile of cardiometabolic risk factors in PAD. The *SELENOS, SEPP1* SNPs contributed to the inter-individual variation in ABI, while the *SELENOS, GPX4, SEPP1* SNPs were associated with PAD related to T2DM. These results confirmed the complex genetic architecture of PAD and ABI, in which candidate gene SNP main effects and SNP-covariate interactions contribute to the risk.

O-147 PERIPHERAL ARTERIAL DISEASE STILL IN THE PERIPHERY: OUTCOME AND TREATMENT PRACTICE FOR PATIENTS WITH PERIPHERAL ARTERIAL DISEASE AND MYOCARDIAL INFARCTION ACCORDING TO SWEDISH NATIONWIDE DATA

PERIPHERAL ARTERIAL DISEASE

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Introduction - Potential differences in comorbidity, cardiovascular (CV) outcome and mortality patterns for peripheral arterial disease (PAD) and myocardial infarction (MI) patients is not well described. The aim of this study was to compare baseline comorbidity, treatment patterns and outcome among men and women with incident PAD and MI.

Methods - This population-based observational cohort study linked morbidity and mortality data retrieved from Swedish national registries for patients discharged alive with either MI or PAD diagnosis as the first primary recorded atherosclerotic manifestation. Index date was date at discharge and follow-up data was available up to six years after index date. Observation period for the MI cohort was 2006-2011 and 2006-2013 for the PAD cohort. Risk of CV-related death was analyzed separately, and was assessed using Kaplan-Meier analysis.

Results - Overall, 64 362 incident MI patients and 34 000 PAD patients were included. At baseline, MI patients had a mean age of 73.7 years, 31% females. PAD patients were older (mean age 74.9 years) with an equal distribution of men and women. Heart failure was more prevalent among MI patients (21.1% versus 16.5%) while more PAD patients had diabetes (28.7% versus 20.7%) atrial fibrillation (20.1% versus 17.8%) and stroke (12.6% versus 10.1%). Men with PAD were older and had a higher burden of co-morbidity, while co- morbidity was less pronounced among men with MI compared to women. Three-year cumulative incidence rates of CV- and non CV-death among MI patients were 24% and 10%, the corresponding figures for PAD patients were 30% and 17%. For CV deaths, 69% were of coronary ischemic origin among MI patients and 43% among PAD patients. Non-CV death among MI and PAD patients were attributed to cancer (16% versus 22%), diabetes (5% versus 10%), and respiratory diseases (5% versus 7%). CV preventive medication use was more intense in the MI population. Aspirin and statins was used by 89% versus 65% and 74% versus 53%. Compared with men, women in both populations were less likely to receive preventive medication. Aspirin and statins were used by 91% and 81% among men with MI compared with 64% and 49% among women with PAD.

Conclusion - Having PAD confers a higher risk for both CV- and non-CV mortality compared with patients with MI. Men with PAD and women with MI had a higher burden of co-morbidity. The likelihood of meeting guideline-recommended therapy varied between studied populations, to the detriment of PAD patients. Women in both groups, and especially women with PAD, were less well treated

O-148 BOVINE PERICARDIAL PATCH – A GOOD ALTERNATIVE IN FEMORAL ANGIOPLASTY

PERIPHERAL ARTERIAL DISEASE

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Introduction - This study investigates the results of bovine pericardial patch closure in femoral endarterectomies. The main focuses are immediate as well as later complications such as infections, stenosis at the patch site and patch ruptures.

Methods - This retrospective study consists of all the femoral endarterectomies with bovine pericardial patch closure (Peri-Guard Supple® or Xenosure®) performed in Helsinki University Hospital (HUH) from January 1 2010 to July 31 2017. Patient data was collected retrospectively from the prospectively maintained Husvasc-registry and from the prosthesis registry in the operating room. Primary endpoints are restenosis at the patch site, patch ruptures and patch infections. Secondary endpoints are restenosis and infections at the entire surgical site.

Results - During the study period 1160 femoral endartectomies including angioplasty took place in HUH. In 167 (14.4%) bovine pericardial patch closure was used. The indications for operations were claudication (28%), ischemic wound (22.6%) and rest pain

(21.4%). Of the operations 51.8% were hybrid procedures including endovascular treatment either proximally (51.7%), distally (32.2%) or in both directions (16.1%).
Median follow up time was 2.6 years, during which five (2.4.%) restenosis at the patch site were detected, four with ischemic symptoms and one found incidentally. If proximal and distal restenoses are included there were altogether 11 (6.5%) restenosis. Infections at the whole surgical site appeared in 23 (13.7%) patients, majority (n=20) detected within 30 days. Deep infections affecting also the patch occurred in 11 (6.5%) patients. There were no patch ruptures during the follow up. Eight (4.8%) patients had the patch removed due to infection (n=2), stenosis (n=5) and reoperation technique (n=1).

Conclusion - Bovine pericardial patch provides a safe choice in femoral angioplasty with reasonably good patency results and relatively small risk for complications and can be considered comparable to autologous vein patch.

O-149 PERFUSION ANGIOGRAPHY IN THE PREDICTION OF WOUND HEALING IN ENDOVASCULAR TREATMENT OF CRITICAL LIMB ISCHEMIA: TRANSLATING IMAGING PARAMETERS INTO CLINICAL OUTCOMES

PERIPHERAL ARTERIAL DISEASE

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Introduction - Current endovascular treatments (EVT) of critical limb ischemia (CLI) have no clear treatment goals[1]. Perfusion Angiography (PA) is an image-processing software based on the change in density per pixel over time, that can help to predict wound healing and clinical success of EVT[2,3].

Methods - Consecutive patients undergoing EVT at a single center for CLI were analyzed with PA before and after treatment. The relative frequency of lesions according to TASC classification[4] is shown in Fig 1. Exclusion criteria were poor PA image quality, no ulcer, death and loss at follow-up. Demographic and clinical data were recorded and clinical follow-up was performed to trace the time to heal (TTH) of the ulcers. The PA parameters were measured on the contrast time-density curve: Arrival Time (AT), Peak Time (PT), Wash-in Rate, Width, Area Under Curve and Mean Transit Time (MTT). Two cohorts based upon a TTH of less (group A) or more than 30 days (group B). Statistical analysis of PA parameters after EVT was performed using Student t-test for independent variables and for changes before and after EVT. Cut-off values from ROC curves for the significant PA parameters were identified.

Results - From January 2015 to July 2016, 332 consecutive patients were studied, from which 123 were excluded (34 because of poor image quality, 50 patients had no ulcer, 20 died and 19 were lost at follow-up). Mean age was 72 years and 67.5% were men. 133 patients had Rutherford 5 and 76 had Rutherford 6 lesions, with similar distribution in both groups. We found significant differences between groups in the following after treatment PA parameters: AT (mean difference 1,2 seconds, 95% CI: 2.01-0.39; p=0.004), PT (mean difference 0.56 seconds, 95% CI: 1.01-0.11; p=0.014) and MTT (mean difference 0.5 seconds, 95% CI: 1-0.08; p=0.022), and also on the improvement of MTT post-EVT (mean difference 0.64 seconds, 95% CI: 1.16-0.1; p=0.02). No statistical differences were found among the other parameters. Cut-off values for significant PA parameters were: AT>6 seconds (Sensitivity=64.8%, Specificity=59%, p=0.001), PT>5.2 seconds (Sensitivity=43.7%, Specificity=76.9%, p=0.002), MTT>4.1 seconds (Sensitivity=80.3%, Specificity=35%, p=0.015) and improvement of MTT>1.7 seconds (Sensitivity=42.4%, Specificity=81.7%, p=0.16).

Image -

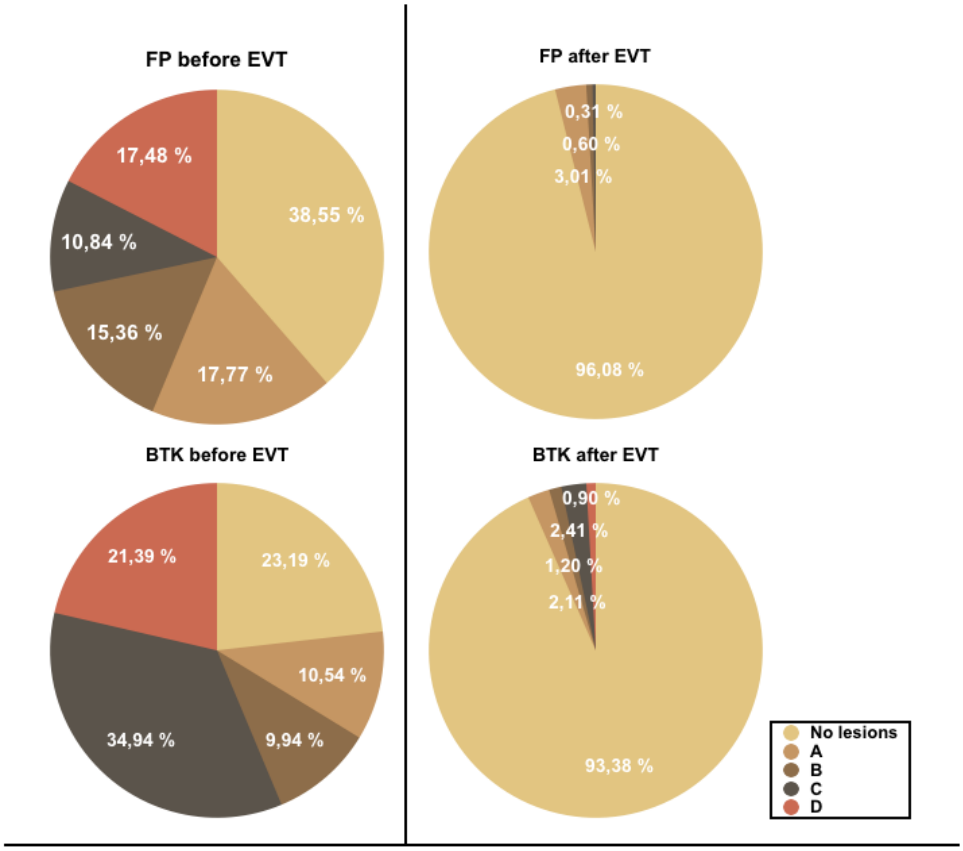

Fig 1. TASC classification of angiographies before and after EVT, in the femoropopliteal (FP) and the below the knee (BTK) regions.

Conclusion - PA parameters AT, PT and MTT can predict early CLI wound healing (in less than 30 days). Further analysis is needed to calculate an algorithm based on these parameters that will serve to set EVT goals.

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O-150 PEDAL ARCH PATENCY GUARANTEES WOUND HEALING AND LIMB SALVAGE OF TRANSMETATARSAL AMPUTATION FOLLOWING LIMB REVASCULARIZATION

PERIPHERAL ARTERIAL DISEASE

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Introduction - Transmetatarsal amputation(TMA) is necessary whenever several toes or the forefoot are affected by gangrene due to peripheral arterial disease (PAD). Revascularization before TMA is mandatory to guarantee wound healing. Currently, factors that may affect TMA healing are not well investigated. The study's aim was to evaluate the role of foot arteries in TMA healing and limb salvage after revascularization.

Methods - All patients treated for PAD with chronic limb threatening ischemia(CLTI) between April-2012 and November-2017 were collected in a prospective database. Retrospective analysis was performed including only patients who underwent TMA after any type of revascularization (surgical, endovascular). Patient's demographics and clinical characteristics were assessed. Pre-operative digital subtraction angiography(DSA) were reviewed together with interventional data to determine the patency of foot arteries and the presence of in-line flow to the foot. The pedal arch patency was classified[1] as: no pedal arch(NPA), incomplete pedal arch(IPA) and complete pedal arch(CPA). Clinical and Duplex follow-up was performed at 3,6 and every 6 month thereafter. The study's primary endpoints were: wound healing (WH), Limb Salvage(LS) and impact of foot arteries and pedal arch patency on LS and WH on the basis of Chi square test and Log-Rank test in the Kaplan-Meier analysis. Secondary endpoints were: primary(PP), assisted(AP) and secondary patency(SP) and patient survival(S).

Results - A total of 112 limbs in 105 patients (median age 72 ±10 years, male 76.2%, 7 patients treated bilaterally) satisfying the inclusion criteria were treated in the study period. Complete data on the foot arteries were available in 104(93%) limbs. Coronary artery disease, diabetes mellitus, kidney disease and chronic obstructive pulmonary disease(COPD) were present in 39.6%, 67.6%, 52%(dialysis 28.1%) and 38.4%, respectively. Clinical presentation was Rutherford stages 5 and 6 in 10.7% and 89.3%, with 69.7% of wounds presenting infection. Surgical and endovascular revascularization were performed in 37.5% and 62.5% of cases with a technical success of 87.5%. Dorsalis pedis and common plantar arteries patency, NPA, IPA and CPA were found in 55.8%, 54.8%, 21.2%, 60.6% and 18.3%, respectively. Direct in-line flow to the foot arteries was achieved in 72.1% of cases. The mean follow-up was 17.7 months. WH was 57.1%, 89.3% and 98.2% at 6,12 and 24-month, respectively. LS was 81.1%, 79.5% and 77.5% at 6,12 and 24-month, respectively. The study's secondary endpoints are reported in table 1.
TMA healing and limb salvage were not affected by patency of either dorsalis pedis artery or plantar artery (P=0.26 and P=0.33, respectively). Similarly, direct in-line flow was not associated with better wound healing and limb salvage rates (P=0.12 and P=0.35, respectively). In contrast, the presence of CPA compared to IPA or NPA was associated with higher wound healing (at 12-month: 93.3% vs 83.3%. P=0.01) and limb salvage rates (at 12-month: 100% vs 75%. P=0.019).

Table 1: secondary endpoints at 6,12 and 24-month

	PP (%)	AP (%)	SP (%)	S (%)
6-month	68.4	71.1	77.8	69.1
12-month	57.3	62.5	71.8	64
24-month	50.8	55.6	68.4	52.1

Conclusion - The study results suggest that the pedal arch patency has a principal role in wound healing and limb salvage after transmetatarsal amputation in patients with CLTI undergoing limb revascularization.

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O-151 A COMPARISON OF CLINICAL OUTCOMES FOLLOWING FEMORO-POPLITEAL BYPASS OR PLAIN BALLOON ANGIOPLASTY WITH SELECTIVE BARE METAL STENTING IN THE BYPASS VERSUS ANGIOPLASTY IN SEVERE ISCHAEMIA OF THE LIMB (BASIL) TRIAL

PERIPHERAL ARTERIAL DISEASE

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Introduction - The Bypass versus Angioplasty for Severe Ischaemia of the Leg (BASIL-1) trial is the only randomised controlled trial (RCT) to have compared a bypass surgery (BS) first with a best endovascular treatment (BET) first revascularisation strategy for the treatment of chronic limb threatening ischaemia (CTLI) due to infra-inguinal disease. BASIL-1 found that, in patients who survived for more than 2 years, BS was associated with better amputation free (AFS) and overall (OS) survival. However, these data included patients undergoing femoro-popliteal (FP) and infra-popliteal (IP) procedures. The aim of the present study is to examine outcomes in the sub-group of BASIL-1 patients who underwent FP BS or plain balloon angioplasty (PBA) +/- bare metal stent (BMS) in order to build equipoise for the BASIL-3 trial which is randomising CLTI patients to FP PBA +/- BMS vs drug coated balloon (DCB) +/- BMS vs primary drug eluting stent (DES).

Methods - Outcome data were obtained from prospectively gathered BASIL-1 case record forms. Differences between BS and PBA+/-BMS were compared using the t-test, chi-squared and Wilcoxon rank sum tests according to the distribution of data using SAS v9.4.

Results - A total of 311 BASIL-1 patients were studied; 128 undergoing primary SB (89 VB, 39 SynB) and 183 primary PBA+/-BMS. PBA+/-BMS patients were older and more likely to be current smokers, and SB patients were more likely to have chronic obstructive pulmonary disease (COPD). Immediate technical success was significantly better for SB (98% vs. 81%, p<0.0001). Patients undergoing SB had a longer mean index hospital admission (16 vs. 8 days, p=0.0001). However, at 12 months patients in both groups had spent an equivalent mean number of days (n = 17) in hospital. All-cause 30-day mortality was not statistically different between the two groups, PBA+/-BMS patients underwent more re-interventions within the first 30-days (2% vs 7%, p=0.06). There was no significant difference in AFS (HR 1.18, p=0.4), OS (HR 1.14, p=0.5) or LS (HR 1.09, p=0.8) between SB and PBA+/-BMS. However, FF-MALE (HR 1.51, p=0.04) and FF-R (HR=1.68, p=0.02) were significantly better following SB. FF-MALE (71% vs 58% vs 56%, p=0.02) was significantly better following VB. Resolution of rest pain (HR=0.84, p=0.2) and wound healing at 3 years (HR=0.78, p= 0.2) were similar in the two groups.

Conclusion - This BASIL subgroup analysis indicates that although amputation rates and overall survival are similar, primary SB, especially VB, resulted in significantly fewer MALE and re-interventions than PBA+/-BMS. So, although an endovascular first revascularisation strategy may be a less resource intensive and morbid option in the short term, this appears unlikely to be the case in the long-term. Present data add further weight to the argument that, where possible, most patients presenting with CLTI due to FP disease should be offered VB as their primary revascularisation procedure where suitable autogenous conduit is available.

O-152 THE RATE OF PATIENTS FOR ENDOVASCULAR REPAIR OF POPLITEAL ANEURYSMS MAY BE OVERESTIMATED FOLLOWING THE INSTRUCTIONS FOR USE. CTA AND MRA ARE MANDATORY TO SELECT PATIENTS

PERIPHERAL ARTERIAL DISEASE

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Introduction - Popliteal artery aneurysms (PAA) are the most common peripheral aneurysms. Although rare and often asymptomatic there is a significant risk of thrombosis, embolism and limb loss. The number of endovascular treated PAA is increasing although long-term data is scarce. The aim of this study was to evaluate the eligibility for endovascular repair of patients treated for symptomatic and asymptomatic PAA.

Methods - All patients treated for PAA with open surgical repair between the years 2010 – 2017 were analysed if suitable for endovascular treatment. There is no selection bias as endovascular treatment of PAA was not performed. Preoperative imaging (CT and MR angiography) was reviewed for applicability with an experienced interventional radiologist and two vascular surgeons. Evaluation was performed according to the following criteria adapted from the instructions for use of Gore ® Viabahn stent graft: at least a single vessel tibial run-off, proximal and distal landing zone more than 2 cm, no large difference in vessel diameter proximal and distal to the aneurysm, no overstenting of significant collaterals necessary and no inadequate kinking of the artery. The patients were classified in three categories: the patient was eligible (all criteria was met), endovascular treatment was

feasible (not all criteria fulfilled but technically possible) and endovascular treatment was not appropriate (technically not possible, e.g. no landing zone, no tibial run-off vessel).

Results - 51 patients with 61 symptomatic and asymptomatic PAA were identified (49 male, 2 female), mean age 67.5 years (SD 10.3 min 45 max 85). 45 cases (73.8 %) were asymptomatic, 11 cases (18.0 %) showed clinical symptoms such as claudication and in 5 cases (8.1 %) the patients presented with acute ischemia. In 14 cases (23.0 %) the PAA was completely thrombosed. Endovascular intervention was eligible in 24 patients (39.3 %), 14 cases (23.0 %) were feasible and in 23 cases (37.7 %) was not appropriate. There was no significant difference in aneurysm diameter and length among the groups. In both intervention groups were significantly less thrombosed aneurysms present ($p < 0,001$).

Conclusion - In this study more than half of the patients with PAA were not eligible for endovascular treatment. These data suggest that endovascular repair remains a treatment option for selected patients only. Whereas the role of endovascular PAA repair concerning long-term patency still remains to be clarified, in clinical reality a majority of patients with PAA is not eligible for endovascular repair.

O-153 LONG AORTIC PART OF THE STENTS AS A NEW PREDICTOR FOR IN-STENT RESTENOSIS AFTER KISSING STENTING OF THE AORTOILIAC ARTERIES

PERIPHERAL ARTERIAL DISEASE

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Introduction - Kissing stenting is the preferred, minimally invasive treatment for aortoiliac steno-occlusive disease. However, only a few publications are available about the long-term patency of aortoiliac kissing stents and about the risk factors for in-stent restenosis (ISR), the majority of which have conflicting outcomes. Our aim was to determine the long-term patency rates of aortoiliac kissing stents and to identify predisposing factors for the development of ISR.

Methods - One hundred and five patients (64 females; median age: 60.9 [56.3-69.2] years) with symptomatic aortoiliac steno-occlusive disease (Fontaine II, 86.7%; III-IV, 13.3%; TASC A, 49.5%; B, 27.6%; C, 3.8%; D, 19%) who underwent kissing stenting (n = 210 stents; self-expandable, 85.7%; balloon-expandable, 14.3%) between 2001 and 2015 were retrospectively analyzed. Patient, vessel, lesion, and stent characteristics were examined. Follow-up included palpation of peripheral pulses, measurement of ankle-brachial index, and duplex ultrasonography. Mann-Whitney *U* and Fisher's exact tests as well as Kaplan-Meier, Cox regression, and receiver operating characteristic (ROC) analyses were used as statistical methods.

Results - The median follow-up time was 45 (21-69) months. The primary patency rate was 95%, 93%, 86%, and 77% at 6, 12, 24, and 60 months, respectively. Significant ISR developed in 23 patients (21.9%; unilateral, n = 11; bilateral, n = 12). Univariate Cox regression analysis revealed older age (hazard ratio [HR], 0.5; 95% confidence interval [CI], 0.31-0.81; P = .004), presence of hypertension (HR, 0.15; 95% CI, 0.04-0.54; P = .003), and larger aortic diameter (HR, 0.42; 95% CI, 0.25-0.7; P < .001) to be significant protective factors against ISR, while longer aortic part of the stents (HR, 1.56; 95% CI, 1.16-2.09; P = .003) and larger discrepancy between sum of the stent diameters and aortic diameter (HR, 1.64; 95% CI, 1.01-2.65; P = .043) were associated with worsened long-term patency. Multivariable analysis showed longer aortic part of the stents to be the only significant determinant of ISR (HR, 1.44; 95% CI, 1.02-2.01; P = .035). Regarding the length of aortic part of the stents, 20 mm was identified by ROC analysis as the optimal cut-off value due to its highest sensitivity, specificity, and clinical relevance (sensitivity, 66% [95% CI, 55-76%]; specificity, 74% [95% CI, 52-90%]; area under the curve, 0.69 [95% CI, 0.58-0.81]; P = .004). The length of aortic part of the stents was dichotomized into the categories of ≤ 20 mm and > 20 mm. The primary patency rate was 98%, 97%, 95%, and 89% at 6, 12, 24, and 60 months, respectively, in patients whose aortic stent part was ≤ 20 mm, while it was 91%, 88%, 74%, and 59% at 6, 12, 24, and 60 months, respectively, in patients whose aortic stent part was > 20 mm. The primary patency rates were significantly worse (P < .001) in patients with longer aortic stent part compared to those with shorter aortic stent part.

Conclusion - Kissing stent technique can be performed with good long-term patency rates for the treatment of aortoiliac steno-occlusive disease. Patients whose iliac stents protrude too far into the aorta need closer follow-up care.

O-154 THE EFFECT OF SUPERVISED EXERCISE THERAPY ON CARDIOVASCULAR RISK PROFILE OF PATIENTS WITH INTERMITTENT CLAUDICATION? A SYSTEMATIC REVIEW AND META-ANALYSIS

PERIPHERAL ARTERIAL DISEASE

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Introduction - Patients with intermittent claudication (IC) are at increased risk for cardiovascular morbidity and mortality. Therefore, in patients with IC, the primary goal is to reduce risk factors for cardiovascular disease. Next to optimal medical treatment and life-style advice, supervised exercise training (SET) is nowadays a class IA recommendation in the treatment of patients with IC. Whereas bountiful evidence supports the beneficial effects of SET on walking capacity, we know little about the effect of SET on the cardiovascular risk profile of patients with IC. Therefore, the objective of this study was to evaluate the effects of SET on cardiovascular risk factors in patients with IC by using meta-analytic techniques.

Methods - A systematic review of the electronic databases Pubmed, EMBASE, Cinahl and Central was conducted. Randomized and non-randomized controlled trials lasting ≥ 4 weeks and investigating the effects of SET on traditional cardiovascular risk factors in patients with IC were included. Traditional cardiovascular risk factors were studied as primary outcomes, pain-free (PFWD) and maximal walking distances (MWD) were included as secondary outcomes. All meta-analyses were performed using random-effects models with summary data reported as weighted means, Hedges' g and 95% confidence interval (CIs).

Results - We included 14 trials, involving 17 study groups (9 walking, 3 resistance, 3 combined and 2 aerobic training groups), totaling 828 patients (mean age: 66.4 yrs, mean ABI: 0.65). Overall, exercise training induced a significant reduction in systolic blood pressure [-4.4 mmHg (CIs -8.1;-0.65, p=0.02)] and fasting triglycerides [-0.22 mmol/l (CIs -0.42;-0.01, p=0.04)]. All other cardiovascular variables including body weight, body mass index, diastolic blood pressure, total cholesterol, low and high density cholesterol remained statistically unaltered. Exercise training also significantly improved PFWD [+117 m (CIs +51;+183, p=0.001)] and MWD [+161 m (CIs +78;+245, p<0.001).

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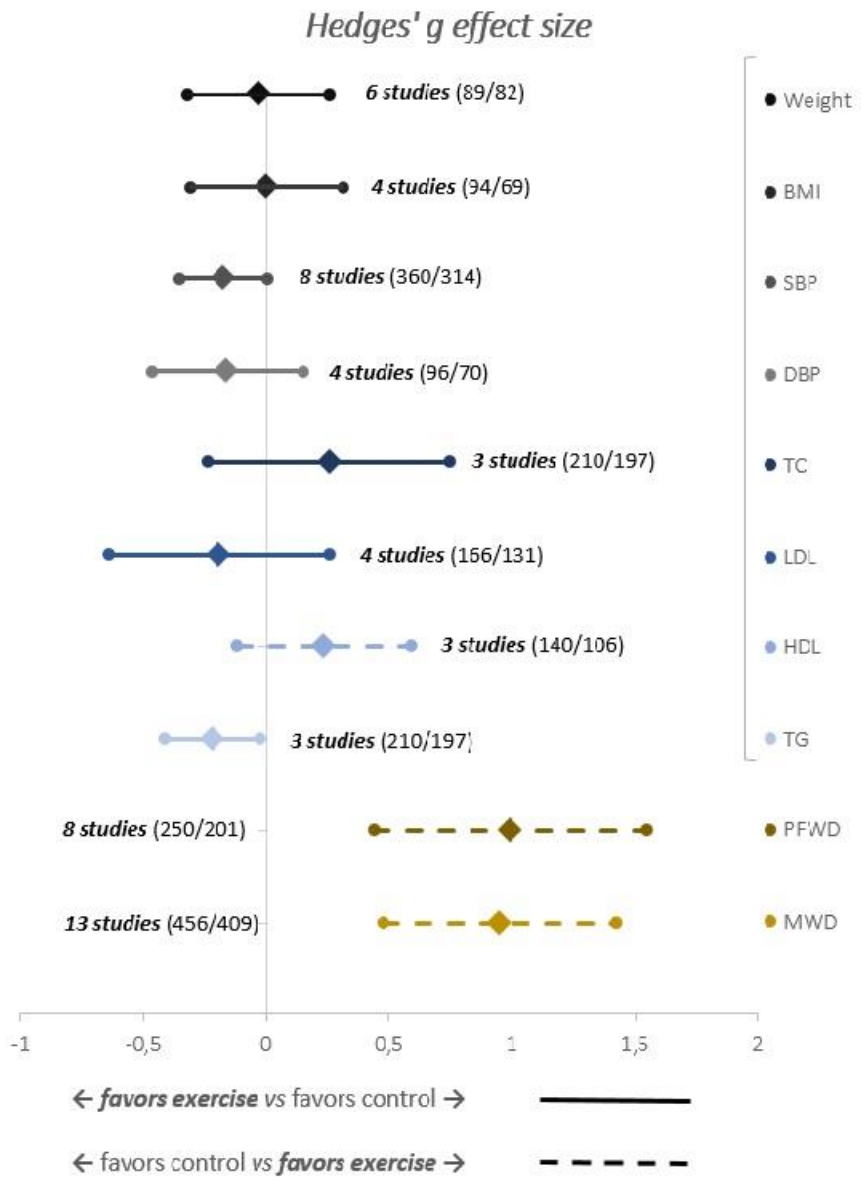

Conclusion - This meta-analysis supports the beneficial effects of SET on walking capacity. In addition, we found some evidence for SET to ameliorate the cardiovascular risk profile in patients with IC. However, the small number of studies warrants the need for more RCTs evaluating the effect of exercise therapy on cardiovascular risk factors as primary outcomes in patients with IC.

O-155 QUALITY OF LIFE AND NOT HEALTH STATUS IMPROVES AFTER MAJOR AMPUTATION IN THE ELDERLY CRITICAL LIMB ISCHEMIA PATIENT

PERIPHERAL ARTERIAL DISEASE

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Introduction - Particularly in elderly patients with critical limb ischemia, a patient-oriented appraisal of treatment has become extremely important. Quality of life (QoL) is an important patient-reported outcome in vascular surgery. Frequently, the physical domain of QoL questionnaires represent an 'objective' evaluation of performing activities, which is expected to be impaired after lower extremity amputation. However, an *objective* appraisal of physical functional is an assessment of health status (HS) and not of QoL. Little is known about the *subjective* appraisal of physical health (QoL). The goal of this study was to evaluate prospectively QoL (WHOQOL-BREF) in relation to HS (SF-12) in elderly CLI patients undergoing lower extremity amputation.

Methods - Patients suffering from CLI and ≥70 years old were included in a prospective study between January 2012 and February 2016 with a follow-up period of 1 year. Patients were divided into two groups according to undergone major limb amputation or not. The WHOQOL-BREF was used to asses QoL. The 12-Item Short Form Health Survey (SF-12) was used to measure HS. These self-reported questionnaires were completed five times (at inclusion, after 5 to 7 days, after six weeks, after six months, and after one year). Linear mixed models were performed to assess the change of QoL and HS for both treatment groups.

Results - Of the initial cohort of 387 patients, 200 patients were included. Forty-six patients (23%) underwent a lower extremity amputation within one year. Amputees had statistically significant improvement of the physical QoL domain after six months (14.0 vs. 9.0 (95% CI -7.84 - -1.45), p=0.005) and after one year (14.0 vs. 9.0 (95% CI -9.58 - -1.46), p=0.008) follow-up compared to baseline. Amputees did not show any statistically significant differences in HS. For non-amputees, both physical domains QoL and HS improved. There was an instant statistically significant improvement of the physical domain of the QoL 1 week after inclusion (12.0 vs. 10.9 (95% CI -1.57 - -0.63), p<0.001). However, statistically significant improvement in the physical domain of HS first occurred after six weeks follow-up (14.6 vs. 14.1 (95% CI -4.14 - -0.89), p=0.003).

Conclusion - There is a clear difference between patients' functioning (HS) and patients' appraisal of functioning (QoL). In elderly CLI patients we find a discrepancy between physical QoL (WHOQOL-BREF) and HS (SF-12) scores in vascular amputees. This raises the question which outcome measurement is leading for elderly CLI patients. Individual treatment goals should be kept in mind when assessing the HS or QoL and selecting treatment in hospital care. With respect to shared decision making, distinctive and *subjective* QoL questionnaires, like the WHOQOL-BREF, provide a very important outcome measurement and should be used in future research.

O-156 A NIRS-ASSISTED TEST DISCRIMINATES PATIENTS WITH PERIPHERAL ARTERIAL DISEASE AND CHRONIC VENOUS INSUFFICIENCY WITH IMPROVED FOOT OXYGENATION FOLLOWING LOW ELASTIC COMPRESSION THERAPY

PERIPHERAL ARTERIAL DISEASE

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Institution(s) - [1]Biomedical and Surgical Specialties Sciences, University of Ferrara, [2]Unit of Translational Surgery, [3]Unit of Rehabilitation Medicine, University Hospital of Ferrara, [4]Morphology, Surgery and Experimental Medicine, University of Ferrara, Ferrara, Italy

Introduction - Elastic compression (EC) therapy is often avoided or only temporarily allowed in patients with peripheral arterial disease (PAD) and chronic venous insufficiency (CVI), to not compromise arterial inflow.
Recently a toe-flexion test assisted by near-infrared spectroscopy (NIRS) has been developed to quantify the foot perfusion under dynamic conditions [1]. The study evaluates whether this test may be used among PAD patients with CVI to evaluate effects on foot perfusion and tolerability of moderate EC.
Methods - This prospective observational study, approved by the local ethics committee, was conducted from December 2015 to June 2017 and involved consecutive PAD patients at Leriche-Fontaine's stages II-III and bilateral CVI at CEAP clinical class ranging C2-C4, aged 50-85.
The testing session (figure 1) included Ankle-Brachial Index (ABI) measurement and dynamic foot perfusion determination by toe-flexion test, with NIRS sensors placed on the dorsum of the foot to record oxygenation changes during 10 consecutive toe-flexion

movements. The test was repeated after 2 minutes of rest. Subsequently knee elastic stockings that according to the manufacturer (Flebysan Italy) exert a pressure regimen to the medial malleolus of 18-21mmHg (1st class RAL classification) were applied to both limbs. With the stockings on, the test was repeated twice.
Toe-flex area (ToFA) was determined by calculating the area under the curve of the oxygenated hemoglobin track recorded by the NIRS during the four sessions. An improved foot perfusion arbitrarily set at a ToFA reduction >20% with EC was established, to identify limbs positively responding to EC treatment. Only subjects with such improvement received the EC prescription for at least 6-hour/day for six weeks and a diary to report adherence to EC and any related symptoms.

Results - Forty-seven PAD patients (74±9 years, males 68%, ABI 0.67±0.24) with CVI (CEAP 3; IQR 2-4) were enrolled. For all legs, a similar ToFA of -170±117 arbitrary units (au) and -155±107 au was calculated for the first two attempts, respectively (ICC 0.92).
EC was applied to all subjects (94 legs). In the whole population, the ToFA average value significantly improved following EC (from -170±117 au to -114±110 au; $p<0.001$).
Sixty-two limbs (n=38 patients or Benefit group) showed a ToFA reduction >20% after EC with a mean variation of 80±47 au while 32 limbs (n= 23 patients, Non-benefit group) showed stable or worsened values after EC (mean change of -8±45 au).
In a regression model, favorable absolute variations of ToFA after EC were linked to a low baseline degree of foot perfusion ($r_{partial} = -0.42$) and not to other parameters (ABI, BMI, Charlson index, age, systemic or peripheral pressure values, walking ability, degree of pressure of EC) ($R^2 = 0.18$; $p<0.001$) while the percentage improvement of ToFA was directly correlated only to the CEAP class ($p =0.012$)
At follow up, 34 Benefit patients who received EC prescription reported its daily use (7 hours, IQR 5-8) in absence of symptoms, while four patients early discontinued the EC use for discomfort.

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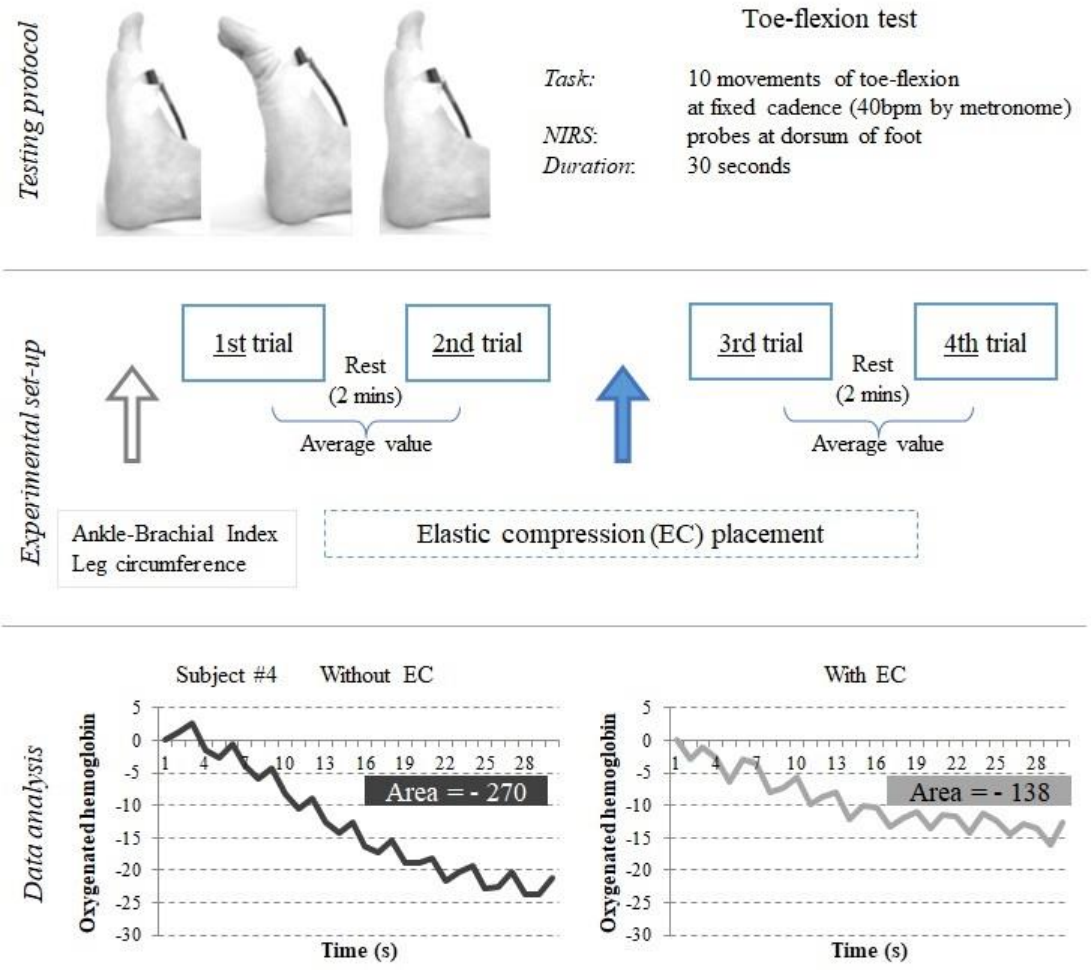

Conclusion - A rapid NIRS-assisted test identified patients with PAD and CVI with an improved foot perfusion after moderate EC, with most of them tolerating a prolonged treatment.
Unexpectedly, after EC an increased foot oxygenation was observed in patients with lower degree of perfusion at baseline.

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O-157 THE ROLE OF FEMALE GENDER ON OUTCOMES AFTER STENTING FOR AORTO-ILIAC ARTERIAL OBSTRUCTIVE DISEASE

PERIPHERAL ARTERIAL DISEASE

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Introduction - The aim of this study was to evaluate early and long-term outcomes of stenting for aorto-iliac obstructive disease in female (F) patients, comparing their results with males (M).

Methods - A single-center retrospective review of all aorto-iliac lesions treated with angioplasty and stenting from 2008 to 2017 was conducted. Preoperative clinical and anatomical data, including mean arterial diameter at the level of the target iliac artery (TIA) and external iliac artery (EIA), were prospective collected in a dedicated database. Thirty-days outcomes, long-term patency and limb salvage rates were compared between female and male groups. Follow-up results were analyzed with Kaplan-Meier curves. Major clinical, anatomical and procedural characteristics as also the type of stent used (uncovered, covered, self-expanding, balloon-expanding) were evaluated for their association with patency using Cox proportional hazards.

Results - Overall 228 patients, accounting for 303 limbs (F: n=79 35%; M: n=224), were treated. Mean age was 70.3±10.3; iliac lesions were classified by limb as TASC B (n=75, 25%), C (n=144, 47%) and D (n=84, 28%). When comparing females and males, there were no differences between the two groups regarding comorbidities (SVS score, F: 0.67±0.56; M: 0.83±0.59; P=.108) and TASC classification (P=.622). At presentation, females were more likely to have ischemic tissue loss (Rutherford category 5/6; F: 41%; M: 26%; P=.008). Target lesions were located in the common iliac artery in 46% of cases (n=133; F: 53%; M: 43%), external iliac artery in 22% (n=64; F: 17%; M: 23%), while long lesions involving both common and external iliac were 32% of cases (n=93; F: 29%; M: 33%), with no differences in distribution between the two groups (P=.288). Mean arterial diameters were significantly smaller in females compared to males at the level of TIA (F: 8.7±1.5 mm; M: 10.1±2.6 mm; P=.006), and this difference was maintained at the level of EIA (F: 7.9±1.7 mm; M: 9.2±2.4 mm; P=.001); similarly the mean stent's diameter was significantly smaller in female gender (F: 9.1±1.5; M: 10.1±3.6; P<.001). Early medical (F: 6%; M: 2%; P=.224) and cumulative surgical (F: 5%; M: 3%, P=.287) complication rates were similar. At 5 year, females had a significantly lower primary patency (F: 66.5%; M: 85.3%; P=.043) and secondary patency (F: 80.8%; M: 95.2%; P=.001) rates compared to males; limb salvage rates were similar (F: 91.1%; M: 94.8%; P=.998). The multivariate analysis indicated that overall a stent diameter ≤8 mm was a negative independent predictor of primary patency (HR 2.52, 95%CI 1.04-6.08; P=.039), independently from sex (HR 0.31, 95%CI 0.48-3.91; P=.549) and type of stent used (HR 0.56, 95%CI 0.21-1.52, P=0.262). Stenting at the level of the external iliac artery (HR 3.70, 95%CI 1.04-13.13; P=.042) was an independent negative predictors of patency within the female group, independently from the type of stent used.

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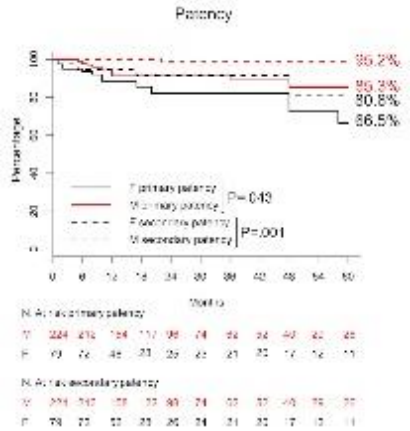

Conclusion - Stenting for iliac artery obstructive disease shows excellent similar early outcomes in females and males. However during long term, primary and secondary patency rates in female are significantly lower than in male patients, and this may be explained by smaller arterial diameter; in particular, a stent diameter ≤8mm is an overall independent negative predictor of patency. Stenting in specific anatomical segment as the external iliac artery, are negatively associated with patency in women independently from the type of stent used.

O-158 LONG-TERM QUALITY OF LIFE AFTER REVASCULARISATION IN PATIENTS WITH PERIPHERAL ARTERIAL DISEASE: A TRANSVERSAL STUDY

PERIPHERAL ARTERIAL DISEASE

Author(s) - Rianne Vossen*[1], Dianne Ras[2], Anco Vahl[1], Vanessa Leijdekkers[1], Alexander Montauban van Swijndregt[3], Willem Wisselink[4], Ron Balm[5]

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Introduction - Patient reported outcome measures (PROMs) are increasingly recognised as important variables when evaluating vascular interventions. In this study, we investigated if PROMs were correlated with objective technical parameters in patients with peripheral arterial disease (PAD).

Methods - We conducted an observational transversal study at OLVG in Amsterdam, the Netherlands. A random sample was taken from a cohort of patients who underwent invasive treatment for PAD from 2004 to 2015. The ankle-brachial index (ABI) and the pre- and post-intervention difference (ΔABI) were used as objective outcome variables. PROMs were measured using the Dutch shortened Vascular Quality of Life questionnaire (VQ-6-NL) and patients were questioned about their improvement of symptoms post-intervention. We conducted a linear regression analysis to examine the relation between ABI and VQ-6-NL. Multivariate logistic regression analysis was performed to investigate if patient-related variables were associated with improvement of symptoms.

Results - 95 patients with a mean follow up of 5.8 years (SD ± 2.4) participated in the study. The average ΔABI in the total cohort was 0.32 (SD ± 0.3). Mean VQ-6-NL was 17 (IQR 7 – 24; SD ± 4.8). Patients with an improvement of symptoms had a higher mean VQ-6-NL compared to patients with no improvement of symptoms (19 vs 13, $P < 0.001$). No significant linear relation between VQ-6-NL and ABI and ΔABI was found.

Conclusion - The objective technical parameter ABI is not sufficient to evaluate invasive interventions in patients with PAD. Functional parameters, like VQ-6-NL, are an important additive in the evaluation of vascular interventions for PAD.

O-159 A COMPARATIVE COST-EFFECTIVENESS ANALYSIS OF PERCUTANEOUS TRANSLUMINAL ANGIOPLASTY AND FEMORAL-POPLITEAL BYPASS SURGERY FOR MEDIUM-LENGTH TASC II B AND TASC II C FEMOROPOPLITEAL LESIONS

PERIPHERAL ARTERIAL DISEASE

Author(s) - Rianne Vossen*[1], Pilar Philipszoon[2], Anco Vahl[1], Vanessa Leijdekkers[1], Alexander Montauban van Swijndregt[3], Ron Balm[4]

Institution(s) - [1]Surgery, OLVG Hospital, [2]Health sciences, VU medical center, [3]Radiology, OLVG Hospital, [4]Vascular surgery, AMC Medical Center, Amsterdam, Netherlands

Introduction - The growing number of patients with peripheral arterial disease (PAD) will result in a substantial increase in health care costs. In this study, we evaluate the total mid-term costs and cost-effectiveness of percutaneous transluminal angioplasty (PTA) with optional stenting (PTA/S) as initial treatment compared with femoropopliteal bypass (FPB) surgery, in patients with medium-length superficial femoral artery disease (SFAD).

Methods - All hospital health care costs for 226 consecutive patients with a complete 3-year follow-up period were calculated. The main outcome measure was the clinical patency rate at 3-year follow-up. Multiple imputation and bootstrapping were used to analyse the data. The adjusted incremental cost-effectiveness [VA1] ratios (ICERs) were calculated by dividing the difference in total costs by the difference in 3-year clinical patency rate.

Results - Mean total costs per patient were €29 058 in the PTA/S treatment group versus €42 437 in the FPB surgery group (mean adjusted difference -8291 95% CI: -17 229; 255). Differences in 3-year clinical patency between PTA/S and FPB surgery were small and non-significant (69.9% and 70.3%, respectively). An ICER of 563 716 was found, indicating that FPB surgery costs €563 716 more per one patient extra reaching 3-year clinical patency in comparison with PTA/S treatment.

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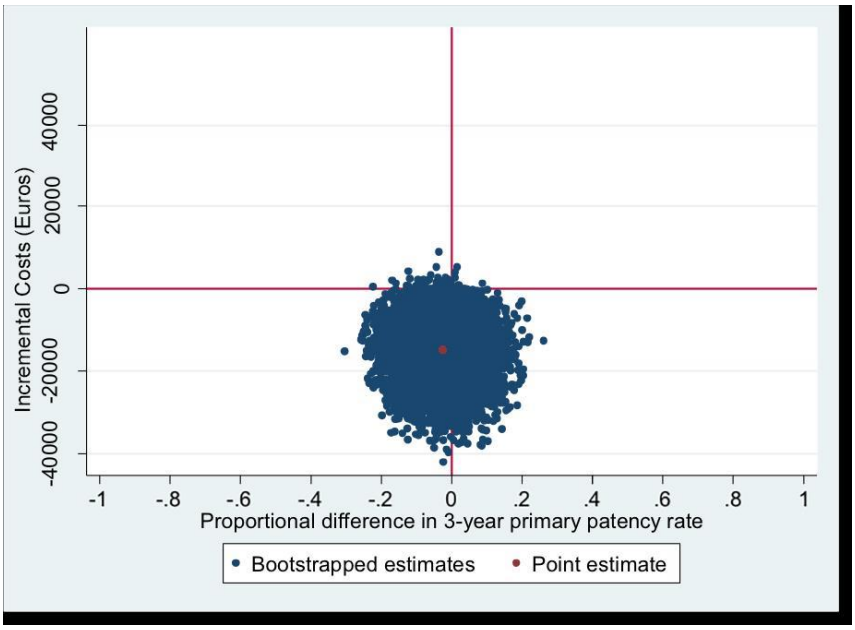

Conclusion - FPB surgery in medium-length SFAD involved higher total costs and was not cost-effective in comparison with PTA/S, when evaluated over a 3-year follow-up period. Taking into account the less invasive character and lower morbidity rates of PTA/S, an endovascular-first approach is recommended.

O-160 ONE-YEAR RESULTS OF pCMV-VEGF165 GENE TRANSFER IN PATIENTS WITH CRITICAL LOWER LIMB ISCHEMIA DUE TO PERIPHERAL ATHEROSCLEROSIS AND DIABETES MELLITUS

PERIPHERAL ARTERIAL DISEASE

Author(s) - Roman Kalinin[*1], Igor Suchkov[1], Nina Mzhavanadze[1], Andrey Krylov[1], Maria Abyzova[2], Ayrat Bilyalov[2], Roman Deev[1,3]

Institution(s) - [1]Ryazan State Medical University, Ryazan, [2]Kazan (Volga region) Federal University, Kazan, [3]PJSC Human Stem Cell Institute, Moscow, Russian Federation

Introduction - atherosclerotic peripheral arterial disease is common in patients with diabetes mellitus (DM) and leads to a significant increase in amputation rates. Induction of angiogenesis may be a promising technique in improving limb salvage rates and quality of life in patients with critical limb ischemia (CLI) and DM.

Methods - The study was divided into experimental and clinical parts. Experiment was performed using a model of surgical skin wound in Wistar rats with alloxan-induced DM. Experimental animals were treated with 60mcg (N=8) or 200mcg (N=8) of pCMV-VEGF165. Animals in control group were treated with water for injections. At 10 days the animals were withdrawn from the experiment with following morphological and immunohistochemical assessment of the wound and surrounding soft tissues. Clinical study included 140 patients with CLI and DM. Patients were divided into 4 groups: group I – arterial revascularization and conservative therapy (N=45), group II –conservative treatment (N=40), group III – arterial revascularization, conservative therapy, and pCMV-VEGF165 gene transfer (N=30), group IV – conservative treatment and pCMV-VEGF165 gene transfer (N=25). Limb salvage rates, lethal outcomes, degree of ischemia, pain-free walking distance, ankle-brachial index (ABI), transcutaneous oxygen tension (tcp02), blood velocities, and neurological symptom score (NSS) were assessed within 1 year after treatment.

Results - experimental part: epithelization and granulation rates were higher in diabetic animals treated with pCMV-VEGF165 (p=0.038). Histological and immunohistochemical studies have revealed a better multi-caliber vessel growth in rats which received

gene therapy. Clinical part: after one year amputation rates and lethal outcomes were lower in patients in group III (16.7% of amputations as compared to group I, p=0.041; 13.3% of lethal outcomes). When assessing the results of treatment among the patients who received conservative treatment, amputation rates and lethal outcomes were lower in subjects treated by gene transfer (36% of amputations, p = 0.0496; 16% of lethal outcomes). Postprocedural patency rates at 6 months were comparable between the patients in groups I and III (66.7% and 70%, respectively), while the number of amputations was significantly lower in subjects treated by pCMV-VEGF165 gene transfer (33.3% and 86.7% of amputations in groups III and I, respectively, p=0.013). When comparing the difference in pain-free walking distance, better results were obtained in patients in group IV as compared to group II (p=0.032). When comparing the perfusion parameters and neurological score between the patients in groups II and IV, ABI was not affected by gene therapy, while the subjects in group IV had improved tcpO2 values, blood velocity, and NSS score (p=0.028, p=0.047, p=0.044, respectively).

Conclusion - 1. pCMV-VEF165 gene transfer leads to improved wound healing rates and increased vascularization of granulation tissue in diabetic experimental animals (p=0.038). 2. Gene therapy improves perfusion and increases limb salvage rates in diabetic patients with CLI when used in combination with arterial revascularization or conservative therapy within 1 year after treatment.

O-161 BRACHIOBASILIC ARTERIOVENOUS FISTULAS DO BETTER THAN BRACHIOAXILLARY ACCESS GRAFTS IN TERMS OF PATENCY AND COMPLICATIONS: A SINGLE CENTRE STUDY

VASCULAR ACCESS

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Introduction - As life expectancy and comorbidity of end-stage-renal-diseased patients requiring hemodialysis increases, the difficulty to perform an autogenous forearm arteriovenous fistula or brachiocephalic fistula grows too, due to either unsuitable anatomy or failure of previous accesses. The options then to perform an access are either a prosthetic graft or a brachiobasilic arteriovenous fistula (BBAVF). Although better patency and lower complication rates have been described for BBAVF, grafts have some advantages: less time to cannulate, sometimes no need for maturation and ease to cannulate. Besides, BBAVF usually need transposition of the vein, meaning longer time to cannulate and almost always two interventions. This is why brachioaxillary access graft (BAG) is becoming the preferred solution in some centres. The aim of our study was to compare BBAVF with BAG in our centre in terms of patency, complication and reintervenction rates at 1 year.

Methods - From October 2014 all patients in which we performed a surgical arteriovenous access for hemodialysis were included in a registry recording demographic, technical and follow-up data, including duplex exam pre- and postoperative. We've selected patients receiving a BBAVF and compared them with those in which we performed a BAG. Primary, assisted-primary and secondary patency at 1 year were assessed using Kaplan-Meier method and compared with the log-rank test. Complications and reinterventions between groups were also recorded. A subgroup analysis was done comparing patency of BAG with two-stage transposed BBAVF (TBBAVF).

Results - 111 patients were indentified in the study period, 65 of which underwent BBAVF (40 TBBAVF) and 46 BAG. The median age was 71 years. The median follow-up was 14,8 months (CI 95% 12,8-16,8). The groups were well matched for gender, age, dyslipidemia, diabetes, coronary disease, cardiac insufficiency, peripheral arterial disease, obesity, hypercoagulability, antiagregant/anticoagulant treatment, and previous ipsilateral central vein catheter (X^2). There were more hypertensive (92,3% vs 76% ; X^2; p=0,017) and current smokers in the group of BBAVF (15,4% vs 6,5%; X^2; p=0,0001). The BAG group had more previous ipsilateral accesses (58% vs 32,3%; X^2 ; p=0,015) and were more often in dyalisis than the BBAVF group (76,1% vs 45%, X^2; p=0,001). One year primary, assisted-primary and secondary patency were 67,7%, 78,5% and 78,5% in the BBAVF and 30,4%, 37% and 50% in the BAG group (p=0.27, p=0,2, p=0,015; log rank). In the subgroup analysis, one year primary, assisted-primary and secondary patency were 82,5%, 72,5% and 82,5% in the TBBAVF group compared to 30,4%, 37% and 50% in the BAG group (p=0,5, p=0,071, p=0,04; log rank). The median time to cannulate the access was significantly longer in the BBAVF than in the BAG group (5,9 vs 2,3 months; p=0,0001; Mann-Whitney U test). The total complication and reintervention rates were higher in BAG than BBAVF (106% vs 37%; p=0,001 and 67,5% vs 13,8% p=0,008, respectively).

Conclusion - Our study shows that BBAVF have clearly better patency rates than BAG, with statistically significant difference in secondary patency. Their complication and reintervention rates are also smaller, although time to cannulate was longer.

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O-162 A SYSTEMATIC REVIEW OF 88 REPORTED CASES OF ISCHAEMIC MONOMELIC NEUROPATHY FOLLOWING VASCULAR ACCESS PROCEDURES

VASCULAR ACCESS

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Introduction - Ischaemic monomelic neuropathy (IMN) is a rare neurological complication of vascular access surgery which can lead to irreversible chronic pain and functional loss. It is estimated to affect 0.5% of vascular access procedures, yet its pathophysiology remains poorly understood and the diagnosis is often missed. Most authors recommend immediate ligation of the vascular access in suspected cases. However, an evidence-based consensus on optimal management has not been reached.

Methods - A systematic review of the literature was performed in accordance with the 2009 PRISMA statement. PubMed, MEDLINE, the Cochrane Library, Scopus, Web of Science and Google Scholar were searched from their inception to 31st July 2017, using the terms "ischaemic monomelic neuropathy" or "ischemic monomelic neuropathy". Case reports unrelated to vascular access or containing insufficient data were excluded. The dataset was used to compile a descriptive summary of reported cases and to perform quantitative analysis of the effectiveness of available management strategies.

Results - 88 reported cases were identified. 94.3% of cases used the brachial artery for inflow. There were no reported cases of IMN associated with forearm access. 2 cases (2.3%) occurred following revisional surgery on a pre-existing vascular access. 2 patients (2.3%) had a history of previous IMN. Patients who developed IMN were predominantly female (61.4%) and diabetic (72.7%), and experienced onset within 24 hours of access creation (76.1%). Symptoms included muscle weakness (69.3%), pain (64.8%), numbness (33.0%), paraesthesia (36.4%), swelling (20.5%) or a cold extremity (15.9%). Peripheral neurological examination findings included objective motor (69.3%) and sensory (50.0%) deficits or deformity (23.9%).
65 patients (73.9%) underwent surgical or endovascular interventions and 23 patients (26.1%) were managed conservatively. 47 patients (53.4%) underwent ligation and 18 patients (20.5%) underwent access-preserving interventions, including banding (13.6%), distal revascularisation and internal ligation (DRIL) (3.4%), and proximal arterial angioplasty (3.4%). Favourable outcomes, defined as clinically significant recovery or complete resolution of symptoms, occurred in 54.4% of patients with access ligation, 27.8% of patients with access-preserving interventions and 26.1% of patients managed conservatively (p=0.0375). 10 patients (15.4%) received intervention within 24 hours of symptom onset. Favourable outcomes occurred in 80.0% of patients treated within 24 hours and 44.7% of patients treated after 24 hours (p=0.0555).

Conclusion - Patients at highest risk of developing IMN appear to include women, diabetics and those with brachial artery access. Despite this, it is essential to consider the diagnosis in anyone with disproportionate pain or neurological deficits following vascular access procedures. Efforts to increase awareness amongst both staff and patients would facilitate early recognition. Ligation of the vascular access at the earliest opportunity, ideally within 24 hours, offers the best chance of a favourable outcome. However, the magnitude of any neurological recovery following ligation is offset by the consequences of the loss of a functioning vascular access, and the need for further access creation with a risk of recurrent IMN. Optimal management therefore necessitates careful

shared decision-making with each individual patient. A prospective registry of cases would provide valuable additional research data.

O-163 CENTRAL VENOUS ACCESS PORTS : UPPER ARM COMPARED TO CHEST DEVICES: LONG-TERM RESULTS

VASCULAR ACCESS

Author(s) - Renske Konings*[1], Niels Vos[1], Zjir Rashaan[2], Jorianne de Nie[2], Peter van den Akker[1], Cagdas Ünlü [1]

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Introduction - Recent years the application of peripherally implanted venous access ports is expanding, while there is still debate in the literature whether this method would result in more or less short and long-term complications. The aim of the study is to compare the peripherally implanted (UAIVAP) and central (CIVAP) using clinically relevant outcomes in a large cohort of patients.

Methods - In this retrospective study all consecutive access ports implanted between 2006 and 2016 in two affiliating hospitals were analyzed. Outcome measures were divided in short term complications including hematoma, infection, thrombosis and pneumothorax and long term complications such as patency, re-intervention rates, time of procedure, catheter related complications (thrombosis, infection, dislocation, rotation).

Results - A total of 236 ports were placed, of them 126 UAIVAP (mean follow-up 560 (10 – 2252)) and 110 CIVAP (mean follow-up 693 (1 – 3899)). Implantation of UAIVAP was successful in all cases, CIVAP was aborted in 2 cases. There was no significant difference between the two groups in short term outcome. In long-term complications there were significant less complications in the UAIVAP group (CIVAP 34/109 vs UAIVAP 20/109 p=0.006). In addition, as a result, a higher number of ports were removed because of complications (16/126 (group 1) vs 33/77(group 2) (p=0,001). There was no difference in incidence of clinically relevant infection or thrombosis. In addition, duration of operation was shorter for peripherally implanted ports.

Conclusion - UAIVAP is safe, fast and technical success rate is high. It has significant less long-term complications and less ports were removed due to complications. Although it has comparable short-term complication rates the risk of major complications such as hematopneumothorax are reduced to zero. Moreover, they are less likely to require removal before completion of therapy.

O-164 FIRST-IN-HUMAN STUDY OF BIOTUBE VASCULAR GRAFTS: A 2 YEAR FOLLOW-UP IN A BYPASS MODEL OF STENOSED AV SHUNT

VASCULAR ACCESS

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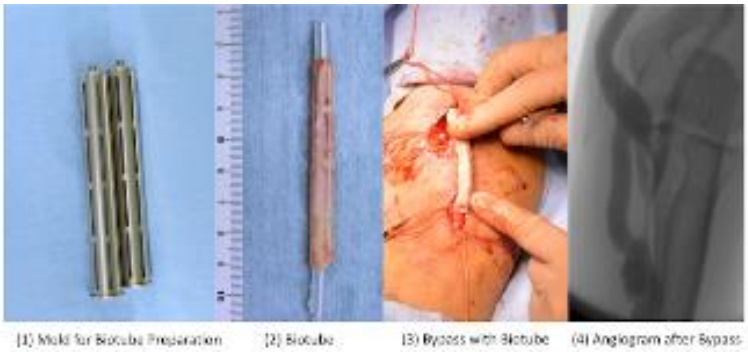
Introduction - An arteriovenous (AV) fistula is the current gold standard for chronic hemodialysis access. However, a substantial number of shunt will fail because of stenosis or obstruction at anastomotic site or venous outflow. Tissue-engineered blood vessels have been proposed for dialysis access as an alternative to prosthetic grafts. We developed autologous collagenous tubular tissues Biotubes based on in-body tissue architecture (iBTA), which is a novel regenerative medicine technology by using a patient's body as a bioreactor. This report presents the results in the first-in-human study up to 2 year follow-up in the first two patients bypassed with an autologous Biotube.

Methods - Two female patients had end-stage renal disease and had been receiving heamodialysis with a high probability of failure, because of repeatable stenosis about every 2 or 3 months at venous outflow regions over 1 year. Biotube with 5 or 6 mm

in diameter and 7 cm in length (**2** in photos) was prepared as autologous collagenous tubular tissues with wall thickness of ca. 1 mm by subcutaneous embedding of the molds (**1** in photos), assembled with a silicone center rod and a stainless steel pipe, into patients abdominal pouches for 2 months.

Results -The Biotubes after stored for 1 day in a 70% alcohol solution and washing with a saline solution before surgery were bypassed by end-to-side anastomoses over venous stenosis region of an AV shunt (**3** in photos). Palpable thrill and typical turbulent flow pattern by pulsed-wave Doppler were observed. Monthly angiography showed little change in the implanted grafts with no signs of dilation or stenosis with time points up to 3 months (**4** in photos). Although shortening of the Biotubes occurred, dialysis was possible without requiring balloon expansion for 2 years.

Image -



Conclusion - This long-term follow up study successfully supported the concept of creating dialysis access by Biotube grown in patient's subcutaneous pouches.

O-165 IMMEDIATE ACCESS ARTERIOVENOUS GRAFTS DECREASE CATHETER DAYS AND COMPLICATIONS

VASCULAR ACCESS

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Introduction - Immediate-access arteriovenous grafts (IAAVG) can be used as peripheral access or in combination with outflow through the Hemodialysis Reliable Outflow (HeRO) graft. This study compares IAAVG to standard arteriovenous grafts (SAVG) as well as describing IAAVG use with HeRO outflow.

Methods - All patients who underwent placement of AV graft from 1/2014 - 4/2016 at two large tertiary referral centers were retrospectively identified in the electronic medical record and through the Vascular Quality initiative (VQI). Patients were divided into three groups based on the type of graft implanted (SAVG and IAAVG) and a third group of HeRO/IAAVG. Patient comorbidities, graft configuration, operative characteristics and subsequent follow-up were collected and analyzed with respect to primary patency, primary assisted patency, and secondary patency. Additional outcomes included graft-related complications, time to first canulation, time to tunneled catheter removal, catheter-related complications and overall survival. Patency was defined per Society for Vascular Surgery recommended reporting standards and was determined from the time of the index procedure. Chi-square, Kaplan-Meier and Cox regression analysis were used with the p-value set as significant at <0.05

Results - 254 grafts were identified; 148 SAVG, 62 IAAVG, 44 combined IAAVG-HeRO. Patient characteristics were similar between groups, except for more pre-operative central venous occlusions in the IAAVG vs SAVG (16.3% vs 6.8%, p<0.04) and these vs IAAVG/HeRO (100%, P<.001) . Of the IAAVG group, 50 were Acuseal (Gore) and 12 were Flixene (Atrium). IAAVG/HeR0 patients all used Acuseal. Standard AVG were all ePTFE (Gore Medical). Overall primary, primary assisted, and secondary

patency at 6 months were 35.9%, 43.6%, and 51.3% respectively for IAAVG/HeRO. Primary patency at 1 year (SAVG: 39.4%, IAAVG: 56.7%, p=0.4), and secondary patency (SAVG: 50.7%, IAAVG: 52.1%, p=0.73) showed no significant differences. Similarly, there were no significant differences in primary (SAVG: 29.0%, IAAVG: 43.7%, p=0.4) or secondary patency (SAVG: 42.3%, IAAVG: 46.3%, p=0.73) at 18 months. Regression analysis did not show any association to the type of graft; however, IAAVG patients required fewer additional procedures to maintain patency (mean number of procedures 0.99 SAVG vs. 0.61 IAAVG, p=0.025). There was no difference in steal syndrome (SAVG: 6.8%, IAAVG: 8.1%, p=0.74).) or graft infection (19.0% SAVG vs. 12.0% IAAVG, p=0.276). 75% of all grafts were successfully canulated, with shorter median time to first canulation in the IAAVG group (6 days IQR 1-19) compared to the SAVG group (31 days, IQR 26-47) (p<0.01). For IAAVG/HeRO) patients, 95% of grafts were successfully canulated with mean time to canulation of 13.0±51.6 days. 53% of IAAVG/HeRO patients left the OR with this graft as their only access. This group had 100% canulation success at < 24 hours. 65.75% of all pre-existing catheters were removed, with a shorter median time until catheter removal in the IAAVG cohort at 34 days (IQR 22-50) versus 49 days (IQR 39-67) in the SAVG group (p<0.01). Catheter-related complications occurred less frequently in the IAAVG group (16.4% vs. 2.9%, p<0.045).

Conclusion - IAAVGs allow earlier canulation and tunneled catheter removal, thereby significantly decreasing catheter-related complications. Patency and infection rates were similar between SAVG and IAAVG, but with fewer secondary procedures performed in IAAVG.

O-166 NEW TECHNIQUE: MINI-INVASIVE PROXIMAL CONTROL OF THE BLEEDING AFTER HIGH INGUINAL PUNCTURE

MISCELLANEOUS

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Introduction - There is growing amount of procedures with percutaneous inguinal access with large sheath patients who are very old and fragile. The bleeding or growing pseudoaneurysm at the access site is a typical complication, which need open surgical repair. Especially repair of punctures over inguinal ligament are related remarkable blood loss even with very talented surgeon. There is a need for development of the repair treatment.
This new technique is very easy, simple and there is no need for x-ray or special equipments or skills.

Methods - The treatment start for exposure of the superficial or common femoral artery just distal from the bleeding level. Then arterial puncture, J-wire 0.036" up to 20cm from inguinal level (J-wire did not go easily puncture hole) and then introducing 10cm long 7fr sheath. Then through the sheath no.4 standard Fogart balloon catheter just outside to the sheath about 10cm above inguinal ligament and fulfill the Fogart balloon. If working, there is not anymore pulse at the Common femoral artery. If not working, the balloon can be taken backward few centimeters surely inside iliac external vessel and fullfil again. Now there is proximal control of the injured area and the distal control is just taken by normal clamping. If the sheath or balloon location is not sure, the c-arm can be easily used and contrast media can be also in the balloon.

Results - In our Hospital we have treated ten case during years 2014-2017. Four of the cases have been done by trainees without senior and six cases by specialist. Mean bleeding have been 60ml (30ml - 250ml) and there have been 5 cases after external iliac artery puncture of large sheet (18fr to 22fr) and some very obese patient. There was no need for c-arm use. Trainees did not want to use old basic technique anymore.

Conclusion - In overall, this new technic is simple, and can be done with basic skills of vascular surgery. Especially technic is usefull for patients who can not tolerate bleeding and obese patients or patients with iliac artery injury.

O-167 ACHIEVING CONSENSUS TO DEFINE CURRICULAR CONTENT FOR SIMULATION-BASED EDUCATION IN VASCULAR SURGERY: A EUROPEAN-WIDE NEEDS ASSESSMENT INITIATIVE

MISCELLANEOUS

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Introduction - Vascular surgery has evolved significantly over the last decade with a dramatic increase in endovascular and decrease in open procedures. Furthermore, “learning by doing” is no longer possible due to the European Working Time Directive and increased emphasis on patient safety (1). To face these challenges, simulation-based education has been adapted in vascular surgery to allow trainees to learn and practice technical skills to become proficient surgeons (2-4). Unfortunately, the development of simulation-based education largely depends on availability of equipment, coincidence or local interests rather than complying with a systematic educational plan (5). The development of a structured curriculum should start with problem identification and a general needs assessment (6). The objective of this study was to perform a European-wide needs assessment to identify technical procedures in vascular surgery that should be included in a simulation-based curriculum.

Methods - A three-round Delphi survey was initiated among 189 predefined key persons from 35 countries across Europe who were identified according to their positions in the European Society for Vascular Surgery (ESVS councillors and councilor-nominated persons, Executive Committee, Academy, European Vascular Surgeons in Training, Vascunet, and guidelines committee members), the European Journal of Vascular and Endovascular Surgery, and Union Européenne des Médecins Spécialistes (national delegates). All communications were sent individually. The first round was a brainstorming phase to identify technical procedures that a newly qualified vascular surgeon should be able to perform. The answers were analyzed qualitatively. The second round investigated how often the identified procedures were performed, the number of surgeons that should be able to perform the procedures, if simulation is feasible and the risk for the patient. A needs assessment formula enabled pre-prioritizing of the procedures (5). Round 3 included elimination and re-ranking of procedures. Only procedures that gained more than 70% support were included. Non-responders from one round were not included in the next. An international steering group consisting of open and endovascular surgeons and medical educators governed the entire process.

Results - The response rates in the three rounds were 75% (142/189), 89% (126/142), and 85% (107/126), respectively. In the final list, 26 out of 56 procedures were eliminated, resulting in a prioritized list of 30 technical procedures for simulation-based education (table 1). We found that 53%, 40% and 7% of the procedures were open procedures, endovascular procedures and imaging, respectively. The top five procedures were basic open skills, basic endovascular skills, vascular imaging interpretation, peripheral bypasses and aortoiliac angioplasty. Among the eliminated procedures were peripheral pressure measurement, wound management, open management of complications, major amputations and advanced endovascular skills.

Image -

Table 1: Final list of prioritized technical procedures for simulation-based training in Vascular Surgery	
1	Basic open skills (anastomosis training, instruments, sutures, prosthesis, clamping techniques, patches)
2	Basic endovascular skills (endovascular tools, radiation safety, US access, arteriography)
3	Vascular imaging interpretation (arteriography, CTA and MRA)
4	Peripheral bypass (Infrainguinal, above knee, below knee, crural, intraoperative flow measurement)
5	Aortoiliac angioplasty
6	Above knee angioplasty
7	Femoral endarterectomy (profunda plasty, patch)
8	Open embolectomy of upper and lower limb
9	Basic EVAR and sizing
10	Carotid thromboendarterectomy (CEA)
11	Vascular access surgery, hemodialysis (radiocephal fistula, brachiocephal fistula, fistula thrombectomy, bridge graft, DRIL)
12	Open management of pseudoaneurysms
13	Open management of ruptured AAA
14	Open AAA resection (tube or bifurcated graft)
15	Basic vascular ultrasound (aorta, varicose veins, DVT, fem-pop, bypass, pseudoaneurysms)
16	Open management of varicose veins
17	Endovascular closure devices
18	Minor amputations (finger, toe, forefoot)
19	Open management of vascular trauma
20	Endovenous management of varicose veins
21	Endovascular management of ruptured AAA (EVAR, REBOA)
22	Aorto-bifemoral, aorto-biiliacal and iliac-femoral bypass due to occlusive disease
23	Extra anatomical bypass lower limb (fem-fem, axillo fem, obturator)
24	Basic TEVAR (aneurysm) and sizing
25	Fasciotomy
26	Open resection of femoral and popliteal aneurysms (medial/posterior approach)
27	Below knee angioplasty
28	Endovascular management of pseudoaneurysms (trombin injection, covered stent)
29	Endovascular management of vascular trauma
30	Angioplasty of vascular access for hemodialysis

Conclusion - This general needs assessment aims to facilitate the development of a relevant simulation-based curriculum targeted to current training needs. The prioritized list of technical procedures from this ESVS-supported project should be used as a guide in the planning and development of future simulation-based education for vascular surgeons across Europe.

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O-168 PRE-OP CORONARY CTA-FFRCT EVALUATION OF PATIENTS WITH NO CARDIAC HISTORY WHO ARE UNDERGOING PERIPHERAL VASCULAR SURGERY MAY REDUCE THE RISK OF POST-OP MI/DEATH

MISCELLANEOUS

Author(s) - Dainis Krievins* [1], Edgars Zellans[2], Andrejs Erglis[3], Kaspars Kisis[1], Ligita Zvaigzne[4], Aigars Lacis[1], Gustavs Latkovskis[3], Christopher K. Zarins[5]

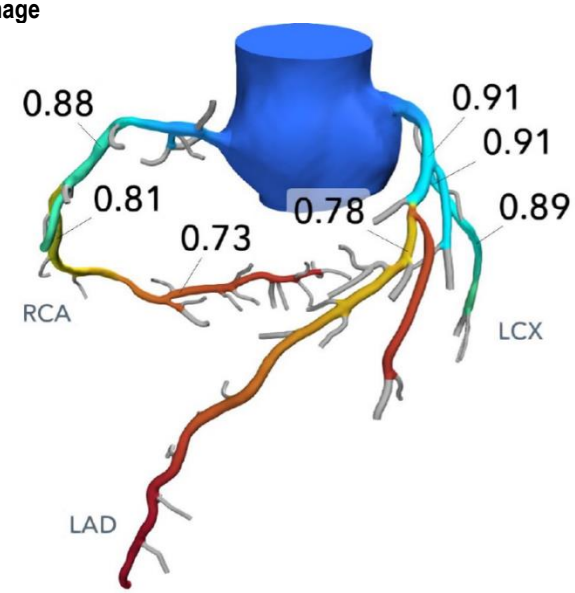
Institution(s) – [1]Vascular Surgery, [2]Anesthesiology, [3]Cardiology, [4]Radiology, Pauls Stradins Clinical University Hospital, Riga, Latvia, [5]HeartFlow, Inc., Redwood City, United States

Introduction - Patients undergoing carotid, aortic or peripheral vascular surgery (PVS) have increased risk of post-op MI/death due to coexistent coronary artery disease, but the value of pre-op cardiac testing is uncertain. A new non-invasive diagnostic modality, coronary CT angiography (CTA) and computed fractional flow reserve (FFR_{CT}), can reliably identify ischemia-producing coronary stenosis in stable chest pain patients (ref. 1,2,3) but its use for pre-op coronary risk assessment in PVS patients has not been reported. We performed pre-op CTA-FFR_{CT} in patients with no cardiac history undergoing PVS in a prospective IRB-approved study and compared outcomes to a Registry of similar vascular patients with no cardiac history who underwent PVS during the preceding 18 months.

Methods - Beginning Oct 2017, patients with no cardiac history and normal EKG admitted for elective PVS signed informed consent and underwent pre-op CTA -FFR_{CT} evaluation with results available in <24 hours. Functionally significant coronary stenosis was defined as $FFR_{CT} \leq 0.80$ distal to a stenosis in one or more coronary arteries >2mm in diameter. CTA-FFR_{CT} patients were compared to Registry patients with respect to MACE (MI, acute coronary syndrome, stroke, death).

Results - Coronary CTA was performed in 88 PVS patients with image quality suitable for FFR_{CT} analysis in 80 (91%) despite extensive coronary calcification (median calcium score 718, range 10-4135, 42% >1000). CTA-FFR_{CT} patients (n=80) were no different from Registry (n=192) with regard to age (66±9 v. 67±8 years), gender (81% v. 82% male), cardiac risk factors, pre-op ABI or vascular surgical procedures performed. Most CTA-FFR_{CT} patients (55/80, 69%) had functionally significant coronary stenosis ($FFR_{CT} \leq 0.80$) with multivessel disease in 58% (Figure). Nonetheless, PVS was performed as scheduled in 74/80 (93%) with no post-op MI/death. PVS was postponed in 6 patients due to CTA-FFR_{CT} results: 2 had coronary angiography and coronary revascularization (stenting); 4 had medical therapy. At 30 days, MACE in CTA-FFR_{CT} was 0/80 (0%) compared to 10/192 (5.2%) in Registry (p=0.037). After 30 days, 24 CTA-FFR_{CT} patients underwent elective coronary angiography and coronary revascularization (20 with stents and 4 with CABG) with no complications or MACE events through 90 days. Longer term follow up is ongoing.

Image -



Conclusion - Pre-op CTA-FFR_{CT}reveals a high prevalence of unsuspected ischemia-producing coronary stenosis in the majority of patients with no cardiac history who undergo elective peripheral vascular surgery. Increased focus on peri-and post-operative cardiac care of vascular surgery patients with functionally significant coronary stenosis may reduce MI/mortality and improve survival.

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O-169 ACCURACY OF PET/CT IN THE DIAGNOSIS OF VASCULAR GRAFT INFECTIONS

MISCELLANEOUS

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Introduction - Vascular graft infections (VGI) have an incidence of 1 to 6 %. Positron emission tomography/computed tomography with 18F-fluorodeoxyglucose (FDG-PET/CT) has emerged as a new tool to replace nuclear scintigraphy. However, its clinical reliability is still unknown.
The aim of this study was to evaluate the diagnostic accuracy of FDG-PET/CT in a population with suspected VGI and to validate the quantitative value of diagnostic parameters.

Methods - This is a retrospective cohort study. FDG-PET/CT was performed in 37 patients with suspected VGI between 2013 and 2017. A reliable culture was obtained in 25 of them and were finally included in the study. VGI was considered proven only in case of a positive culture (blood, peri-graft collections or graft samples. Diagnostic accuracy was assessed comparing culture results (gold standard) with FDG-PET/CT values. We assessed maximal standardized uptake value (SUVmax), tissue-to-background ratio (TBR), and visual parameters (FDG distribution patterns and visual grading scale) in the final confirmation of the diagnosis of AGI. Receiver operating characteristics (ROC) curves were used to assess the ability of SUVmax and TBR to identify the presence and absence of VGI.

Results - The mean age was 64.32 ± 16.75 years, 72% were males. Cultures were positive in 20/25 patients. FDG-PET/CT was considered positive in 19/25 patients. Surgery was performed in 13/25 patients. Mortality was 24% (6/25 patients). The most frequent microorganism was Staphylococcus aureus (9/13 patients). All these patients were followed with long-term antibiotic treatment until negativization of tests including FDG-PET / CT.
Mean SUVmax was 6.4 ± 3.41 and TBR 2.14 ± 0.5 in all cases. For positives cultures the mean SUVmax was 7.34 ± 3.3 with a TBR 3.73 ±1.7. In the ROC analysis, the area under the curve for SUVmax was 0.56 (95% CI: 0.30-0.84) and for TBR was 0.53 (95% CI:0.27-0.78). A SUVmax cut off point of 4.5 yielded a 91,7% Sensitivity (Sens) and 50% Specificity (Spec). A TBR cut off point of 2.9 yielded 58% Sens and a 60% Spec with a positive predictive value of 73.68% and negative predictive value of 83.33%.

Conclusion - FDG-PET/CT may be a useful tool in the diagnosis and surveillance of VGI. Nevertheless, the accuracy of quantitative parameters is jeopardized by the uncertainty of gold standard based on microbiology data. Further and larger registers with standardized measurements are needed to establish a more reliably parameters, necessary to take difficult decisions in this kind of patients.

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O-170 DOES FRAILTY PREDICT OUTCOME IN VASCULAR PATIENTS? AN ASSESSMENT OF FRAILTY IN OLDER VASCULAR INPATIENTS AND IMPLICATIONS ON OUTCOME IN A SINGLE VASCULAR UNIT

MISCELLANEOUS

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Introduction - The UK has an ageing population with 18% of the population over 65 years and with this projected to increase over the next 30 years. Increasingly elderly patients represent the vascular surgery patient population and have complex medical and social needs. Planned proactive input from a care of the elderly physician has been shown to reduce morbidity and length of stay for these patients. The aim of this study was to investigate levels of frailty and outcomes in vascular patients over the age of 65.

Methods - All patients over the age of 65 years admitted to the single vascular unit during a 3-month period (26th June 2017 - 25th September 2017) were included in this study. Data were collected prospectively including demographics, mode of admission, procedure type and the Edmonton Frail Scale(EFS). Primary outcome measures were the length of stay, mortality and discharge destination.

Results -151 patients over the age of 65 years (105 (69.5%) male with a median age of 76 [Interquartile Range, IQR = 71-82] years) were admitted during the study period. 50 (33%) were 80 years or older, 7 (4.6%) were 90 years or older. The majority (105 (69.5%)) were admitted acutely and the majority (120 (79.5%) were admitted from home. 15 patients died giving an overall mortality rate of 9.9%.
Frailty scores were obtained for 97 patients, of whom 44 (45%) were considered not frail, 25 (26%) vulnerable, 16 (16%) mildly frail, 6 (6%) moderately frail and 6 (6%) severely frail. Frail patients (EFS >7) had a longer hospital stay (median 11.5 [6.25-31] versus 6 [3-13] days, p=0.018). Although there were more deaths in the frail group (3/53 (5.7%) versus 1/44 (2.3%)) this did not reach statistical significance (p=0.4). Only half of the moderate or severely frail patients were discharged to their own home.

Conclusion - Frailty is common amongst patients over the age of 65 years admitted to vascular surgery and was associated with an increased length of stay in this study. Identifying frail patients may represent a useful way of targeting care of the elderly resource use to improve outcomes in elderly patients.

O-171 FACTORS INFLUENCING NON-PULMONARY ARTERIAL INVOLVEMENT RECURRENCE IN PATIENTS WITH BEHÇHET DISEASE

MISCELLANEOUS

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Introduction - Behçet disease (BD) is a chronic, relapsing, multisystemic disorder characterized by mucocutaneous, ocular, vascular and central nervous system manifestations.The concept of vasculo-Behçet has been adopted for cases in which vascular complications are present and often dominate the clinical features. Vasculo-Behçet patients are at risk for multiple vessel-related complications.
BD significantly increases morbidity and mortality. Male gender, arterial involvement and a high number of flares are independently associated with mortality in BD. While venous manifestations are frequent and have been reported in many publications, data

regarding arterial lesions in BD are rare and often isolated. Vascular surgery is challenging in BD patients and mortality is high mainly due to anastomotic relapses and graft thrombosis.
There is currently no consensual technique for the surgical management of these patients. The main fear in these patients, apart from bypass thrombosis, is the formation of false anastomotic aneurysms in the near future, requiring iterative interventions and threatening the patient's survival in case of rupture.
The aim of this study is to retrospectively evaluate factors influencing post-operative arterial recurrences in patients with BD associated to non-pulmonary arterial involvement.

Methods - Monocentric retrospective study in patients with BD operated between my 1996 and September 2015. BD's diagnosis was based on criteria from the international Study Group of Behçet Disease. Recurrence was defined as the occurrence of an aneurysmal arterial involvement confirmed by ultrasound or CT-scan. We have distinguished between recurrence at the same arterial site and recurrence at a different site. The influence of pre- and/or post-operative immunosuppressive treatment on recurrence was also evaluated. A technical trick to reinforce the anastomosis consisted in sleeveing the anastomosis with a short additional prosthesis segment. The influence of anastomotic sleeving on the occurrence of recurrence was evaluated.

Results - Twenty-three patients with BD and arterial involvent were included in our study. A total of 47 procedures were performed, averaging 2.1±0.8 procedures per patient.
Among operated patients, recurrence occurred in 74% of cases. 48% had one relapse (11/23), 22% had 2 relapses (5/23) and 1 patient had 3 relapses (4%). Of the 24 recurrences, 9 (37%) occurred early. The same anatomical arterial site was concerned in 92% of cases. The influence of preoperative treatment on the occurrence of recurrence showed that 71% (15/21) of treated patients did not recur whereas 69% (16/23) of untreated patients recurred OR=0.18 IC95%[0.03;0.75 (P=. 015). 91% (10/11) of untreated patients recurred OR=0.12 CI 95%[0.002;1.207] (P=. 004) while post-operative patients did not recur in 61% (19/31). The absence of sleeving increased the risk of recurrence by a factor of 3 for false anastomotic aneurysm HR=3.14 IC 95%[1,085;9,100] (P=. 034).

Conclusion - This study confirms the need for targeted perioperative treatment to reduce the risk of recurrence. The use of anastomotic sleeving should be generalized when the open surgical option is decided. This patients should be specifically monitored.

O-172 COLONIC ISCHEMIA AS AN EARLY MARKER OF ACUTE MESENTERIC ISCHEMIA

MISCELLANEOUS

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Introduction - Acute mesenteric ischemia (AMI) and colonic ischemia (CI) share risk factors and pathophysiologic mechanisms and they may be quite intricate and appear in the same patient simultaneously or in different time frames. However, in the majority of patients with CI a specific major vascular lesion cannot be identified, as opposed to AMI.
According to the American College of Gastroenterology (ACG), CT angiography should be performed in all patients with severe CI in order to exclude AMI.
The main purposes of this study were to stratify CI severity to determine if there was an association with AMI, and to identify determinants of AMI in severe CI.

Methods - All patients admitted in our centre in a 5-year-period with the diagnosis of CI were retrospectively reviewed. Statistical analysis was performed with SPSS V25

Results - A total of 241 patients were included, 213 with isolated CI and 28 with CI+AMI. No cases of AMI were found in mild CI but 1.5% of moderate CI and 56.8% of severe CI had simultaneously AMI.

The severe isolated CI was compared with the severe CI+AMI group. Hematochezia was more frequent in isolated CI ($p<0.001$) whereas isolated right CI was more common in CI+AMI ($p<0.01$). Lactate level was significantly higher in the CI+AMI (7.6±4.6 Vs 2.4±1.3; $p=0.001$). Atrial fibrillation and coronary disease were more common in the CI+AMI ($p<0.05$). Global mortality rate was 16.7% in isolated CI, whereas in CI+AMI it reached 77.8% ($p<0.001$).

Conclusion - The knowledge of an association between CI and AMI prompts to look for underlying occlusive vascular disease in patients with severe CI. Our results support the ACG recommendation for CT angiography in all patients with severe CI. Elevated lactate level, right isolated CI, atrial fibrillation and coronary disease are predictors of AMI in patients with severe CI in this study.

O-173 3D PRINTED AORTIC MODELS AS A TEACHING TOOL FOR TRAINEES IN VASCULAR SURGERY

MISCELLANEOUS

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Introduction - Thorough understanding of geometrical features of patient's anatomy has a paramount importance in aortic disease management [1]. 3D-printing allows to produce patient-specific replicas of anatomical parts in a relatively time- and cost-effective manner. This technology has been used as a teaching tool in other fields of medicine, and its role in vascular surgery has to be better defined [2].
The aims of our study were to collect preliminary data on the use of 3D printing as a teaching tool for vascular surgery trainees and to validate a questionnaire addressing understanding of aortic disease in the educational setting.

Methods - Six models of aortic disease have been 3D-printed from anonymized patients' CT-angiography imaging. Accurate segmentation of the aortic lumen was carried out with a semiautomated algotithm [3]. Virtual models were generated and edited, including the addition of a junction mechanism. The Vat-photopolymerization technique was used to create disassembling models in transparent rigid resin. The models were displayed to surgical trainees during a frontal lecture. A questionnaire to measure the improvement in understanding from before (T0) to after (T1) the 3D printed model demonstration was developed and validated in terms of face and content validity, construct validity and internal consistency [4].

Results - A panel of 15 experts (four experts in methodology, 11 vascular surgeons) participated in evaluating face and content validity of the questionnaire. The items of the questionnaire were relevant and appropriate (content-validity-ratio, 0.6 to 1.0, median 0.9; scale-content-validity-index = 0.99).
The models were displayed to 37 trainees, including a model in which a stent graft had been previously deployed inside, so as to simulate the intervention. Visual and tactile exploration of the luminal surface of landing zones was possible by detaching the models. All the trainees answered the questionnaire. The correlation matrix of the questionnaire was suitable for factor analysis. The study of the eigenvalues, the scree test and the semantic interpretation of the items suggested the extraction of one dimension. Fit indices confirmed that the mono-dimensional structure of the questionnaire was adequate, and the mean of the items could be used to measure the understanding. The exploratory-factor-analysis model using one factor solution explained 59% of the total variance at T0 and 65% at T1. The study of the internal consistency was good (α Cronbach = 0.82 at T0; 0.88 at T1).
The median score (interquartile range, IQR) was 7.3 (1.71) at T0 and 7.6 (1.15) at T1. The change in understanding was positive, showing a significant improving from T0 (median=7.25; IQR=1.50) to T1 (median=8.00; IQR=1.50; Z=-3,091; P=0.002).
Image -

Conclusion - The use of 3D-printed aortic model as a teaching tool was feasible and improved understanding of aortic disease among vascular surgery trainees.

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O-174 DIAGNOSIS AND TREATMENT OF NEUROGENIC THORACIC OUTLET SYNDROME (NTOS) ACCORDING TO A DEDICATED CARE PATHWAY: A PROSPECTIEVE COHORT STUDY IN THE NETHERLANDS

MISCELLANEOUS

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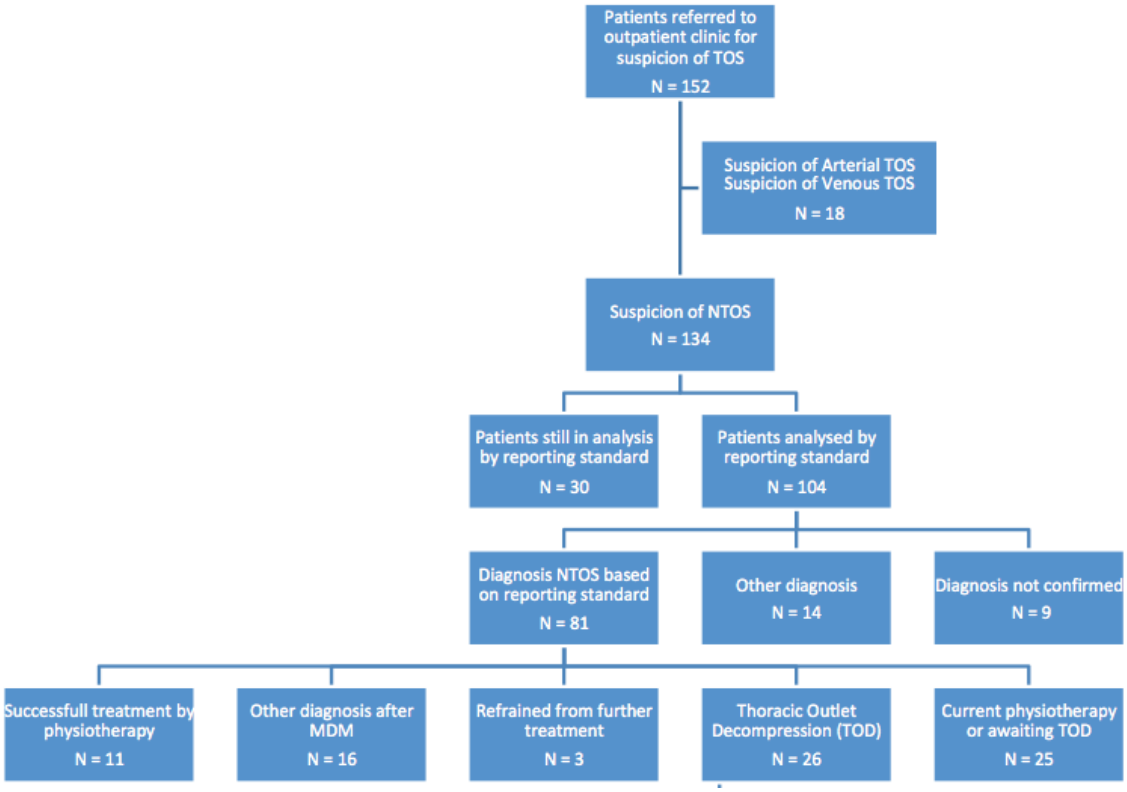
Introduction - Neurogenic thoracic outlet syndrome (NTOS) is a condition caused by compression of the brachial plexus serving the upper extremity. The clinical presentation of NTOS is characterised by pain, paresthesia, numbness and/or muscle weakness of the neck, arm or hand. Unfortunately, diagnosis and therapy of NTOS remain disputed. The recently published reporting standards for thoracic outlet syndrome (TOS) by the Society of Vascular Surgery aim to produce consistency in diagnosis, description of treatment and assessment of results to allow for more valuable data to be reported[1]. In this prospective cohort study, these reporting standards are implemented into a 'NTOS care pathway'. Here, we present this dedicated protocol as well as our first results.

Methods - All patients suspected for TOS that were referred to our clinic between January 1st and December 31 (2017) were included in the study cohort. Diagnosis and treatment was performed according to the reporting standards[1]. The diagnosis NTOS was defined according to the CORE NTOS criteria[2]. Post-operative outcome was scored by comparing pre- and postoperative TOS Disability Scale, Cervical-Brachial Symptom Questionnaire (CSBQ) and Disabilities of the Arm, Shoulder and Hand (DASH) questionnaires.

Results - The flowchart of enrolled patients is depicted in figure 1. In 2017, 152 patients were referred under the suspicion of TOS. NTOS was suspected in 134 of these patients (women 73%; age 44 ±15 years). At time of writing, 104 patients completed the analysis of NTOS by the reporting standard. 81/104 patients (78%) met the reporting standard criteria for NTOS. In 9/23 patients diagnosis was not confirmed, and in 14/23 patients another diagnosis was established. Specialized physical therapy was successful in 11/81 (14%) patients. In 16/81 (20%) patients another diagnosis was made after a dedicated NTOS multidisciplinary meeting. 3/81 (4%) patients refrained from further treatment. 26/81 (32%) patients underwent transaxillary thoracic outlet decompression (TOD) with neurolysis and 25/81 patients (31%) are currently treated with physical therapy, or are awaiting TOD surgery. 3 months after TOD, the TOS disability scale decreased from 7.90 to 3.10 ($p<0.001$), the CSBQ from 85.90 to 19.90 ($p<0.001$) and the DASH from 59.42 to 24.33 ($p<0.001$). So far, a 3-month patient-reported outcome is documented in 18 patients who underwent TOD surgery. 10/18 patients are complaint free and very satisfied, 7/18 patients show objective improvement and are satisfied with the postoperative result. In 1 patient TOD offered no improvement. Severe complications (hemorrhagic events, brachial plexus injury, pneumothorax, re-intervention) did not occur. Mean hospital admission was 1,77 (±0,70) days.

Image -



Conclusion - Systematic work up of patients suspected for NTOS according to a care pathway based on the reporting standards gives good guidance on diagnostics and treatment of this population. Short and long-term results must be awaited.

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O-175 SPATIAL DISTRIBUTION OF ABDOMINAL AORTIC ANEURYSM SURFACE GROWTH AND CORRELATION WITH DIAMETER AND VOLUME EXPANSION

MISCELLANEOUS

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Introduction - The management of Abdominal Aortic Aneurysms (AAAs) is currently based on maximum size and growth rate criteria. Large or rapidly growing AAAs are thought to be at an increased risk of rupture, thus being suitable for intervention. Size and growth are determined based on the maximum diameter alone. Nevertheless, this variable takes into account a single portion of the vessel, while expansion is non-uniform, characterized by significant spatial variability. We aim to quantify regional surface growth of a cohort of AAAs.

Methods - This is a single institution study including 31 lesions. Each AAA should have at least one baseline and one follow-up CT scan. From those, 3-Dimensional AAA models were created by semi-automated segmentation using dedicated software. Maximum orthogonal diameter and total aneurysm volume were recorded and used to calculate annual growth rate.
Regional surface growth was quantified using the VascForm algorithm, which is written in Matlab, adapted to aneurysm follow-up studies and has been recently validated.**[1]** In general it is based on non-rigid point cloud registration and the iterative closest point algorithm. Initially, surfaces are pre-aligned applying principal component analysis and a general deformation of the Source surface is performed in order to best match the Target. Then, the surfaces are finely matched through a non-rigid local deformation model and each point in the Source surface is placed closer to the Target surface. After the registration, the surface growth distribution is the discretized surface element growth distribution.
Maximum and average surface growth were calculated and correlated with the diameter and volume growth rate. The Spearman rho correlation coefficients were calculated and the statistical significance was tested using a two-tailed test. In order to identify potential correlation between intraluminal thrombus deposition (ILT) and surface growth, the co-localization of maximum surface growth with initial ILT maximum thickness was examined.

Results - Median annual surface growth was 6.7%(0%>68%) and maximum surface growth was 26%(12%>444%). Correlations between surface and diameter/volume growth are summarized in **Table 1**. In 48% of follow-ups (15/31), maximum surface growth occurred away from the site of maximum diameter and thus could not have been captured by the measurement of maximum diameter growth. Sixteen cases presented maximum surface growth away and fifteen at the region of maximum initial ILT thickness. AAAs in the former group had significantly lower initial ILT thickness (11.3 vs 19.5mm, p<0.001) compared to those in the latter.

		Dmax	Volume
MaxSurface	CorrelationCoefficient	,465	,544
	Sig. (2-tailed)	,014	,009
AvgSurface	CorrelationCoefficient	,389	,866
	Sig. (2-tailed)	,045	,000

Conclusion - Regional surface growth of AAAs is not uniform. Average and maximum surface growth are related to the diameter growth but the correlation is only moderate. Volume growth presents very strong correlation with average but only moderate correlation with maximum surface growth rate. Almost half of the lesions display maximum surface growth at a site different from that of maximum diameter. Regional growth is related to initial local amount of ILT. Surface growth provides a means to evaluate spatial distribution of AAA expansion which may be of value for rupture risk predictions.

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O-176 LANGUAGE EDITING FOR THE EUROPEAN JOURNAL OF VASCULAR AND ENDOVASCULAR SURGERY

MISCELLANEOUS

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Introduction - The remit of the language editor for the EJVES is to ensure consistency, freedom from errors and readability of the content of both the EJVES and EJVES Short Reports. The quality of the submitted articles varies widely irrespective of both the country of origin and first language of the authors. From 1 February 2013, all documents from all countries have been subjected to language editing, and to date >1000 documents have been edited.

Methods - For one year from 1 February 2017 detailed data on the country of origin, corrections per page, turnaround time, and common edits were collected. After acceptance for publication and copy editing, double line spaced copies of each article were sent to the language editor. The turnaround time was set at a maximum of 7 days to minimise publication delay.

Results - 320 documents were edited with a turnaround time of 2.4 days (0-9 days). There were 14 categories of document of which 141 (44%) were Original Articles, 56 (17.5%) were Coup d'Oeil, 42 (13.1%) were Invited Commentaries, and 21 (6.5%) each were Reviews and Editorials.
The articles were submitted from 38 countries (1-64 per country) with UK, France, Sweden, Netherlands and Italy accounting for 49%. A total of 4435 pages were edited, ranging from 1-160 pages per document. The editing time was 3:00 minutes per page (range 1:09-8:50) and was determined by the number of corrections required.
For documents of more than 3 pages (*n* = 210, average number of pages 20, total pages 4230) the number of corrections ranged from 0.87-16.8 per page, with an average per country of 3.4 for the best and 15.3 for the worst. The commonest corrections included inappropriate hyphenation, incorrect word use, spelling, order of words, mixing US and UK spelling, omission of the definite and indefinite article and word spacing errors.

Conclusion -All papers in the EJVES and EJVES Short Reports have been language edited for 5 years providing consistent, error free, readable content. The onerous job of the Senior Editor and Editor in Chief, who previously performed this task themselves, has been made significantly easier.

O-177 SHORT TERM EFFECTS OF A SPECIFIC MUSIC THERAPY INTERVENTION ON ENDOTHELIAL FUNCTION IN PATIENTS WITH PERIPHERAL ARTERIAL DISEASE (The TARREGA Trial outcomes)

MISCELLANEOUS

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Introduction - Endothelial dysfunction is the premier event triggering the peripheral arterial disease (PAD). Music is proved to activate brain pathways of the insular cortex, central nucleus of the amygdala, and lateral hypothalamus, which are involved in the integration of emotional and ambient sensory input, with corresponding autonomic responses that could improve the endothelium-dependent arterial vasodilation. The aim of this study was to assess the short-term efficacy of a specific Music Therapy intervention, based on previously tested emphasis and phrasing parameters, upon the vascular reactivity and endothelial function in healthy subjects and patients with peripheral arterial disease in early stages.

Methods - The TARREGA clinical trial was a proof-of-concept, randomized controlled parallel-group crossover study evaluating the effect of a music intervention on the flow-mediated arterial dilation (FMD) conducted in 30 healthy subjects and 60 PAD patients with Rutherford category 1-2 of recent diagnosis randomized 1:1 to bosentan-induced endothelin blockage vs. placebo for 12 weeks. The music intervention consisted in listening to a fragment of Henry Górecki's Symphony No.3, OP.36 (Symphony of Sorrowful Songs) *Lento – Cantabile semplice* for 15 minutes vs. silence for 10 minutes (control). Baseline FMD was assessed and after 10, 30, and 60 minutes of the intervention and the silence, subsequently applied in each arm of the study.

Results - FMD was increased by 3.3±1.3% ($p<0.01$; relative increase rate 37%) in healthy subjects 10 minutes after listening to the music as well as in patients without endothelin inhibition by 1.8±1.1% ($p<0.01$, relative increase rate 35%) whereas FMD wasn't found significantly increased in patients with endothelin receptors antagonists (1.3±1.2; $p=0.1$; relative increase rate 19%). No enhancement in FMD were detected after silence application.
Improvement in FMD showed in healthy individuals and patients with intermittent claudication without maintained endothelin blockage progressively got down back to baseline levels after an hour period since the music intervention.

Conclusion - Specific music based on emphasis and phrasing parameters may be able to improve the endothelial-dependent arterial vasodilation via endothelin pathway. Effects on endothelial function lasts for as long as music is listened to, sustained no longer than an hour after the intervention. These findings may have promising implications, extending the spectrum of lifestyle modifications that can ameliorate arterial function.

O-178 COCHRANE SYSTEMATIC REVIEW OF ACETYL-L-CARNITINE FOR THE TREATMENT OF DIABETIC POLYNEUROPATHY

MISCELLANEOUS

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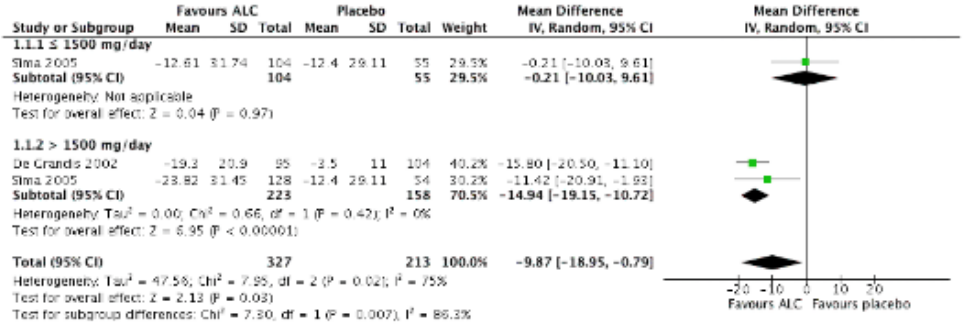
Introduction - Painful diabetic polyneuropathy (DPN) occurs in 20% of people with diabetes; a complete and comprehensive management strategy for the prevention and treatment of painful DPN has not yet been defined.
The amino acid acetyl-L-carnitine (ALC) plays a role in the transfer of long-chain fatty acids into mitochondria for β-oxidation and induces neuroprotective and neurotrophic effects in the peripheral nervous system. Therefore, ALC supplementation could have clinical therapeutic potential.
We undertook a Cochrane Review to assess the effects of acetyl-L-carnitine for the treatment of diabetic polyneuropathy[1]. This abstract is based on a draft pre-peer review version of a Cochrane Review. Upon completion and approval, the final version is expected to be published in the *Cochrane Database of Systematic Reviews* (www.cochranelibrary.com).

Methods - On 10 February 2017, we searched the Cochrane Neuromuscular Specialised Register, CENTRAL, MEDLINE, Embase, LILACS, and two clinical trials registries without any language filter. We checked references, searched citations, and contacted study authors to identify additional studies.
We included randomised controlled trials (RCTs) and quasi-RCTs. Participants could have any severity and either type of DPN, and we accepted any definition of minimum criteria for DPN: probable, confirmed, or subclinical, in accordance with the Toronto Consensus[2].
The intervention was ALC compared with placebo, other therapy, or no intervention. Pain was the primary outcome, measured as the proportion of participants with a 30%>50% decrease in pain and on a visual analogue scale (VAS) or Likert scale[3].
We used standard methodological procedures expected by Cochrane[4].

Results - Searches of the literature revealed 74 potentially eligible records from which we identified three studies (906 participants) fitting inclusion criteria and suitable for analysis. These studies provided data for two comparisons: ALC versus placebo (two trials) and ALC versus methylcobalamin (MC) (one trial). One placebo-controlled trial investigated ALC at a dose of 2000 mg/day; the other compared two doses of ALC (1500 mg/day and 3000 mg/day) and placebo. The latter trial was at high risk of bias; the other two trials were at low risk of bias.
For the primary outcome (pain measured on a 0 to 100 mm VAS), the result favoured ALC over placebo, but moderate heterogeneity was present (mean difference (MD) -9.87, 95% confidence interval (CI) -18.95 to -0.79; two studies; N = 540; P < 0.03; I^2 = 75%; random-effects). Subgroup analysis indicated that VAS scores were little different from placebo with ALC at a dose of 1500 mg/day or less (MD -0.21, 95% CI: -10.03 to 9.61; one study; N = 159; P = 0.97) but at doses greater than 1500 mg/day there was very low-quality evidence of an effect in favour of ALC (MD -14.94, 95% CI: -19.15 to -10.72; two studies; N = 381; P < 0.00001; I^2 = 0%). See the figure.
The third included study compared ALC with MC in 232 participants, but did not report effects on pain.

Image:

Forest plot of comparison: ALC versus placebo, outcome: Pain after six to 12 months



Conclusion - Low to very low quality evidence suggests that ALC may reduce pain after 6 to 12 months in people with DPN when compared with placebo; this effect may not be present at doses under 1500 mg/day. A trial comparing ALC and MC provided no data on pain relief. Further high quality studies are needed to clarify the findings.

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O-179 ACT GUIDED HEPARIN ADMINISTRATION LEADS TO BETTER LEVELS OF HEPARINIZATION IN NON-CARDIAC ARTERIAL PROCEDURES

MISCELLANEOUS

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Introduction - To prevent thrombo-embolic complications during arterial procedures (unfractionated) heparin (UFH) is administered. Almost all vascular surgeons and interventional-radiologist use a single bolus of 5000 international units (IU), regardless of procedure details or patient characteristics. During these procedures the anticoagulatory effect of heparin can be monitored using the activated clotting time (ACT). Contrary to cardiac interventions, only in a very small percentage of non-cardiac procedures the ACT is measured. Next to its beneficiary effect, heparin causes a higher bleeding tendency. Heparin has a non-linear dose-response and elimination curve in the individual patient. For non-cardiac arterial procedures there is no evidence on optimal level of ACT or optimal dosage of UFH to reach an adequate level of anticoagulation. We evaluated the effect of a fixed dose of 5000 IU UFH compared to ACT guided heparinization. Thereafter, the preliminary results of an ACT guided protocol based on bodyweight and standardized additional doses are presented.

Methods - MANCO trial: Measuring the ACT during non-cardiac arterial procedures, Clin. Trials.gov NCT 03426293). ACT was measured during open and endovascular procedures. The ACT was measured by the Hemostatis Management System Plus (Medtronic), before and 5 minutes after every administration of UFH intravenously and every 30 minutes thereafter. In group 1 no additional bolus of heparin was given. In group 2 it was aimed to reach a target ACT of 250 seconds. If the ACT was below 200

sec. a bolus of 2500 IU UFH was applied. If the ACT was between 200 and 250 sec. a bolus of 1000 IU UFH was applied. In 20 patients in group 3 first heparin bolus was based on bodyweight (100 IU per kilogram) and additional fixed doses were administered (5000 IU if ACT < 200 sec. and 2500 IU if ACT was between 200 and 250 sec.) Target ACT was also 250 seconds. Primary outcome was maximum ACT measured. Secondary outcomes were amount of heparin given and number of additional boluses UFH needed. ACT times were depicted using mean and standard deviations (± SD). Descriptive statistics were used to determine the distribution and the percentages of patients reaching an specific ACT and the total amount of heparin needed to reach an specific ACT.

Results - From December 2016 till February 2018 250 patients were included (group 1: 150, group 2: 80, group 3: 20). The baseline ACT, before administering heparin, was measured in 230 patients: mean ACT of 131 ± 17 seconds. After a standard dose of 5000 IU UFH the mean ACT was 189 ± 33 seconds (n=230). Only 5% of patients reached an ACT of 250 seconds. In the ACT guided additional dose protocol 27% of patients reached an ACT of 250 seconds. In this group the mean heparin dose necessary to reach an ACT of 250 was 8852 ± 2848 IU. Mean number of additional doses was 2, with a maximum of 6 additional doses. A negative correlation was found between bodyweight and ACT. In the group with the bodyweight based initial dose the mean ACT was 232 ± 42 seconds. Eventually, in this new protocol 47 percent of patients reached an ACT of 250 seconds.

Conclusion - A standard dose of 5000 IU heparin leads to inadequate levels of heparinization in a vast majority of the patients. ACT guided heparin administration leads to better levels of anticoagulation. Results of this MANCO trial show that it should be obligatory to measure the ACT during non-cardiac arterial procedures.

O-180 IS THERE A ROLE FOR REMOTE ISCHAEMIC PRECONDITIONING FOR VASCULAR AND ENDOVASCULAR SURGERY?: A META-ANALYSIS OF RANDOMISED CONTROLLED TRIALS

MISCELLANEOUS

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Introduction - Remote ischemic preconditioning (RIPC) is a non-invasive therapeutic strategy that uses brief cycles of blood pressure cuff inflation and deflation to protect against ischaemia-reperfusion injury. RIPC is reported to improve cardiac biomarkers in patients undergoing open vascular or endovascular surgery, but uncertainty about translation to clinical outcomes remains. The aim of this study is to assess the efficacy and safety of RIPC in high-risk vascular surgical patients.

Methods - We searched Medline, Embase, the Cochrane Central Register of Controlled Trials, scientific sessions abstracts, and relevant websites for randomised trials investigating the role of RIPC in reducing mortality and systemic injury in patients undergoing vascular/endovascular surgical procedures between January 1, 1990 and March 15, 2018. The primary efficacy outcome was peri-operative mortality and the primary safety outcome was any reported harm induced by RIPC. Secondary outcomes included cardiac dysfunction (myocardial infarction, congestive cardiac failure and new-onset arrhythimias), renal dysfunction (need for renal replacement therapy, acute kidney injury and significant change in post-operative serum creatinine levels), neurological dysfunction (stroke/transient ischaemic attack) and length of hospital and intensive care unit stay. We analysed the data with both the fixed-effects and the random-effects models using RevMan analysis. For each outcome we calculated the risk ratio (RR) (dichotomous data) or mean difference (continuous data) with 95% confidence interval (CI) based on an intention-to-treat analysis.

Results - We included eleven trials, comprising data for 973 patients randomised to have a vascular/endovascular procedure (including open and endovascular aneurysm repair, carotid endarterectomy/stenting, and lower limb revascularisation) with either RIPC (n=486; mean age 71.3 years, 82% males) or as control/sham (n=487; mean age 71.0 years, 78% males).
Patients treated with RIPC had no statistically significant difference in peri-operative mortality (Risk Ratio (RR) 1.27 [95% CI 0.54-2.97]; p=0.58), myocardial infarction (0.88[0.50-1.56]; p=0.67), composite cardiac dysfunction (1.18[0.71-1.96; p=0.54), composite renal dysfunction (1.01[0.57-1.77]; p=0.98), and neurological dysfunction (0.66[0.17-2.55]; p=0.55). There was no significant difference in length of hospital and intensive care stay. The results were similar with random-effects and fixed-effects models. Clinical and statistical heterogeneity amongst the studies was low (by visual inspection and I^2 0% to 50%). Risk of bias varied

across individual studies and they were not adequately powered for clinical outcomes causing a possible type II error. None of the studies reported any harms related to the use of RIPC.

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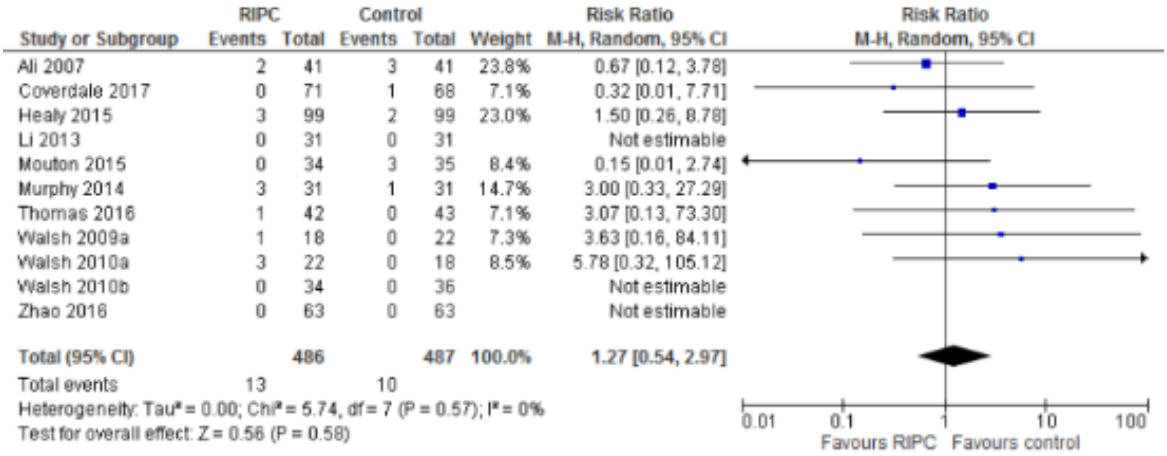

Conclusion - We found no evidence that RIPC has a treatment effect on clinical outcomes in vascular surgical patients undergoing intervention. This is at variance for the significant benefits found in animal studies. Based on its safety and positive effect on biomarkers, an adequately powered prospective randomised controlled trial including assessing the volume of RIPC treated tissue, is needed to resolve its possible role.

O-181 RISK FACTORS FOR MAJOR OPERATIVE COMPLICATIONS (MYOCARDIAL INFARCTION, STROKE, DEATH) AMONG 4,440 ASYMPTOMATIC PATIENTS UNDERGOING CAROTID ENDARTERECTOMY: POOLED ANALYSIS OF VA, ACAS, ACST-1 AND GALA TRIALS

SUPRA-AORTIC ARTERIAL & CAROTID DISEASES

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Introduction - Randomised trials have previously shown that successful carotid endarterectomy (CEA) surgery halves the risk of stroke in people with asymptomatic carotid stenosis. Identification of patients with low peri-operative risk might improve the net benefit from early carotid surgery in this population.

Methods - Individual patient data were obtained from four large carotid surgery trials (6,588 participants from VA, ACAS, ACST-1, GALA; 1983-2007). All asymptomatic participants who underwent CEA after randomisation were included in the analysis. Baseline risk factors associated with major operative complications (myocardial infarction, stroke or other death within 30 days of surgery) were assessed using logistic regression analysis.

Results - 4,440 participants had a CEA and 154 (3.5%) had significant operative complications (111 strokes, 34 myocardial infarctions, 9 deaths from other causes). The major finding was a substantial reduction in the risk of major operative complications across the course of these trials, from ~6.0% in 1983-7 to ~2.6% in 2003-7, a decrease of one-third per decade (suggesting that contemporary risks could be about 1.5%). The risk factors most clearly associated with operative complications were high grade contralateral stenosis >80% (odds ratio [OR] 1.63, 95% CI 1.08-2.44), contralateral occlusion (OR 1.58, 0.97-2.58),

cerebrovascular disease (mainly contralateral: OR 1.58, 1.09-2.29) and ischaemic heart disease (OR 1.50, 1.08-2.08). For patients with any contralateral cerebrovascular disease (severe stenosis, occlusion or prior contralateral symptoms) the OR was 1.78 (CI 1.26-2.51). Hypertension, tight ipsilateral stenosis and female sex were not associated with increased procedural risk.

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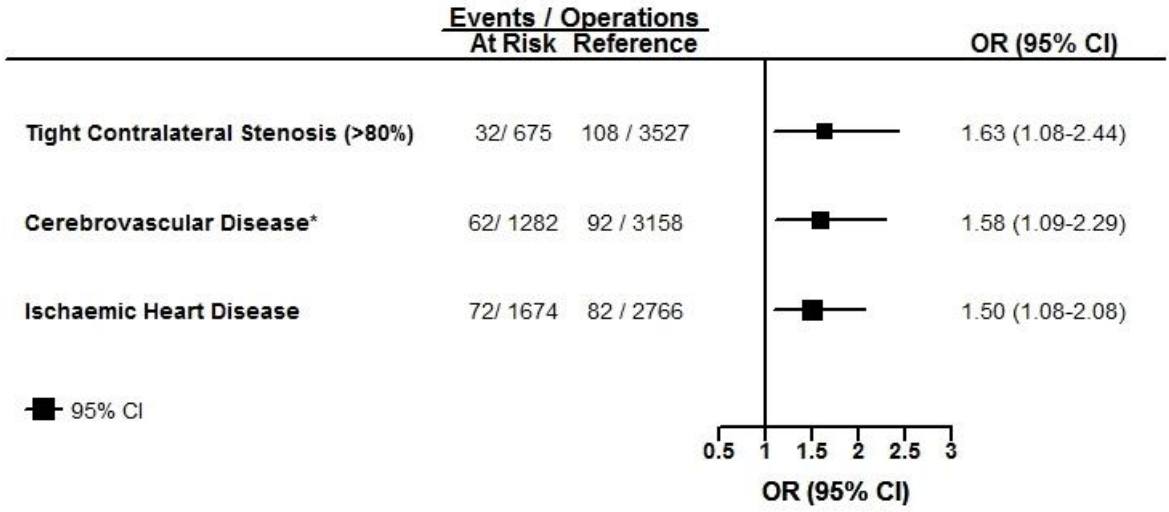

Conclusion - Procedural risk of asymptomatic CEA has declined substantially since the 1980s, and contemporary registries suggest risk of stroke or death risk may now be ~1% in high volume centres. Assessment may identify patients with higher procedural risk, though many such patients may be more likely to benefit from a successful procedure as they may have higher underlying future stroke risk.

O-182 DISEASE ACTIVITY IN TAKAYASU'S ARTERITIS AFFECTS LONG-TERM GRAFT RELATED OUTCOMES

SUPRA-AORTIC ARTERIAL & CAROTID DISEASES

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Introduction - Takayasu's Arteritis (TA) is a rare, inflammatory large-vessel vasculitis of unknown etiology. This disease occasionally requires surgical intervention. There is a paucity of published data on the long-term outcomes of surgical intervention in these patients. There is limited data on the results of these procedures in patients with or without active disease.

Methods - A retrospective review was conducted of patients with Takayasu's arteritis who underwent open, noncardiac vascular procedures at our institution between 1994 and 2017. Basic demographics, diagnostic workup, treatment and outcomes were reviewed. Active disease was defined by the National Institute of Health or/and the Mayo Clinic criteria.

Results - Between 1994 and 2017, 51 patients with Takayasu's Arteritis underwent open noncardiac vascular surgery. Forty-four patients (86) were female with a mean age of 38 years (range 10-72 years). At the time of surgery 36 patients (77%) were on steroids, with 23 patients (49%) taking an additional immunomodulate pharmaceutical. Twenty patients (42%) had required prior vascular interventions. Six patients (13%) had an additional autoimmune disorder diagnosed previously. The most common location for disease was the aorta (86%) with the subclavian (80%), carotid (69%), innominate (41%), and the renal (33%) arterial lesions also seen. Vascular reconstruction was performed on 82 arterial lesions. The most common locations requiring reconstruction was the carotid artery (28%) followed by the subclavian (22%), aorta (15%) and renal arteries (11%). Mean follow-up was 74 months (range 1-265 months). Early complications (less than 30 days) occurred in 14 patients (31%). Late

complications (greater than 31 days) occurred in 22 patients (49%). There were two perioperative mortalities (4%). Eighteen patients (40%) required endovascular and/or surgical reintervention. The primary and primary assisted patency were 72% and 89% respectively. Seventeen patients (35%) had active disease at the time of surgery and three (18%) of these patients developed graft occlusion and underwent revision. Six patients (35%) with active disease required eight additional graft related re-interventions. Thirty-one patients (65%) had quiescent disease with three (10%) of patients occluding their reconstruction follow-up. Four patients (13%) with quiescent disease required four additional graft related re-interventions. The incidence of graft related re-interventions was higher on patients with active disease (p<0.05). Erythrocyte sedimentation rate (ESR) demonstrates a sensitivity rate of 29% with a positive predictive valve of 63% in active disease. 71% of patients with active disease had a normal ESR.

Conclusion - The outcome of the intervention appears to be related to the presence of active disease. Patients with active disease had worse graft related outcomes compared to patients with quiescent disease. Normalized ESR is not a good predictor of quiescent disease.

O-183 DO INTEGRATED SYSYEMS OF STROKE CARE IMPROVE SYMPTOM TO SURGERY TIMES IN PATIENTS WITH SYMPTOMATIC CAROTID STENOSIS? A DECISION TREE ANALYSIS

SUPRA-AORTIC ARTERIAL & CAROTID DISEASES

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Introduction - The objective of this study was to examine the impact of integrated systems of stroke care on symptom to surgery times, cost effectiveness and quality of life measures in patients with symptomatic carotid stenosis.

Methods - Patients who underwent carotid endarterectomy in a regional vascular centre between 1st of April 2011 and 31st of March 2016 were identified from NVR. Risk of stroke on medical therapy for each patient was calculated using the Oxford stroke risk calculator. Symptom to surgery times were compared between patients referred from a stroke service providing an integrated stroke care and the stroke service in an adjacent NHS trust which provides standard urgent referral pathway. A decision-analytic Markov process model was constructed to determine the cost-effectiveness of CEA versus medical treatment in patients who followed the standard and integrated pathways. This model examined the lifetime costs and health benefits of carotid endarterectomy through each pathway.

Results - 376 patients underwent carotid endarterectomy of whom, 243 were managed through the integrated stroke pathway and 133 through standard urgent referral pathway. Median symptom to surgery time was 11(0-66) days for the former and 15(3-90) days for the latter (P<0.001). Overall 30-day stroke-death rate was 1.87%. CEA through the integrated pathway improved quality adjusted life expectancy by an additional 0.13 [0.64 QALYs (Integrated pathway) to 0.51 QALYs (standard pathway)], as well as being associated with an incremental lifetime cost benefit of £2,203.4.

Conclusion - Integrated stroke systems of care are cost effective and associated with significant improvements in quality adjusted life years.

O-184 INDIVIDUAL SURGEON REPORT CARDS FOR RATE OF CAROTID ENDARTERECTOMIES IN ASYMPTOMATIC PATIENTS: AN IMPROVING WISELY PERFORMANCE METRIC FOR CAROTID DISEASE

SUPRA-AORTIC ARTERIAL & CAROTID DISEASES

Author(s) - Caitlin W. Hicks*[1], Peiqi Wang[2], Susan Hutfless[2], Martin A. Makary[2], James H. Black[1]

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Introduction - Prior randomized trials have demonstrated that carotid endarterectomy (CEA) can reduce stroke risk in asymptomatic patients. However, subsequent improvements in medical management have challenged this notion. The aim of our study was to describe surgeon-specific CEA rates for asymptomatic *versus* symptomatic patients in the United States, and to identify factors associated with potential overuse of asymptomatic CEA.

Methods - We studied all patients undergoing an initial CEA in the Medicare Claims database between 01/2014 – 12/2016. The database includes National Provider Identification (NPI) numbers for surgeons. Patients with any prior CEA and surgeons who performed ≤ 10 CEAs during the study period were excluded. For each individual surgeon, we calculated the proportion of patients undergoing CEA for asymptomatic vs. symptomatic carotid disease. Multivariable logistic regression was performed to identify surgeon covariates associated with performing a very high proportion (100%) of CEA in asymptomatic patients.

Results - Overall, 108,391 patients (median age 75 years, 62% male) underwent CEA by 2,983 surgeons during the study period, of whom 89.5% (N=97,007) were asymptomatic. The majority of surgeons performing CEA were vascular surgeons (64.1%, N=1,912), followed by general surgeons (24.0%, N=716) and cardiac surgeons (11.9%, N=355). The median number of CEA cases performed by a single surgeon over the 2-year study period was 28 (range 11-331), of which the median proportion of asymptomatic CEA procedures was 93.8% (IQR 87.6-100%). More than half (56.3%, N=1,679) of surgeons performed CEA for asymptomatic disease in ≥90% of their cases. 17.6% (N=514) of surgeons performed CEA for asymptomatic disease in 100% of their cases, including 12.9% of vascular surgeons and 25.0% of non-vascular surgeons (Figure 1). Individual surgeon factors that were independently associated with operating exclusively on asymptomatic patients included low-volume vs. high-volume CEA practice [OR 6.4 (95%CI 4.3-9.5)] and non-vascular surgical specialty [OR 2.1 (95%CI 1.7-2.6)].

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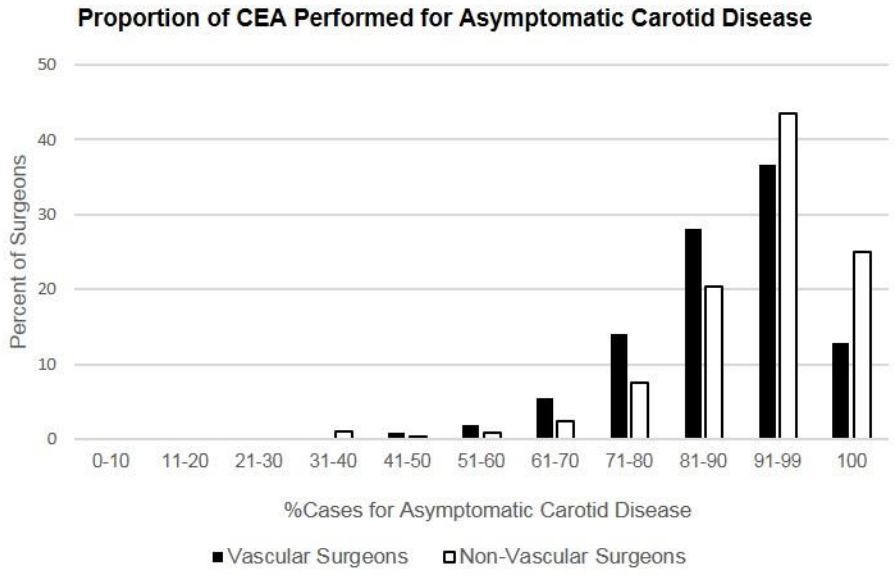

Conclusion - Carotid endarterectomy is performed primarily for asymptomatic carotid disease by the majority of surgeons in the US. One quarter of non-vascular surgeons perform carotid endarterectomy only in asymptomatic patients, suggesting that vascular surgeons user stricter criteria for the operation than non-vascular surgeons. These findings underscore the potential broad implications of the results of the CREST-2 trial, which seeks to better inform our understanding of the benefits of CEA *versus* modern medical management for asymptomatic carotid disease.

O-185 INCOMPLETE CIRCLE OF WILLIS IS ASSOCIATED WITH A HIGHER INCIDENCE OF NEUROLOGIC EVENTS DURING CAROTID EVERSION ENDARTERECTOMY WITHOUT SHUNTING

SUPRA-AORTIC ARTERIAL & CAROTID DISEASES

Author(s) - Peter V. Banga[*1], Andrea Varga[2], Csaba Csobay-Novák[1], Márton Kolossváry[3], Emese Szántó[1], Gustavo Oderich[4], Péter Sótonyi[1]

Institution(s) - [1]Vascular Surgery, [2]Radiology, [3]Cardiology, Semmelweis University, Budapest, Hungary, [4]Vascular Surgery, Mayo Clinic, Rochester, United States

Introduction - A complete Circle of Willis (CoW) is considered an important collateral network to maintain blood flow during cross-clamping in carotid endarterectomy (CEA). The aim of this study was to evaluate the impact of an incomplete CoW with isolated middle cerebral artery (iMCA) on immediate neurological event (INE) after CEA.

Methods - We reviewed the clinical data and outcomes of 545 patients (331 males mean age 69±8 years) who underwent CEA under general anesthesia between 2013 and 2015. All patients had pre-operative computed tomography angiography (CTA) of the extra- and intra-cranial cerebral circulation. Indications were asymptomatic (52%) and symptomatic (48%) carotid artery disease. Patients who had CEA with shunt and those with inadequate intra-cranial imaging to assess CoW were excluded. CTAs were reviewed independently by two vascular radiologists who were blinded for treatment outcomes. Imaging assessment included the vertebral and carotid circulation and each segment of the CoW, which was classified as normal, hypoplastic (diameter < 0.8 mm) or absent. The ipsilateral MCA was considered isolated if there was absence of anterior and posterior communicating branches from the contra-lateral carotid or posterior circulations. INE was defined as any transient ischemic attack and stroke diagnosed immediately after the procedure.

Results - Twelve (2.2%) patients had a stroke in the postoperative period. There were 19 INEs (7 strokes and 12 TIA). Complete circle of Willis was rare, it was only in 19 (3.5%) cases and iMCA was found in 34 (6.3%) patients. When at least one collateral circulation was complete (in 348 patients) we observed only 3(1%) INEs. From the 34 iMCA patients, 8 (24%) had INE (6 TIAs and 2 strokes). Overall, iMAC was an independent predictor of future immediate neurologic events (odds ratio [OR],11.43; 95% confidence interval [CI], 3.68 – 35.51; P<.001). With logistic regression model including hypertension, smoking, diabetes, hyperlipidemia, carotid clamping time (min), contralateral significant ICA stenosis >90%, ipsilateral significant ICA stenosis >90%, preoperative symptoms in 6 months and iMCA, above iMAC only symptomatic patients had higher risk (OR, 3.42; 95%CI, 1.21–9.71; P=.02), while all other parameters were non-significant.

Conclusion - An isolated MCA carries more than ten-fold higher risk of INEs after CEA with cross-clamping without shunt protection. In these patients, routine shunting is recommended to prevent INEs.

O-186 IMPROVING THE QUALITY OF CAROTID ENDARTERECTOMY AND CAROTID ARTERY STENTING: IDENTIFYING HOSPITAL-LEVEL STRUCTURAL FACTORS THAT AFFECT OUTCOMES IN THE PREVENTION OF THROMBOEMBOLIC STROKES

SUPRA-AORTIC ARTERIAL & CAROTID DISEASES

Author(s) - Kamran Gaba[*1, 2, 3], Prem Chana[1], Dylan Morris[1, 2, 3], Martin Landray[1, 2, 3, 4], Richard Bulbulia[1, 2, 3], Alison Halliday[1, 2, 3, 5]

Institution(s) - [1]Medical Research Council Population Health Research Unit, [2]Clinical Trials Service Unit and Epidemiological Studies Unit, [3]Nuffield Department of Population Health, [4]Big Data Institute and Oxford National Institute for Health Research Biomedical Research Centre, [5]Nuffield Department of Surgical Sciences, The University of Oxford, Oxford, United Kingdom

Introduction - Carotid Endarterectomy (CEA) and Carotid Artery Stenting (CAS) effectively reduce long-term stroke risk. Peri-procedural factors affecting outcome have been studied extensively. However, factors relating to the organisation of hospitals (structural factors) may also impact on the quality of patient care. The aim of this study was to examine the evidence that hospital structural factors may affect outcome following CEA or CAS.

Methods - A systematic review was conducted of published studies from 2005 onwards. Three independent reviewers screened titles, abstracts and extracted data from papers, using Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. Structural factors assessed were: Size of the population served by the Vascular Unit; number of hospital beds; availability of dedicated Vascular beds; impact of clearly defined pathways of care; size of the Surgical Intensive Care Unit (SICU) as a proxy for availability of care; and specialty of doctors performing the vascular procedure. Primary outcomes were: mortality; stroke; combined mortality/stroke; serious cardiac complications; length of hospital stay (LOS); and procedural cost.

Results - Seventeen retrospective cohort studies from six countries, with a total of 95,100 patients, were included. CEA outcomes were reported in fourteen studies, CAS outcomes in two studies and both CEA and CAS outcomes in one study.
Vascular Units providing services to larger populations (>75,000 people) had reduced mortality ($p<0.0001$) and stroke rates ($p=0.001$) following CEA, compared with those serving smaller populations. Larger hospitals providing CEA also had significantly reduced mortality ($p<0.0001$), stroke rate ($p=0.0008$) and cardiac events ($p=0.01$), compared with smaller hospitals (up to 130 beds).
Provision of dedicated Vascular beds was associated with reduced mortality ($p=0.0008$) and fewer cardiac events ($p=0.03$) following CEA. Clearly defined pathways of care also appeared to reduce stroke and cardiac event rates ($p=0.004$) and the costs of CEA (by more than $600 (USD) per patient).
Larger SICU availability (>6 beds) was associated with decreased mortality ($p<0.0001$) and stroke rate ($p=0.001$) compared with smaller units, whilst the presence of a dedicated Intensivist was also associated with significantly lower mortality ($p=0.0002$) following CEA.
Patients treated by Vascular Surgeons versus non-Vascular Surgeons (Neuro-, Cardio-thoracic and 'General' Surgeons) had significantly lower stroke and mortality/stroke rates, as well as shorter LOS, following CEA.
CAS outcomes were not influenced by interventionalist's specialty but CAS was significantly cheaper when performed by a Vascular Surgeon ($p<0.0001$).

Conclusion - Hospital structural factors significantly affect outcomes of Carotid intervention, but data on CAS were limited. These findings can improve the future configuration of Vascular services and may help reduce the procedural risks and costs of CEA and CAS.

O-187 IDUS DETECTS MORE DEFECTS AFTER CEA COMPARED TO ANGIOGRAPHY: RESULTS FROM THE CIDAC STUDY

SUPRA-AORTIC ARTERIAL & CAROTID DISEASES

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Introduction: Intraoperative completion studies were shown to be associated with a lower periopertive stroke risk after carotid endarterectomy (CEA).[1] The CIDAC (**C**omparison of **I**ntraoperative **D**uplex Ultrasound and **A**ngiography after **C**arotid Endarterectomy) study was designed to compare angiography and intraoperative duplex ultrasound (IDUS) as intraoperative completion studies following CEA with respect to differences in detection and rating of defects and their particular interrater reliabilities.
Methods: Prospective, non-randomized study of patients who underwent CEA for symptomatic or asymptomatic carotid stenosis. At the end of the operation, angiography and IDUS were applied subsequently. Intraoperatively obtained video footage was evaluated at a later date by three independent and blinded raters with different levels of clinical experience. Rating occurred according to a four-stage rating scale with higher stages representing more severe defects (see Table). Statistical standard methods (Pearson's chi-Squared test, permutation test, Wilcoxon signed rank test, Kendall's coefficient of concordance W) were applied.

Table. Four stage rating scale to assess defects according to hemodynamic and morphologic criteria.

Grade	Definition	Implication
I	no defect	no operative revision
II	minor defect	consider operative revision
III	major defect	operative revision recommended
IV	severe lesion	operative revision mandatory

Results: In total, 150 patients (mean age 72±7 years, 68.7% male, 33.3% symptomatic) were enrolled between March 2016 and September 2017. Significantly more defects requiring intraoperative revision (Grades III and IV on rating scale) were detected by IDUS (22 vs. 10; p=0.040), which in part remained undetected by angiogram (see Figure). Defects were judged to be more severe with IDUS compared to angiography (median rating; Grade I: 74 vs. 102; Grade II: 54 vs. 38; Grade III: 21 vs. 9; Grade IV: 1 vs. 1; p<0.001). Furthermore, W was significantly higher for IDUS compared to angiography (0.701 vs. 0.568; p=0.003).

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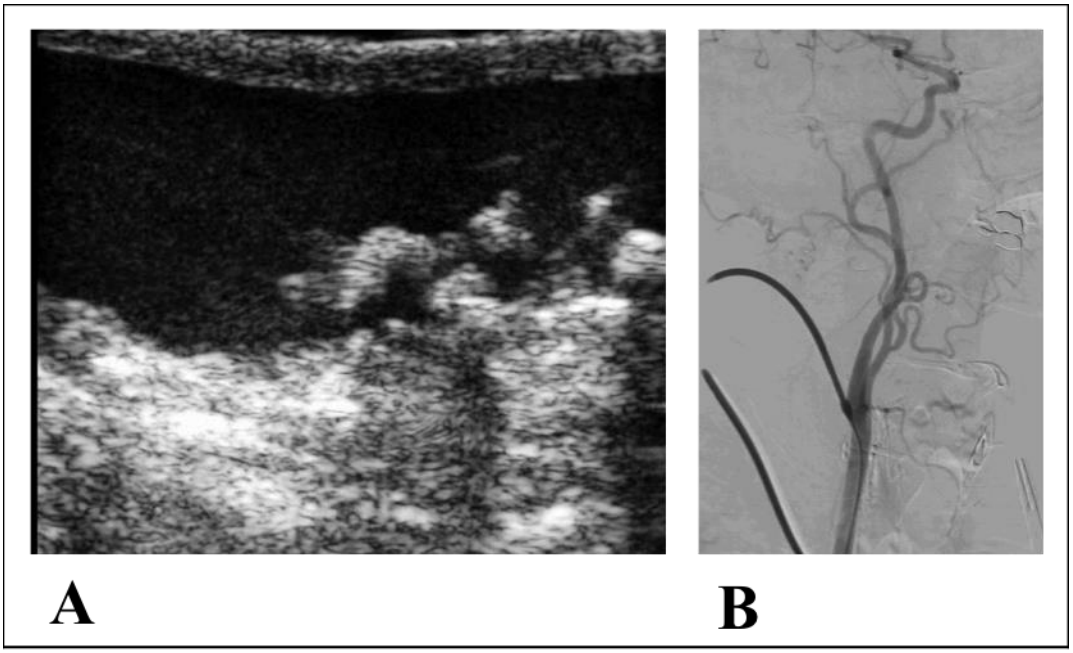

Conclusion - IDUS revealed more defects after CEA compared to angiography, which in practice implies a higher rate of intraoperative revisions. Whether detection and consecutive correction of these additional defects is beneficial for the patient, needs to be assessed in a controlled trial with clinical endpoints. With a higher interrater reliability, IDUS is less dependent on the surgeon's subjectivity compared to angiography. Taking into account the absence of procedure associated risks (i.e. adverse effects of iodinated contrast media and X-ray) IDUS should be considered to replace angiography as standard intraoperative completion study procedure.

References - 1. Knappich C, Kuehnl A, Tsantilas P, Schmid S, Breitkreuz T, Kallmayer M, et al. Intraoperative Completion Studies, Local Anesthesia, and Antiplatelet Medication Are Associated With Lower Risk in Carotid Endarterectomy. Stroke. 2017;48(4):955-62.

O-188 INCREASED INTRA-INDIVIDUAL PERIVASCULAR ADIPOSE TISSUE DENSITY AND INCREASED INFLAMMATORY RNA EXPRESSION OF PERIVASCULAR ADIPOSE TISSUE IN PATIENTS WITH ABDOMINAL AORTIC ANEURYSMS

VASCULAR BIOLOGY

Author(s) - Jorn Meekel[*1], Marina Dias-Neto[2], Natalija Bogunovic[3], Rutger Lely[4], Etto Eringa[3], Willem Wisselink[1], Jan Blankensteijn[1], Kakkhee Yeung[1]

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Introduction - Specific thoracic and abdominal adipose tissue deposits correlate positively with cardiovascular diseases. However, little is known about abdominal adipose deposits and their correlation with aortic pathology. Our aim was to evaluate the general distribution of abdominal adipose tissue in patients with abdominal aortic aneurysm (AAA), aortic atherosclerosis (AAth) and controls without aortic pathology. Furthermore, we aimed to evaluate the RNA expression of PVAT in similar patient groups.

Methods - In this retrospective multicenter case-control study, patients with non-surgically-treated AAA (n=140), AAth (n=104), and control patients (n=108) were included. Subcutaneous, visceral and periaortic adipose tissue (PVAT) measurements were performed based on Hounsfield Units. Furthermore, human PVAT was collected during open surgery for either AAA (n=22), AAth (n=4), and PVAT obtained from normal aorta obtained during renal transplantation surgery (control tissue; n=5). Gene expression of IL-6, IL-8, CD45, MCP1, PLIN, SAA-1, RARRES-2, TIMP-1, TIMP-2, MMP-2, MMP-9, adiponectin, leptin, ICAM-1, ICAM-3 and CCR7 was quantified. PVAT density measurements were compared using univariate analysis and separate linear regression models. Gene expression in AAA and AAth PVAT was compared to controls using Mann-Whitney U test.

Results - AAA patients presented higher intra-individual PVAT differences, with higher PVAT density around aneurysm sac compared to the healthy neck. This association persisted after adjustment for cardiovascular risk factors and diseases and other fat compartments (ß=13.175, SE=4.732, p=0.006). Furthermore, intra-individual PVAT differences presented the highest correlation with aortic volume that persisted after adjustment for other fat compartments, body mass index, sex and age (ß=0.566, SE=0.200, p=0.005). Comparative analysis between AAA vs. controls showed elevated expression of CD45 (p=0.008), IL-8 (p=0.033) and MMP-9 in AAA (p=0.016). Comparative analysis between AAth vs. controls showed elevated expression of MMP-9 in AAth (p=0.016).

Conclusion - Our results suggest a relation between the deposition and inflammatory enzyme excretion of PVAT and AAA pathophysiology. Further research, studying enzyme production of PVAT and stimulation of different adipose tissue compartments on aortic cells, might explore the exact underlying processes.

O-189 STUDY OF DYSREGULATED MICRORNAS IN ABDOMINAL AORTIC ANEURYSM TISSUE

VASCULAR BIOLOGY

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Introduction - microRNAs (miRs) are small non-coding RNA molecules that regulate protein expression (1). The initiation and progression of Abdominal Aortic Aneurysm (AAA) can be regulated by miRs (2), hence their expression in abdominal aortic tissue could be useful for the identification of novel therapeutic targets. In a previous study, we identified some dysregulated miRs in plasma of patients with AAA. In the current study we have measured the expression level of those miRs in AAA and in healthy tissues in order to elucidate their local dysregulation.

Methods - We obtained abdominal aortic tissue from patients undergoing AAA open repair (N=21) and from healthy organ donors (N=8). Tissue samples were snap-frozen and stored in liquid N_2. A cross section of the tissue was homogenized with the TissueLyser LT® (Qiagen), and total RNA was obtained with the miRVANA PARIS® kit (Ambion). cDNA was obtained from 10 ng of total RNA. Sixteen miRs were quantified by Real Time quantitative PCR (RT-qPCR)(Exiqon) and results (CTs) were normalized with the endogenous and stable miR 423-5p selected using RefFinder. Normalized results were adjusted in a linear regression model using the statistic software R (3.3.2 version).

Results - Six miRs were significantly underexpressed in AAA *vs* healthy tissue. The expression of miR-1, miR-27-b-3p, miR-29b-3p, mir-133a-3p, miR-133b and miR-195-5p was 4.8 ($p<0.001$); 2 ($p<0.001$); 1.4 ($p=0.018$); 4.4 ($p<0.001$); 4.6 ($p<0.001$) and 1.6 ($p=0.023$) fold lower than healthy tissue, respectively. Furthermore, 3 miRs were overexpressed in AAA tissue. Thus, miR-146a-5p, miR-21-5p and miR-144-3p were overexpressed 5.8 ($p<0.001$); 1.9 ($p=0.012$) and 7.2 ($p<0.001$) times, respectively. Some targets of these dysregulated miRs are related to vascular wall integrity (COL), apoptosis (PTEN) or inflammation (IRAK1) pathways.

Conclusion - Our preliminary study confirms the dysregulation of 9 miRs in AAA tissue. Our results support the role of these miRs in the development of AAA. Some of the target proteins of these dysregulated miRs are involved in several mechanisms related to vascular pathologies. Thus, miR-29b is involved in collagen deposition and fibrosis, miR146a-5p in inflammation and apoptosis and miR-133b or miR-21-5p in inflammation, apoptosis and cellular proliferation and differentiation (3). However, the role of other miRs such as miR-27b-3p or miR-144-3p in AAA development is yet to be elucidated. The validation of our results in a larger cohort could reveal these miRs as therapeutic targets in AAA.

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O-190 DIETARY FIBRE INTAKE AND THE RISK OF DEVELOPING ABDOMINAL AORTIC ANEURYSM – A PROSPECTIVE LONGITUDINAL COHORT OF MIDDLE-AGED INDIVIDUALS IN SWEDEN

VASCULAR BIOLOGY

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Introduction - A meta-analysis, conducted in 2013, showed that a diet rich in dietary fibre is associated with a lower risk of developing cardiovascular disease and coronary heart disease. However, there is no research focusing explicitly on dietary fibre and the risk of abdominal aortic aneurysm (AAA). Therefore, the aim of this study was to investigate the association between intake of dietary fibre and the risk of AAA in the Malmö Diet and Cancer study (MDCS).

Methods - The MDCS is a large prospective cohort study where baseline data collection was carried out between 1991 and 1996. At baseline, the middle-aged (41 – 73 years of age) individuals who were eligible to participate (n=26 133) were asked to fill out extensive questionnaires documenting their dietary habits. The mean follow-up for the participants was 20.7 years and incident AAA cases (n=353) were identified via hospital registries and death certificates. Weekly fibre intake ranged from 0.45 g/MJ to 7.96 g/MJ in the study population.

Results - After adjusting for several confounders, including age, gender and smoking, it was found that adhering to the national recommendations for fibre intake, was not associated with a reduced AAA risk. Dividing fibre intake into three groups (low, medium and high intake), showed the following HR and 95% CI: 1.00 (ref), 0.72 (0.55-0.94), 0.80 (0.60-1.08). Fibre consumed each week expressed in g/MJ, showed a trend between high intake of fibre and reduced AAA risk ($p=0.062$, HR 0.82, 95% CI 0.67-1.01).

Conclusion - Adhering to diet recommendations for fibre intake was not associated with a reduced AAA risk. However, a medium intake of fibre showed the lowest AAA risk. There is also an 18% lower risk of developing AAA for each g/MJ of fibre consumed.

O-191 MODELING TISSUE RE-MODELING DURING THE PATHOGENESIS OF ABDOMINAL AORTIC ANEURYSMS

VASCULAR BIOLOGY

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Introduction - The pathophysiological mechanisms of aneurysm development and rupture are still not fully understood. Preventive treatment before aneurysm formation lacks clear analysis of the pathophysiology of this disease. To identify the structural components and to generate insight into the pathophysiological mechanisms leading to abdominal aortic aneursm (AAA), this prospective translational study was introduced combining biomechanical, microscopic and clinical data.
Soft biological tissues such as aortic walls may be viewed as fiber-reinforced composites. Changes in the structural components such as the ground matrix and the embedded collagen fibers have been shown to play a significant role in the pathogenesis. Hence, there is a pressing need to develop a deeper understanding of the reorganization during aneurysm development.

Methods - A structurally-motivated constitutive model [1] was developed considering in- and out-of-plane dispersion separately. The structural parameters were obtained from second harmonic generation (SHG) microscopic images. The model was fitted to the mechanical data obtained from biaxial extension tests of samples collected during open abdominal aortic aneursm surgery.
AAA tissues samples were analysed using biaxial tensile tests, SHG imaging and histological stains by utilizing the same material model. Mechanical data were used to derive the stretch at which collagen recruits, i.e. the stretch where the nonlinear stress-stretch starts to stiffen. Consequently, 14 parameters were determined that analyze histological data such as smooth muscle cell and elastin content, abluminal adipocyte content and the ratio of visible layers. In total, 26 parameters were obtained and statistically compared. Levels of disease progression were defined by three stages, depending on the collagen recruitment stretches.

Results - Significant differences in, e.g., elastin content, collagen orientation and abluminal lipid content were found. Indicators in the middle of the wall pointed towards a deposition of new collagen adjacent to inflammatory cells, which increased with disease progression.

Conclusion - A novel hypothesis for disease progression in three levels during AAA development was developed. It is derived from a systematic comparison of structural, mechanical and histological changes in AAAs.

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O-192 STATIN THERAPY REDUCES CAROTID ATHEROSCLEROTIC PLAQUE MATRIX METALLOPROTEINASE-2 CONTENT AND ADVERSE CARDIOVASCULAR EVENTS IN PATIENTS UNDERGOING ENDARTERECTOMY

VASCULAR BIOLOGY

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Introduction - Matrix metalloproteinases (MMPs), participate in the vascular remodeling associated with atherosclerotic plaque development and rupture, responsible for ischemic cardiovascular events.
Aim of this study is to investigate the association between plaque MMPs levels, preoperative risk factors and medical therapy with the occurrence of clinical adverse events in a large cohort of patients underwent carotid endarterectomy (CEA).

Methods - A biobank was created (Athero-Matrix Biobank) by collecting carotid plaque specimens from all patients undergoing CEA between 2009 and 2017. Carotid plaque tissue was removed, cleaned in sterile saline, extracted and analyzed for MMP-2 content by SDS-PAGE zymography (total, pro and active forms) and TIMP-2 by ELISA. Relevant previous clinical history, risk

factors and pharmacological treatments were systematically collected. Cardio-cerebrovascular events occurring during follow-up were registered. Patients were followed up for a mean time of 36 ± 25 months.

Results - Atherosclerotic plaques from 789 (70.6% males) patients were collected**.** Among analyzed risk factors chronic obstructive pulmonary disease (COPD), male sex and chronic renal failure resulted associated with high MMP-2 levels. Preoperative usage of statins correlated with significant reduction in MMP-2 levels, active MMP-2/pro-MMP-2 and active MMP-2/TIMP-2 ratios ($p<0.0001$).
Higher carotid plaque active MMP-2 was also predictive of late cardiovascular events (MMP-2/pro-MMP-2, $p=0.040$) and vascular death (MMP-2 levels, $p=0.015$; MMP-2/pro-MMP-2, $p=0.046$; active MMP-2/TIMP-2 $p=0.005$).
At univariate analysis, preoperative use of statin was the only analyzed factor influencing late outcomes in term of cardiovascular event and vascular death occurrence ($p=0.003$, OR 2.099; CI 1.332-3.307) during follow up.
Furthermore, at Kaplan-Meier analysis statin therapy was associated with better outcomes in term of overall survival ($p=0.023$)

Conclusion - Active MMP-2 in plaques predicts adverse cardiovascular outcomes in patients underwent CEA. Statin therapy reduces significantly active MMP-2 plaque levels and improves cardiovascular event and death rate during follow up. MMP-2 may represent a biomarker for atherosclerosis progression and drugs reducing active MMP-2 in plaques may be of special interest.

O-193 THE PERINEURAL LOCAL ANAESTHETIC CATHETER AFTER MAJOR LOWER LIMB AMPUTATION TRIAL (PLACEMENT): A RANDOMISED CONTROLLED FEASIBILITY STUDY

CLINICAL TRIALS

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Introduction - Pain control after major lower limb amputation for peripheral vascular disease is a significant problem, due to the multifactorial nature of post-amputation pain, contra-indication of epidural anaesthesia in many patients and side effects of opioid analgesics and patient frailty. A perineural catheter is a thin plastic tube which may be placed adjacent to the sciatic or tibial nerve at the time of amputation, through which a continuous local anaesthetic infusion can be given. Although low quality observational data suggest that perineural catheter usage reduces postoperative opioid requirements, little data are available regarding their effect on pain. PLACEMENT is a randomised controlled feasibility study to explore the feasibility of running a multi-centre effectiveness trial to assess the impact of perineural catheter usage on short and medium term postoperative outcomes.

Methods - Fifty patients undergoing major lower limb amputation (at below or above knee level) for peripheral vascular disease were recruited from two centres. Patients were randomised in a 1:1 ratio to receive standard postoperative analgesia, with or without insertion of a perineural catheter and local anaesthetic infusion for up to 5 postoperative days. The primary effectiveness outcome was pain measured on a verbal rating scale in the first five post-operative days. Secondary effectiveness outcomes included quality of life and the prevalence of phantom limb and chronic stump pain assessed 2 and 6 months after surgery as well as total healthcare costs. Key feasibility outcomes included the proportion of eligible patients successfully recruited and the feasibility of using pain scores as a primary outcome measure as well as a preliminary estimate of the effect size. Full ethical approval has been granted (Wales REC 3 reference number 16/WA/0353). The trial is registered as ISRCTN85710690 with EudraCT number 2016-003544-37 and is funded by Health and Care Research Wales (grant number RfPPb-16-1198).
Results - Recruitment commenced on 15th February 2017 and 50 patients were successfully enrolled in the study across two centres by 15th November 2017. Follow-up is due to complete in May 2018, and results of the primary effectiveness and key feasibility outcomes will be available in time for the annual meeting of the European Society for Vascular Surgery, where they will be made publically available for the first time.

Conclusion - PLACEMENT is a multi-centre randomised controlled feasibility study which is the first to explore the feasibility of running an effectiveness trial on perineural catheter usage for postoperative pain in amputees. Recruitment is complete and full trial results will be available in time for the annual meeting of the European Society for Vascular Surgery.

O-194 THE IDOMENEO STUDY - TREATMENT OF PERIPHERAL ARTERIAL DISEASE IN GERMANY

CLINICAL TRIALS

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Introduction - Peripheral arterial disease (PAD) remains a global burden with more than 200 million affected patients. In Germany, invasive treatments are increasing continuously, accounting for more than 200,000 annual procedures performed in approximately 1 million affected people. The IDOMENEO study aims to include large-scaled validated data of the GermanVasc registry and health insurance claims data to answer the following questions: Is treatment reality following valid practical guidelines? What are suitable indicators of outcome quality and are they validly measurable in both data sources? What is the long-term (>12 months) course following endovascular (ER) and open-surgical (OR) revascularisations including patient-reported outcomes?

Methods - This multimethodological and multistage study utilizes retrospective and prospective methods. The complete secondary data of the largest health insurance provider of Germany (BARMER, 12% of insured cohort) is analysed to assess patient´s characteristics and course of events following treatment for PAD. Beginning in May 2018, the data privacy compliant GermanVasc registry (NCT03098290) will collect 10,000 consecutive patients treated by ER or OR for symptomatic PAD in 30 German vascular centres. Following to the enrolment (6 months), the patients will be followed for 12 months. Study endpoints have been consented by international experts including patient-reported outcomes. Simultaneously, all patients matching the inclusion criteria insured by BARMER will be prospectively followed using claims data. The data of 10,000 patients included by GermanVasc and approximately 20,000 patients included by BARMER will be used to validate both data sources using cohort and ranking matching methods.

Results - Among approximately 82.7 million German inhabitants in 2016, 87.8% are insured by statutory health insurance. With a share in the market of >13.2%, BARMER health insurance can be utilised to conduct patient-related population-based analyses. Among >1,800 legally endorsed hospitals in Germany, 100 centres with at least 500 annual procedures have been identified. In 2016, a total of 654 hospitals performed either ER or OR for PAD in 18,569 BARMER patients. The annual case-volume (500 - 2,200) and the proportion of OR (4 - 85%) varied widely. An increasing number of hospital treatments (54,000 - 79,000) has been performed in lesser patients (37,000 - 51,000). In a Delphi expert consensus, 12 out of 44 indicators of outcome quality have been consented. These indicators will be measured in both complementary data sources.

Image -

Conclusion - The treatment-reality of PAD shows wide variations in Germany. The multimethodological and multistage IDOMENEO study will provide large-scaled validated registry and health insurance claims data on the invasive treatment for symptomatic PAD in Germany. Furthermore, it will develop data privacy compliant and innovative technical solutions to conduct registry-based research and quality improvement utilising a privacy by design approach.

O-195 DRUG-ELUTING STENT SHOWS SIMILAR PATENCY RESULTS AS PROSTHETIC BYPASS IN PATIENTS WITH FEMOROPOPLITEAL OCCLUSION IN A RANDOMIZED TRIAL

CLINICAL TRIALS

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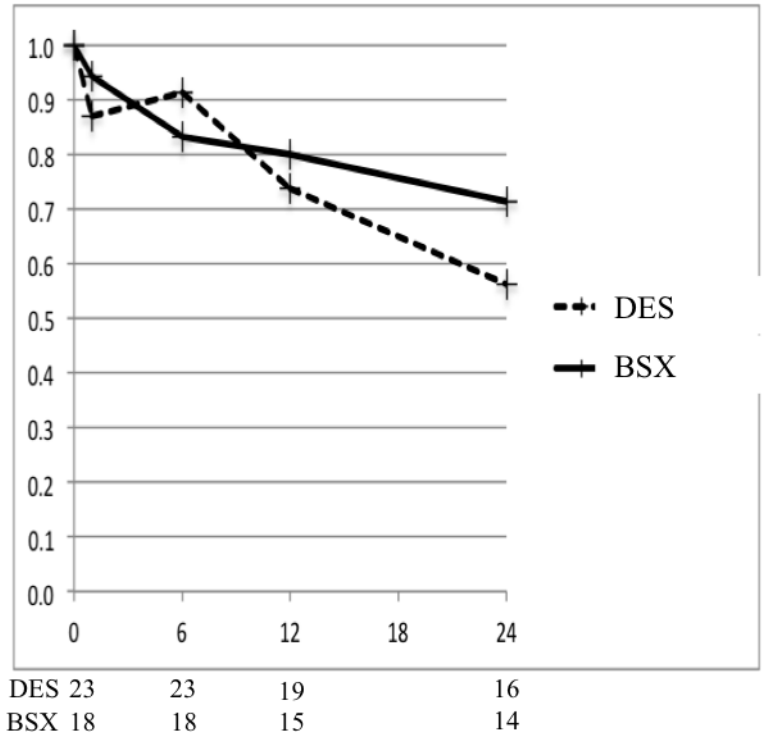
Introduction - Claudication and critical limb threatening ischemia (CLTI) are significant causes of mortality in the elderly. The gold standard of superficial femoral artery (SFA) revascularization is thus far considered to be the femoropopliteal bypass. The aim of this study was to compare mid-term patency between drug-eluting stents (DES) and prosthetic bypass grafts (BSX). Studies have reported comparable results for both methods.

Methods - Patients were randomized at 6 hospitals in Finland. Patients were included between 2011 and 2014, follow-up ended in 2016. Patients presented with rest pain or severe claudication (Rutherford class II-IV), patients with wounds or tissue loss were excluded. 5-25 cm SFA-lesions were eligible for inclusion. The lesions were diagnosed and measured using magnetic resonance angiography or computed tomography angiography. Concomitant inflow or outflow procedures were not allowed. All patients provided written informed consent. Inclusion and exclusion criteria are listed in table 1. Patients were randomized to BA+DES or prosthetic AK femoropopliteal bypass. 2:1 (DES:BSX) block randomization was performed at the ward or outpatient clinic following eligibility and signed informed consent.
Bypass surgery was performed under general anesthesia or spinal blockade from incisions to the groin and proximal popliteal artery. A 6 mm heparin-bonded polytetrafluoroethylene (PTFE) graft was used. The graft was tunneled anatomically or subcutaneously depending on surgeon´s preference. Procedures were performed under systemic heparinization with an activated clotting time (ACT) between 200 and 300 seconds.
In the stent group, access was obtained from the ipsilateral or contralateral common femoral artery. The occlusion was recanalized and crossed intraluminally or subintimally prior to predilatation and stent deployment. The stent was post-dilated according to instructions-for-use. Patients received 5000 IU systemic heparin during the procedure.
Follow-up was 24 months and the primary outcome measure was overall stent or graft patency. Secondary outcome measures were primary and assisted patency as well as amputation-free survival. Follow-up was performed by clinical evaluation for symptoms and by duplex ultrasound to assess patency at 1, 6, 12, and 24 months postoperatively.

Results - 41 patients were eventually analyzed. 6 month secondary patency was 91 % (DES) vs. 83 % (BSX) (P=.450). The corresponding numbers at 12-months in the DES and BSX groups were 74 % and 80 % (P= .750). At 24 months the respective numbers were 56 % and 71 % (P=.830) (fig1). There were no statistically significant differences in primary or assisted primary patency at 1, 6, or 12 months. 5 patients were excluded due to unsuccessful recanalization. There were no deaths or major amputations in either group during 12-month follow-up. The number of patients lost to follow-up at 6, 12, and 24 months was 0 (0.0 %), 6 (14.2 %) and 11 (26.2 %), respectively.

Image -



Conclusion - This is the first randomized trial comparing the DES to prosthetic bypass in above knee femoropopliteal occlusion. At 12 and 24 months after the procedure there was no statistically significant difference in primary patency, assisted primary patency or secondary patency between the groups. Although underpowered, our study suggests non-inferiority of the DES compared to PTFE-bypass in this patient group. Larger studies are needed for more definitive conclusions.

O-196 NEGATIVE PRESSURE WOUND THERAPY VERSUS STANDARD DRESSINGS ON CLOSED INCISIONS FOR THE PREVENTION OF SURGICAL SITE INFECTIONS AFTER VASCULAR SURGERY - A SYSTEMATIC REVIEW AND META-ANALYSIS OF RANDOMIZED CONTROLLED TRIALS

CLINICAL TRIALS

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Introduction - Surgical site infections (SSI) after vascular surgery in the lower limb is a major concern. Negative pressure wound therapy (NPWT) on closed sutured surgical incisions has emerged as an innovative dressing that may reduce SSI. The few published randomized controlled trials (RCT) comparing closed NPWT with standard dressings after vascular surgery show inconsistent results. The aim of this systematic review with meta-analysis of RCTs was to evaluate the available evidence for closed NPWT after vascular surgery.

Methods - A study protocol with defined search criteria settled in consultation with a faculty librarian was established according to the Cochrane handbook for systematic reviews and published in Prospero (Reg. Nr. CRD42018090298) a priori. The records generated by the systematic research of electronic databases for published and unpublished articles were screened for relevance (n=1183), by title and abstract (n=734) and in full-text (n=27) by two of the authors independently in the official Cochrane software Covidence© (Veritas Health Innovation, Melbourne, Australia) resulting in seven eligible studies. These were graded for bias

according to the Cochrane tool for bias and assessed for size effects in Review Manager 5.3© (The Nordic Cochrane centre, Copenhagen).

Results - This review involved 961 incisions from seven studies. Six studies used the Prevena™ (Acelity, San Antonio, US) and one the PICO™ (Smith & Nephew, UK) dressing in the interventional NPWT arm. The meta-analysis for all surgical incisions after vascular surgery in the lower extremity showed a reduction of SSIs with NPWT; odds ratio (OR) 0.32 (95% CI: 0.21-0.47; p<0.00001, heterogeneity level: I^2= 0%), using a random effect model (Figure 1). There was high risk of performance bias in all studies since all dressings were unblinded for patients and personnel. Two studies were only available as abstracts and risk of bias was unclear in five domains in each. In a sensitivity analysis of high-risk groins after lower limb revascularization exclusively in three studies (n=363), OR was 0.37 (95% CI: 0.22-0.63; p=0.0003, I^2=0%), using a fixed effect model. In these three studies, there was a high or unclear risk of detection bias in two of the studies and a high risk of bias due to industry company funding in one of the studies.

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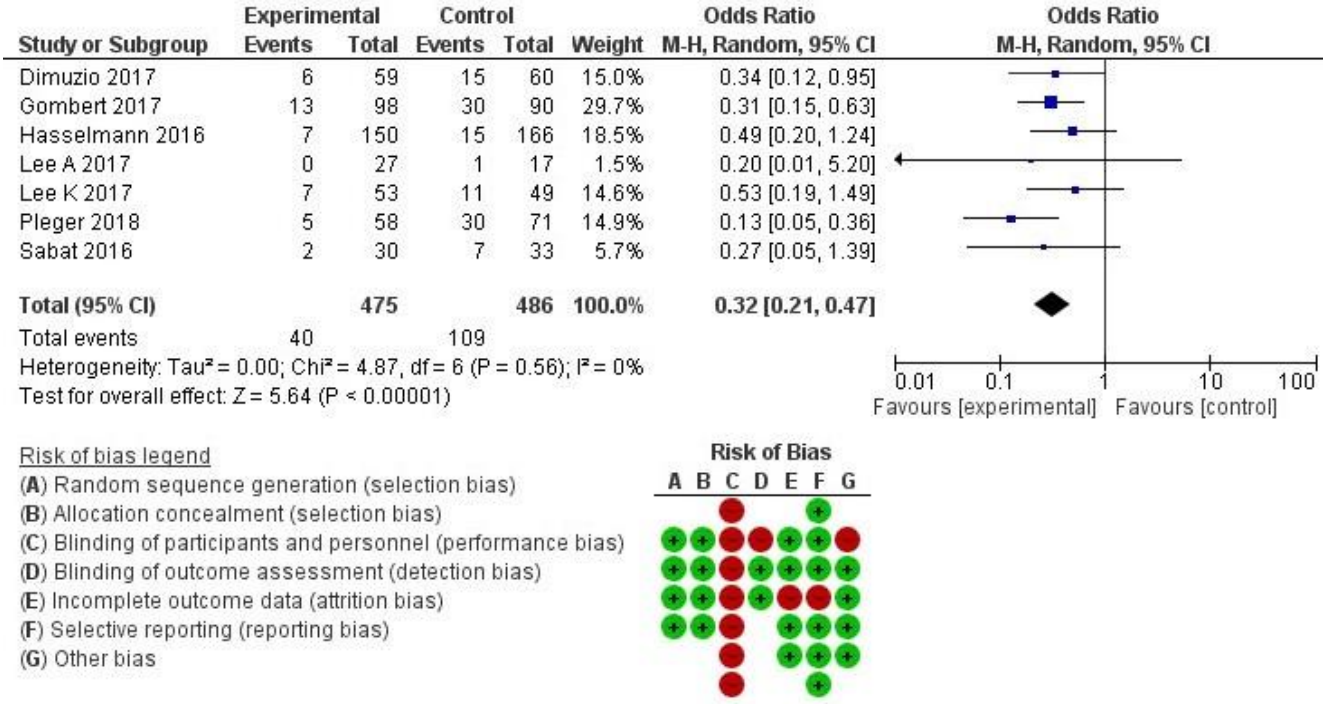

Conclusion - Closed NPWT after vascular surgical incisions in the lower limb reduced SSI compared to standard wound dressing. Heterogeneity between the included studies' results was low. High or unclear risk of bias due to unblinded wound outcome assessment was a concern and these results therefore need to be interpreted with caution. Better and larger high-quality RCTs are needed.

O-197 ENDOVASCULAR TREATMENT OF ISOLATED COMMON ILIAC ARTERY ANEURYSMS USING ILIAC BRANCH STENT-GRAFTS WITHOUT AORTIC COMPONENT: A NATIONAL MULTICENTER REGISTRY

CLINICAL TRIALS

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Introduction - Endovascular therapy of common iliac artery (CIA) aneurysms using iliac branch devices (IBDs) has become an increasingly popular means of preserving antegrade flow to the internal iliac artery (IIA). According to instruction for use, the iliac branch stent graft is to be used with aortobi-iliac stent graft conjunction. Our aim is to assess early and midterm outcomes of IBD implantation without an aortic stent-graft for the treatment of isolated common iliac artery aneurysm (CIAA).

Methods - From December 2006 to June 2016, 49 isolated CIAAs in 46 patients were treated solely with an IBD at 7 vascular centers. Five patients were lost to follow-up, leaving 41 male patients (mean age 72.5±7.8 years) for analysis. Mean CIAA diameter was 39.1±10.5 mm (range 25–65). Thirty-two patients (2 with bilateral CIAAs) were treated with a Cook Zenith iliac branch device; 9 patients (1 bilateral) received a Gore Excluder iliac branch endoprosthesis. Primary endpoints were technical success, survival, aneurysm exclusion, device patency, and freedom from reintervention at 1 and 5 years. Freedom from major adverse events and aneurysm shrinkage at 1 year were also assessed.

Results - No patient presented buttock claudication, erectile dysfunction, or bowel or spinal cord ischemia at a mean follow-up of 52,6±30,1 months. Thirty-day mortality and the IBD occlusion rate were 2.4% and 2.3%, respectively. Three patients died within 6 months after the procedure. Estimates of cumulative survival, device patency, and freedom from reintervention were 90.2%, 95.2%, and 95.7%, respectively, at 1 and 5 years. At 1 year, CIAA shrinkage ≥5 mm was recorded in 21 of 38 survivors. No evidence of endoleak, device migration, or disconnection was found on imaging follow-up.

Conclusion - IBDs implantation without an aortic stent-graft for isolated CIAAs is feasable and effective, resulting in excellent patency, low morbidity and reintervention rates. Our promising midterm results, including no endoleak and migration, support the use of isolated IBDs as a stable and durable means of endovascular reconstruction in cases with suitable anatomy. Longer follow-up and a larger cohort are needed to validate these results.

O-198 REST PAIN AND WOUND HEALING IN PATIENTS SUFFERING CRITICAL LIMB ISCHEMIA (CLI) BENEFITS FROM RECOMBINANT GROWTH HORMONE (RGH) THERAPY: THE FIRST-IN-MAN PILOT STUDY FOR THE USE OF RGH IN CLI

CLINICAL TRIALS

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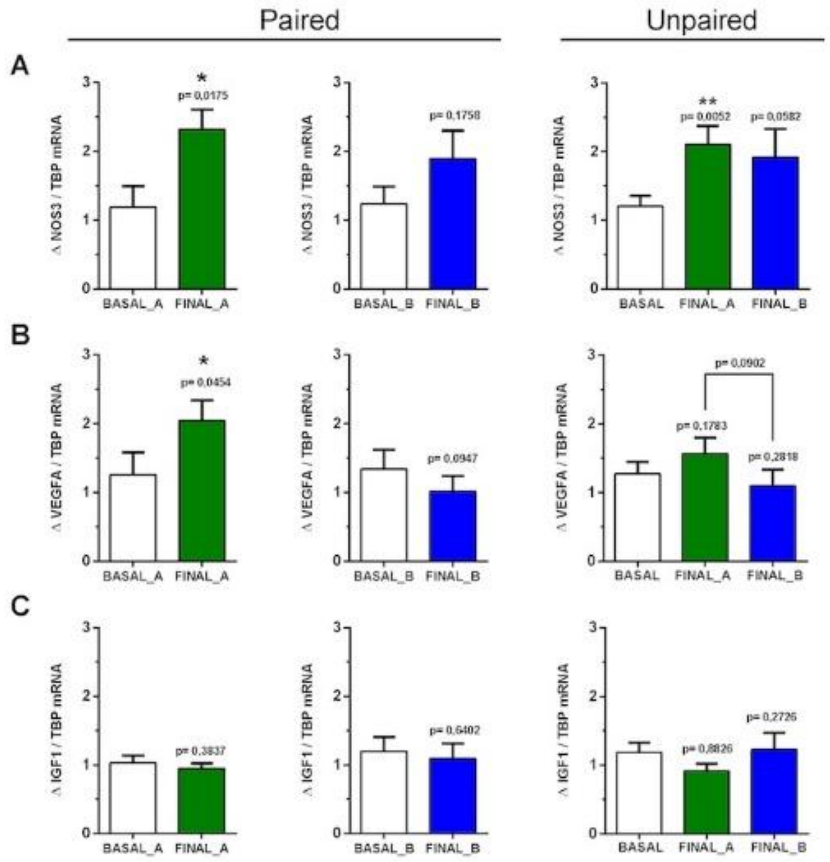
Introduction - Revascularization for critical limb ischemia (CLI) is necessary to alleviate rest pain and wound healing, but nearly 1 out of 5 of these patients cannot be treated or do not benefit properly of surgery or endovascular therapy. In this scenario, there are few alternatives to avoid limb amputation. Among them, the use of growth factors has been widely used, but clinical trials have shown inconsistent results. Growth Hormone (GH) is a pleiotropic hormone capable of inducing angiogenesis and might add special benefits for the redox imbalance that appear in ischemic conditions. GH has been widely used in humans after myocardial infarction obtaining results quite heterogenous, but it has never been tested in a clinical trial for peripheral arterial disease.

Methods - It was designed a randomized, placebo-controlled clinical trial to test the efficacy of recombinant GH at the dose of 0.4mg/day, 5 days/week, during 8 weeks, in CLI patients with failed or not recommendable revascularization because of their high surgical risk or poor condition. There were 36 patients that met the inclusion criteria and finally underwent the treatment. U-Mann-Whitney, Fisher and Wilcoxon tests were mainly utilized for statistic analysis.

Results - Mean age was 71 ±12.7 (79.4% male). Comorbidity: 47.1% of heart disease, 58.8% of Diabetes Mellitus (57.6% of them with established neuropathy), and 26.5% of chronic renal failure. Atherosclerosis was the most frequently cause of CLI (70.6%). Mean baseline ankle-brachial index (ABI) was 0.19. Rutherford class 5 and 6 represented 70.6%. GH group had a significant increase of both, the rate of patients with combined healed wounds or moderate to important improvement (55.6% vs 12.5%, p=0.0087), and the relief of rest pain, measured by EVA scale (2.7 vs 0.62, p= 0.003).There were only 1 limb amputation during the period of treatment in each group, but 6 patients were derived to extreme revascularization in placebo group during this period, and none in GH group. Mortality rate was 20.6% during the first 6 months.There were no treatment-related adverse effects. In the genetic analysis, GH group also presented a significant rise in mRNA levels of VEGF-A and eNOS3 (p=0.045 and p=0.0052, respectively) in muscle samples of 16 patients analyzed so far.

Image -



Conclusion - This is a first-in man study for the use of growth hormone in critical limb ischemia patients. Although first results appear to be safe and demonstrate some beneficial clinical effects of the hormone in these patients, the dose and the period of treatment of GH have to be properly established. GH might represent a new and easy alternative to alleviate symptoms in patients suffering from peripheral ischemia. However, this is a pilot study with a small sample size that makes a leap from the laboratory to the clinic setting, whose results must be confirmed in a larger clinical trial. Mid-term results from this study are also awaited.

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O-199 MAXIMUM CAROTID PLAQUE DILATION PRIOR TO STENT DEPLOYMENT VERSUS POST STENT DILATION FOR ENDOVASCULAR TREATMENT OF CAROTID ARTERY STENOSIS

CLINICAL TRIALS

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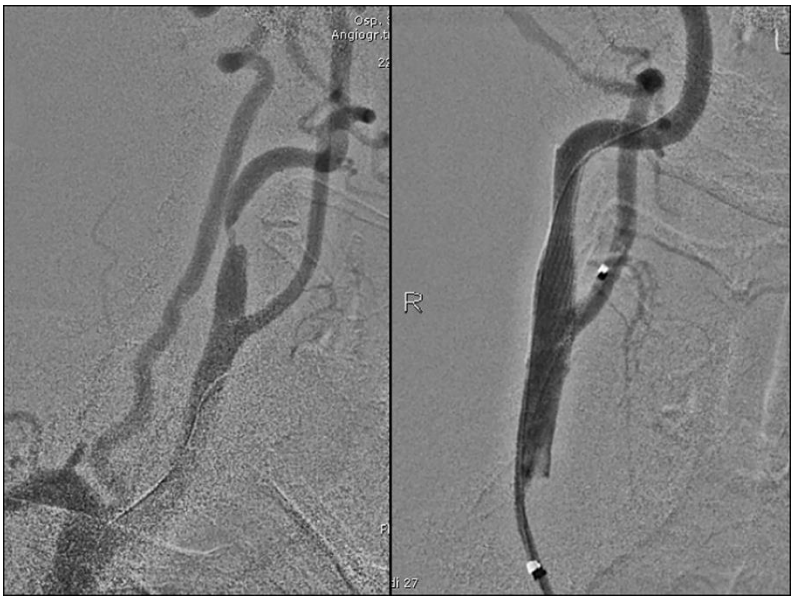
Introduction - Plaque stability is of utmost importance for stroke prevention in the perioperative period (within 24 hours) following carotid artery stenting (1-3). Although carotid plaque is entrapped between the stent struts following stent deployment, plaque can protrude, increasing the risk of post procedural embolic events (4). Maximum carotid plaque dilation prior to stent deployment may reduce this risk (5-7). The current study aims to analyze the effect of maximum dilation of the carotid plaque prior to stent deployment (max-pre-SD) or after stent deployment (post-SD) on macroscopic plaque debris (macroscopic debris), hemodynamic depression (HD) and immediate major adverse events.

Methods - This multi-center retrospective study analyzed patients treated for carotid artery stenosis with CAS from January 2014 to August 2016. Clinical and morphological characteristics, and operative details were analyzed with logistic regression analysis for macroscopic debris and HD. Number of microembolic signals (MES) was assessed by transcranial Doppler and analyzed.

Results - A total of 327 patients were enrolled and treated with standard CAS, mostly perfomed using proximal occlusion cerebral embolic protection device (EPD): 152 received max-pre-SD and 175 were treated with post-SD. Technical success was 99.7%. Macroscopic debris and HD were significantly different between the two groups, in favor of max-pre-SD ($p<0.001$). A significant difference of intraprocedural MES between two groups was detected. Compared with post-SD, max-pre-SD significantly reduced mean MES counts in the proximal EPD group (13.4% vs 50.4%, $p=0.005$). Patients treated with post-SD had a significant increased risk of MES in the immediate postoperative period compared to max-pre-SD (41.1% vs 1.3%, $p<0.001$).
There were no statistically significant differences for major adverse events, mainly due to the small number of events encountered. Patients treated with post-SD had an 23 fold increased risk of macroscopic debris collection (OR 23.6; 95% CI 7.38-75.45; $p>0.001$) and a 13 times increase in HD risk (OR 13.0; 95% CI 2.77-61.02; $p=0.03$) compared to max-pre-SD. Heterogeneous plaque type significantly increased the risk of macroscopic debris (OR 13.5; 95% CI 2.29-79.2; $p=0.004$) whilst acting as a protective factor against HD (OR 0.007; 95% CI 0.001-0.05; $p<0.001$), along with calcified plaque types (OR 0.02; 95% CI 0.003-0.16; $p<0.001$).

Image -



Conclusion - Max-pre-SD seems to be a safe and feasible technical modification to the CAS procedure. Macroscopic debris, HD and MES are significantly reduced compared to CAS with post-SD. Further research with larger, randomized patient cohorts is required to establish superiority of this technical modification

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O-200 VALIDATION OF THE GLOBAL VASCULAR GUIDELINES (GVG) ON CHRONIC LIMB THREATENING ISCHAEMIA (CLTI) GLOBAL ANATOMIC STAGING SYSTEM (GLASS) IN A PRIMARY ENDOVASCULAR TREATMENT COHORT WITHIN THE BASIL-1 TRIAL

PERIPHERAL ARTERIAL DISEASE

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Introduction - The Global Anatomic Staging System (GLASS) is a new angiographic staging system described in the Global Vascular Guidelines (GVG) on Chronic Limb Threatening Ischaemia (CTLI) that separately grades (from 0-4) the severity and

extent of disease in the femoro-popliteal (FP) and infra-popliteal (IP) arterial segments to give an overall limb GLASS stage (termed I, II, III). The GVG proposes that GLASS be used to correlate the angiographic pattern of disease with immediate technical failure (ITF) and long-term clinical outcomes following infra-inguinal endovascular treatment (EVT) to facilitate shared decision-making and evidence-based revascularisation (EBR). However, GLASS has not yet been validated in a cohort of CLTI patients. The aim of the present study, therefore, was to validate GLASS for the first time by examining the relationship between GLASS, ITF and long-term clinical outcomes in patients undergoing primary EVT in the Bypass versus Angioplasty in Severe Ischaemia of the Leg (BASIL-1) trial.

Methods - Using data obtained from the original, prospectively-gathered BASIL-1 trial case record forms (CRFs), we examined the relationships between ITF, amputation free survival (AFS), overall survival (OS), limb salvage (LS), and freedom from major adverse limb events (FF-MALE) in 213 patients who underwent primary EVT (FP only, n=159; IP+FP, n=49; IP only, n=5) as their first revascularisation procedure in BASIL-1; and in whom the original baseline (pre-intervention) angiograms were available for GLASS staging by an expert panel blinded to patient outcomes.

Results - Baseline demographics and co-morbidities were typical of the CLTI population with 70% having tissue loss and 43% having diabetes. There were 5, 23, 37, 42, 106 patients in FP grade 0-4; 149, 23, 18, 8, 15 patients in IP grade 0-4; and 43, 54, 116 patients in GLASS stages I, II, and III, respectively. GLASS stage (HR 0.58, 95% CI 0.36-0.92, p=0,02) and diabetes (p=0.004) were predictive of ITF, which occurred in 47/213 (22%) patients overall; in 14%, 15%, 28% patients in GLASS stages I, II, and III ($p<0.05$) respectively; and was associated with reduced LS ($p<0.05$). In the FP only group, GLASS stage III was associated with significantly worse AFS (vs stage I, p=0.04), LS (vs stage II, p=0.03) and FF-MALE (vs stage I, p=0.05); there was a trend towards worse OS (p=0.08). There was no relationship between these long-term clinical outcomes and GLASS stage in the IP±FP group. In the FP only group, increasing GLASS FP grade (severity from 0 to 4) was significantly associated with worse AFS (p=0.03) and FF-MALE p=0.03), but not LS (p=0.07) or OS (p=0.16).

Conclusion - Present data and angiograms derived from the BASIL-1 suggest that overall GLASS stage and FP grade are useful predictors of ITF and longer-term clinical outcomes (especially AFS, FF-MALE) in patients undergoing EVT. Although further validation of the GLASS is clearly required, we conclude that GLASS is likely to facilitate shared decision-making and EBR allowing better choice of initial revascularisation procedure and stratification of patients within clinical trials.

O-201 CLOSED-INCISION NEGATIVE-PRESSURE THERAPY REDUCES SURGICAL SITE INFECTIONS IN VASCULAR SURGERY: A PROSPECTIVE RANDOMISED CONTROLLED TRIAL (AIMS TRIAL)

PERIPHERAL ARTERIAL DISEASE

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Introduction - Surgical site infections (SSI) of the groin remain a crucial problem in vascular surgery, prompting great interest in preventative techniques, such as closed-incision negative-pressure therapy (ciNPT)[(1, 2)]. Benefits of ciNPT include reduced skin tension in the incision area, fluid removal, and the establishment of a barrier to external contamination during the first days after surgery[3]. The evidence for the use of negative pressure devices derives from few randomized trials with inconsistent results [4,5].
In this prospective randomised multicentre study, we aimed to assess the potential benefits of ciNPT application after groin incision for vascular surgery.

Methods: - This study included 204 patients who underwent vascular surgery for peripheral artery disease (PAD) at two sites between July 2015 and May 2017. These patients received postoperative treatment with ciNPT (study group) or standard wound dressings (control group). After exclusion of drop-outs, 188 patients were assessed regarding wound complications and SSIs using the Szilagyi classification.

Results - Mean patient age was 66·6 ± 9·4 years (range, 43–85 years), and 70 per cent were male (*n* = 132). Regarding PAD stage, 52 per cent were stage IIB, 28 per cent stage III, and 19 per cent stage IV. Among the patients, 45 per cent (*n* = 85) had undergone previous groin incision. The control group experienced more frequent SSI (33·3 per cent; 30/90) than the study group (13·2 per cent; 13/98; *P* = 0·0015; OR, 3·25; 95 per cent c.i., 1·5 to 7·4). The SSI incidence risk ratio was 0·4 in the study group compared to the control group.

Conclusion: Our results confirmed a reduced SSI rate after vascular surgical groin incision using ciNPT compared to standard wound dressings.

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O-202 ENDOVASCULAR MANAGEMENT OF CHRONIC ILIOFEMORAL VENOUS THOMBOSIS-A SYSTEMATIC REVIEW AND META-ANALYSIS

VENOUS DISEASES (INCLUDING MALFORMATIONS)

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Introduction - Chronic iliofemoral venous thrombosis (CVT) is considered a major health problem worldwide, frequently resulting in chronic venous insufficiency and in the post-thrombotic syndrome, at the same time having a great economic social and psychological impact worldwide. Venous thrombosis can result from various etiologic factors such as external pressure or anatomical diversities (May-Turner syndrome), acute or chronic deep venous thrombosis whereas the symptomatology depends on the cause, extent and duration of the disease. Among the most serious complications of the disease is the post-thrombotic syndrome which appears in 20% to 100% of patients despite contemporary treatment, having a negative influence on the Quality of Life (QoL) of these patients. Historically, surgical venous thrombectomy firstly described by Leriche in 1948, represented an alternative treatment choice compared to conservative treatment with acceptable short-term results regarding the recanalization of the iliofemoral venous segment and the improvement of the post thrombotic syndrome. Therapeutic anticoagulation for CVT represents the gold-standard treatment despite high morbidity rates. Although endovascular management of acute iliofemoral venous thrombosis has been reported as a promising and effective treatment option in recently published societal guidelines, its role on CVT management has not been sufficiently described. We conducted a systematic review and metanalysis of the current literature for the efficacy of endovascular treatment of CVT in terms of patency and its effect on the quality of life of patients.

Methods - We interrogated electronic bibliographic sources using a combination of free text and controlled vocabulary searches to identify studies reporting on endovascular management of CVT. We conducted our review according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement standards. We applied fixed-effect or random-effects models to calculate pooled prevalence estimates.

Results - We identified 23 observational cohort studies reporting a total of 2288 participants (709 men and 1579 women). The mean age of participants ranged across the studies from 18 to 85 years. Mean follow up was 18 months and positive thrombophilia

screen was noted in 35% of included patients. Mean intervention time was 7.3 years, technical success was 92.8% (95% CI 93 to 97), 30-day stent occlusion and stent restenosis rates were 4.7% (95% CI 3 to 5) and 16.9% (95% CI 14 to 18) respectively. Primary patency rates at the 1st,2nd,3rd and 4th year of follow up were 97.6%, 93.3%, 81.9% and 54.9% respectively. Similarly, primary-assisted patency rates were 98.5%, 96%, 91.7% and 83.3% respectively whereas secondary patency rates were 98.6%, 97%, 93.8% and 87% respectively. QoL measurements were improved after the intervention compared to preoperative values.

Conclusion - Although endovascular management of acute iliofemoral deep venous thrombosis has been recommended by societal guidelines, its role in chronic settings remains not well defined. However, endovascular treatment of CVT has been shown to reduce the severity of post thrombotic syndrome and improve QoL in treated patients.

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O-203 INTERNATIONAL CONSORTIUM OF VASCULAR REGISTRIES CONSENSUS RECOMMENDATIONS FOR PERIPHERAL REVASCULARIZATION REGISTRY DATA COLLECTION

PERIPHERAL ARTERIAL DISEASE

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Introduction - To achieve consensus on the minimal core data set for evaluation of peripheral arterial revascularization outcomes and enable collaboration among international registries.
Methods - A modified Delphi approach was used to achieve consensus among international vascular surgeons and registry members of the International Consortium of Vascular Registries (ICVR). Variables, including definitions, from registries covering open and endovascular surgery, representing 14 countries in ICVR, were collected and analyzed to define a minimal core data set and to develop an optimal data set for registries. Up to three different levels of variable specification were suggested to allow

inclusion of registries desiring simpler vs. complex data capture, while still allowing for data aggregation based on harmonized core definitions.

Results - Among 31 invited experts, 25 completed five Delphi rounds via Internet exchange and face-to-face discussions. In total, 187 different items from the various registry data forms were identified for potential inclusion in the recommended dataset. Ultimately, 79 items were recommended for inclusion in minimal core data sets, including 65 items in the Level 1 dataset, and an additional 14 items in the more specific Level 2 and 3 recommended data sets. Data elements were broadly divided into 1) patient characteristics, 2) co-morbidities, 3) current medications, 4) lesion treated, 5) procedure, 6) bypass, 7) endarterectomy, 8) catheter-based intervention, 9) complications, and 10) follow-up.

Image -

Conclusion - A modified Delphi study allowed 25 international vascular registry experts to achieve a consensus recommendation for a minimal core data set and an optimal dataset for peripheral arterial revascularization registries. Continued global harmonization of registry infrastructure and definition of items will overcome limitations related to single-country investigations and enhance the development of real world evidence.

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O-204 A NATIONWIDE ASSESSMENT OF THE EPIDEMIOLOGY OF RUPTURED ABDOMINAL AORTIC ANEURYSMS DURING 20 YEARS – DECLINING INCIDENCE, INCREASED OPERATIVE INTERVENTION AND IMPROVED SURVIVAL

ABDOMINAL AORTIC DISEASES

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Introduction - International observations indicate a decrease in incidence of ruptured abdominal aortic aneurysms (rAAA). Although there are indications of reduced perioperative mortality after rAAA repair in the endovascular era, few studies assess if modern therapy has resulted in a higher rate of patients being offered surgical intervention for rupture. In the current study, we aimed to describe the epidemiology of rAAA, surgical intervention and outcome of treatment in a nationwide study.

Methods - All citizens >50 years of age in the country with a diagnosis of rAAA 1994-2013, were extracted from three registries: The Cause of Death Registry, The National Hospital Discharge Registry (based on ICD codes and operation codes), and The National vascular registry (based on registration of operative treatment of rAAA). Using the unique national personal identification number, data were cross-matched between registries to avoid duplicates, as well as with the National population registry regarding mortality. Proportions were analysed in 5-year groups. Data were divided into gender and stratified into age groups (50-79-years versus octogenarians). Time trends for incidence of rAAA (per 100.000), proportion of patients undergoing surgical intervention, operative technique (Open repair or endovascular aortic repair, EVAR) and mortality (<90 days) were assessed with regression analysis.

Results - 18.726 patients were identified, 74.0% men. Overall, the annual incidence of rAAA decreased from 33.1/100,000 inhabitants in 1994 to 21.3/100,000 in 2013 (-36%). The decrease in incidence was significant in men and women <80-years, but not in octogenarians, Figure 1. An increasing proportion of patients with rAAA had a registered operative intervention. The proportion of male patients with rAAA undergoing operation was 44.5% in 1994-1998 versus 49.7% in 2009-2013 (relative rate (RR) increase in men 11.7%, p<0.001). In women, the rate of operative intervention was 1994-1998 22.3%, increasing up to 28.2% in 2009-2013; RR 26.4%, p=0.030. The most important increase in operative treatment occurred in octogenarians (RR men: 44.3% p<0.001; RR women 49.3% p=0.048). The proportion of patients undergoing repair who were treated with EVAR increased from 0% in women and 1.8% in men in 2000 to 41.2% in women and 42.3% in men 2013 (p<0.001). In octogenarians, the rate of EVAR as operative treatment was 50.0% in women and 59.3% in men by 2013.
Overall 90-day mortality (including also those not operated on) in patients with rAAA decreased over time, in men from 75.6% 1994-1998 to 64.8% 2009-2013, RR -14.5%, p<0.001; and in women from 88.5% to 82.2%, RR -7.1% p<0.001. In patients undergoing operative treatment, mortality decreased among men from 47.0% 1994-1998 to 31.8% 2009-2013 (all men RR -32.3%, <80-years RR -33.3%, octogenarians RR -27.5%, p<0.001). In women, the reduction in operative mortality was only significant in the patients <80-years (from 51.7% to 35.2%, RR -31.9%, p=0.049).

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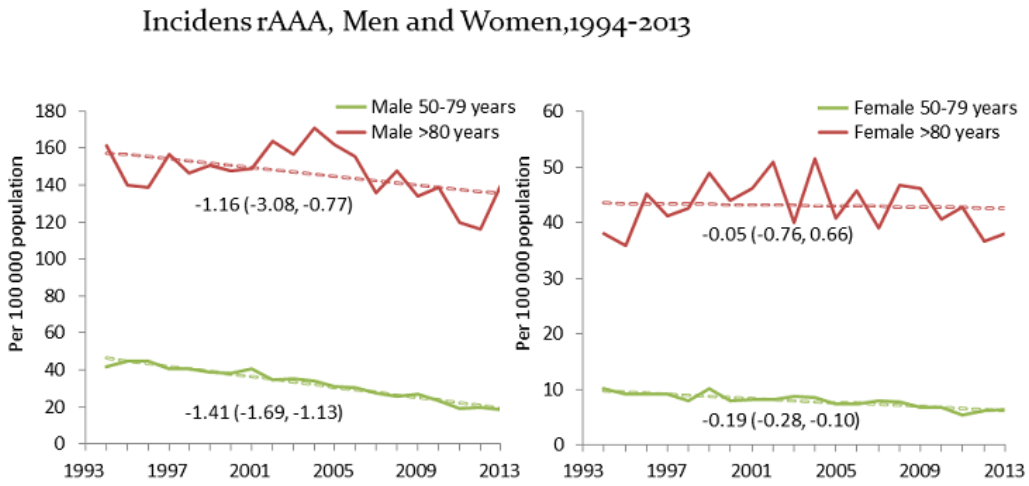

Figure 1. Trends for yearly incidens of rAAA by sex and age-groups with trendlines, age-specific; Male 50-79 years: P<0.001, R^2=0.956 Male >80 years: P=1.000, R^2=0.236; Female 50-79 years : P<0.001, R^2=0.789 Female >80 years : P=1.000, R^2=0.004 (linear regression) .

Conclusion - The incidence of rAAA in the country declined by >40% for men and >20% for women from 1994 to 2013. In addition to a marked reduction in incidence of rAAA, mortality in rAAA is decreasing thanks to increasing surgical intervention rate, especially in octogenarians who often are treated with EVAR, and improved surgical outcome. Gender differences prevail, with women suffering a higher rAAA mortality rate and lower surgical intervention rate.

O-205 TIMING IS EVERYTHING: IMPORTANCE OF EARLY DUPLEX SURVEILLANCE IN PREDICTING RISK OF RE-INTERVENTION FOLLOWING DEEP VENOUS STENTING FOR THE TREATMENT OF POSTTHROMBOTIC SYNDROME

VENOUS DISEASES (INCLUDING MALFORMATIONS)

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Introduction - Endovascular treatment of post-thrombotic syndrome using nitinol venous stents is associated with symptomatic improvement, but ~40% will require re-intervention. Our approach to maintain stent patency has been through close surveillance to intervene before stent occlusion. There is, however, limited data on the efficacy, interval and duration of ultrasound surveillance following deep venous reconstruction. The aim of this study was to examine whether ultrasound surveillance was sensitive for re-intervention, and to investigate whether it was possible to predict which patients had the greatest risk of re-intervention.

Methods - Consecutive patients in whom a venous stent was inserted for symptomatic occlusive post-thrombotic disease between 2012 and 2017 were included for analysis. Stent patency was assessed using duplex ultrasonography 24hrs, 2wks, 6wks, 3mths,

6mths,1yr and yearly post intervention. The maximum in-stent stenosis was calculated, with re-interventions performed when there was a stent diameter reduction of >50%. Patient demographics were collected to determine which factors were associated with re-intervention.

Results - Of 194 patients treated in our venous programme during the study period, cumulative patency was 86% (median follow-up 2.4yrs; range 34-295wks). However, 79 (41%) patients required re-intervention to maintain patency, of which 40/79 (51%) occurred within 3wks of their procedure. Stenting across the inguinal ligament was associated with a higher risk of early re-intervention (HR 1.817; P=0.048, 95% CI [1.005, 3.285]). Re-interventions immediately followed ultrasound surveillance in 70/79 (87%) cases, and this was driven by scan results rather than symptom change. From this group, 13/79 (17%) required only a single re-intervention, while 16/79 (20%) required more than 3 re-interventions (median number of re-interventions 2; range 1-6). At 6wks, maximum in-stent stenosis <30% was a strong predictor of being low risk for re-intervention at 6mths (HR 0.038; P=0.003, 95% CI [0.004, 0.322]). Conversely, patients with a maximum in-stent stenosis between 30-50% at 6wks were at high risk of requiring re-intervention at 6mths (HR 29.90; p=0.002, 95% CI [3.519, 253.989]). Furthermore, the anatomical location of the maximum in-stent stenosis was not a contributing factor for re-intervention.

Conclusion - Ultrasound surveillance is an important component of deep venous stenting, and should occur at frequent intervals up to 3wks post procedure. Ultrasound surveillance at 6wks could be used to differentiate between patients that require further surveillance before 6mths. These may include patients with maximum in-stent stenosis between 30-50% at 6wks and patients with stents crossing the inguinal ligament.

O-206 MEASUREMENT OF FRACTIONAL FLOW RESERVE PREDICTS THE FUNCTIONAL SIGNIFICANCE OF PERIPHERAL ARTERIAL LESIONS IN THE ISCHAEMIC LEG

PERIPHERAL ARTERIAL DISEASE

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Introduction - The current mainstay for investigating peripheral arterial disease (PAD) uses duplex ultrasound (DUS) and visual assessment of lesions by either computed tomography (CTA)/magnetic resonance (MRA) or invasive angiography (IA). In coronary vessels, Fractional Flow Reserve (FFR) measures the trans-stenotic pressure loss during maximum flow to determine the 'functional' significance and inform revascularisation. This study (i) investigated the relationship between anatomical (diameter stenosis, DS%) and functional (FFR) severity of peripheral arterial stenoses and (ii) correlated these parameters to limb tissue perfusion.

Methods - Patients with short-distance claudication (IC) and critical limb ischaemia (CLI) underwent DUS and CTA. Pre-procedural blood oxygenation level-dependent cardiovascular magnetic resonance (BOLD-CMR; 3.0T Achieva, Philips Healthcare) was performed in both legs at rest and during reactive hyperaemia. T2* signal gradient during reactive hyperemia (Grad) of the calf muscles was recorded. During elective angioplasty/stenting, an 0.014" Doppler-flow and pressure-sensing guidewire (ComboWire XT®, Philips Healthcare) was used to measure the trans-stenotic pressure index (distal lesion pressure[Pd]/aortic pressure[Pa]) at rest ("Pd/Pa") and during hyperaemia ("FFR"). Intra-arterial adenosine was used to provoke hyperaemia, which was confirmed by measuring the resting-to-hyperaemic change in average peak velocity (APV) and microvascular resistance (MVR, calculated as Pd/APV). Quantitative Vessel Analysis (Philips Allura Xper FD20, Philips Healthcare) was used to calculate percentage diameter stenosis (DS%) from CTA and IA. Follow up with DUS determined primary patency, defined as <50% restenosis in the treated segment.

Results - Fifty-two stenoses (iliac n=33; femoral n=19) in 41 patients were evaluated; 59% had IC and 41% had CLI. Median DS% by DUS, CTA, and IA were 70% (IQR 60-86), 67% (52-77) and 61% (48-73), respectively. Pd/Pa and FFR were successfully measured in all patients with no complications. There was a significant increase in APV (14.9 cm/s (8.5-20.7) to 30 cm/s (18.2-44.8); p<0.0001) and reduction in MVR (6.8 (4.5-9.2) to 2.7 (1.7-3.9); p<0.0001) following adenosine administration. Median pre-

treatment Pd/Pa was 0.91 (0.78-0.97) and FFR was 0.70 (0.52-0.87), which improved to 0.94 (0.86-0.98; p=0.001) and 0.90 (0.80-0.95; p<0.0001) after angioplasty/stenting, respectively. FFR correlated poorly with CTA and IA-DS% (R^2=0.57-0.60; p<0.0001) and had a stronger association with clinical severity (CLI vs IC; AUC 0.96, p<0.0001). Perfusion in 18 ischaemic limbs (14 patients) was assessed with BOLD-CMR. FFR strongly correlated with Grad (R^2=0.63; p<0.0001), whereas DS% (DUS, R^2=0.18 [p=0.85]; CTA, R^2=0.45 [p=0.001] and IA, R^2=0.41 [p=0.003]) were poor predictors of limb perfusion. Forty patients (98%) were followed up for a median of 3 (1.8-4.1) months. A post-treatment FFR cut-off of 0.88 demonstrated a sensitivity and specificity of 75% for predicting primary patency (AUC 0.852; p

Conclusion - FFR appears to be a useful index of functional severity and ischaemic burden related to peripheral arterial stenoses, and for predicting successful intervention. Clinical trials will determine whether it will become, as it has in the coronary circulation, the gold standard for making treatment decisions.

O-207 PROSPECTIVE ASSESSMENT OF A PROTOCOL USING NEUROMONITORING, EARLY LIMB REPERFUSION AND SELECTIVE TEMPORARY ANEURYSM SAC PERFUSION TO PREVENT SPINAL CORD INJURY DURING FENESTRATED-BRANCHED ENDOVASCULAR AORTIC REPAIR

THORACIC & THORACO-ABDOMINAL AORTIC DISEASE

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Introduction - Spinal cord injury (SCI) is a devastating complication of thoracoabdominal aortic aneurysm (TAAA) repair. The aim of this study was to analyze the outcomes of a standardized protocol using continuous neuromonitoring, lower limb (LL) reperfusion and selective temporary aneurysm sac perfusion (TASP) to prevent SCI in patients undergoing fenestrated-branched endovascular repair (F-BEVAR).

Methods - Patients enrolled in a prospective, non-randomized single-center study between 2014 and 2017 underwent a SCI prevention protocol for TAAAs or ≥5-cm supraceliac coverage, including staged thoracic endovascular aortic repair (TEVAR) for Extent I-II TAAAs, cerebrospinal fluid (CSF) drainage, permissive hypertension (mean arterial pressure [MAP] ≥80 mmHg), LL reperfusion and neuromonitoring. A ≥75% decrease in motor evoked (MEP) and somatosensory evoked potential (SSEP) amplitude triggered standardized maneuvers. Selective TASP was indicated in patients with persistent decline or delayed recovery (>10 min) in MEP/SSEPs despite maneuvers. End-points adjudicated by independent clinical event committee and included mortality and rates of immediate and delayed (>6 hours) SCI.

Results - SCI prevention protocol was indicated in 166 of 232 patients (72%) treated by F-BEVAR for pararenal aneurysms in 22 patients, Extent IV TAAAs in 59 and Extent I-III TAAAs in 85 (Figure). CSF drainage was successful in 162 patients (98%) and stable neuromonitoring was achieved in all patients. Eighty-eight patients (53%) had changes in neuromonitoring starting 50±37 minutes after introduction of the aortic device. Changes in neuromonitoring improved with maneuvers in all except for 10 patients (11%) who had persistent decline in MEP/SSEPs after LL reperfusion. All 10 patients had TASP by leaving a renal-mesenteric branch or contralateral iliac gate incomplete. There was one 30-day or in-hospital mortality (0.4%) due to a subarachnoid hemorrhage from CSF drainage. Ten patients (4%) developed SCIs, including 6 paraplegia and 4 paraparesis. SCIs were immediate in 4 and delayed in 6 with an incidence of 1% for pararenal, 0% for Extent IV, 13% for Extent III and 10% for Extent I-II TAAAs. The probable cause of SCI was hemodynamic compromise in 6 patients, embolic in 2 and epidural hematoma in 2. SCIs occurred in 1/78 patients (1%) with normal neuromonitoring and in 9/88 patients (10%) who had decline in MEP/SSEPs (P=0.02). Among the 10 patients with TASP, neurologic exam was normal in 8 and showed SCI in 2. TASP closure was completed in all patients at 22±16 days, with one SCI 2 days after completion. All 3 patients with post-TASP SCI had complete recovery to ambulatory status. Overall, 2 patients (1%) had permanent paraplegia, which was immediate and probably embolic in both. Factors associated with SCI included extent I-III TAAAs, change in neuromonitoring and need for TASP.

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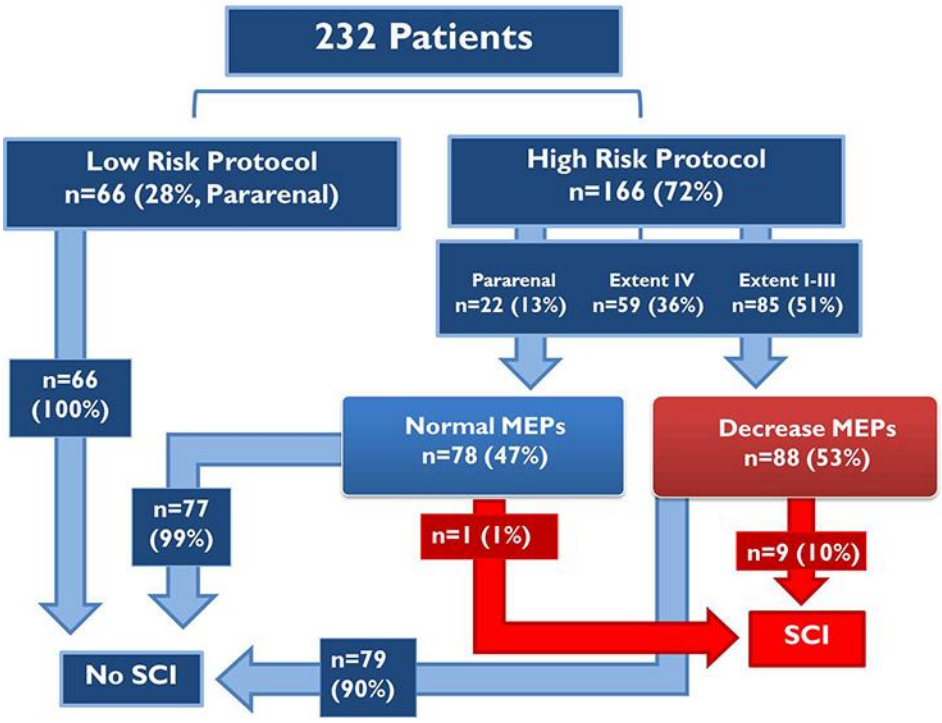

Conclusion - This prospective non-randomized study showed that a standardized protocol was associated with low rate of permanent paraplegia (1%). The predominance of SCIs among patients with Extent I-III TAAAs confirms that this protocol may be avoided in lower risk patients (e.g. pararenal and Extent IV TAAAs) due to potential risk of spinal and cerebral hemorrhagic complications from CSF drainage. Although TASP does not completely prevent SCI, it may optimize recovery to ambulatory status. Further investigation is needed to evaluate the benefits of TASP to prevent permanent paraplegia.

O-208 PHYSICAL ACTIVITY, AND INACTIVITY, AND RISK OF ABDOMINAL AORTIC ANEURYSM

ABDOMINAL AORTIC DISEASES

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Introduction - Physical activity and its benefits on cardiovascular morbidity are well documented, as are the independent negative effects following a sedentary lifestyle. Studies investigating the possible effects of this life-style factor on abdominal aortic aneurysm (AAA) development are scarce, however. The aim was to investigate the possible associations between walking/bicycling and leisure time exercise, as measures of physical activity, and daily hours of sitting down/watching TV, as a measure of inactivity, and risk of AAA.

Methods - The study consisted of 38,952 men from the Cohort of Swedish Men (COSM), and 31,449 women from the Swedish Mammography Cohort (SMC), excluded for prevalent AAA at baseline, implausible energy intake, and missing information on primary exposures. Participants, aged 46 to 84 years, reported specific types of activity in a detailed food-frequency questionnaire. AAA was identified by linkage of the cohorts to the Swedish Inpatient Register, the Swedish Registry for Vascular Surgery (SWEDVASC), and the Swedish National Cause of Death Register. Cox proportional hazards models were used to estimate hazard ratios of AAA with 95% confidence intervals (CIs). Results were also compared with a logistic regression analysis with AAA >30mm

as outcome in a subsample of 14,286 men that had undergone population-based AAA screening between 65 and 75 years of age (mean 13.7 years after baseline).

Results - During the 17-year follow-up from 1st January 1998 to December 31st 2014, 1142 men and 198 women were diagnosed with or underwent surgery for AAA. Of these events, 241 were ruptures (of which 198 occurred in men [82.2%]). In the subsample of screened men, 150 (1.05%) had an AAA.
The HR of AAA among those with 2-3h of weekly exercise was 21% lower (95% CI, 7% – 33%), compared with those who exercised <1h/wk. The HR of AAA was 20% lower (95% CI, 5% – 33%) among those who walked/bicycled 20-40 min/d, and >40 min/d, in comparison with those who hardly ever walked or bicycled. Sitting down/watching TV >3h/d was associated with a more than two-fold increased risk of ruptured AAA (HR, 2.21; 95% CI, 1.12 – 4.39), compared with <1h/d.
Among never smokers, the association between exercise and AAA seemed to be more pronounced than among ever smokers (P for interaction = 0.041). Compared with <1h/wk, the HR of AAA among those who exercised 1-2h/wk was 0.78 (95% CI, 0.65 – 0.94) among ever smokers, respectively 0.66 (95% CI, 0.45 – 0.97) among never smokers.

Conclusion - We observed that physical activity was associated with a decreased risk of AAA in general, while inactivity was associated with an increased risk of ruptured AAA. Those who had never smoked seemed to benefit even more from leisure time physical exercise compared with ever smokers.

O-209 BASELINE FINDINGS IN THE DANISH CARDIOVASCULAR SCREENING (DANCAVAS) TRIAL – A MULTIFACETED AND MULTICENTER RANDOMIZED CONTROLLED CLINICAL SCREENING AND INTERVENTIONAL TRIAL OF 65-74 YEAR OLD MEN

CLINICAL TRIALS

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Introduction - The societal challenge of age-related diseases, including cardiovascular, increases. Attempts to reduce cardiovascular mortality via routine checks by general practitioner have failed. New imaging modalities for cardiovascular disease (CVD) have improved discriminant accuracy and risk classification. This might be useful in population screening. In the autumn 2015, we initiated the Danish Cardiovascular Screening Trial (DANCAVAS), which is a randomized, clinically controlled, multicenter screening and intervention trial. Recruitment was completed in in 2017.
This cross-sectional baseline study aim to report organization, acceptability, and relevance of the intervention arm of the DANCAVAS trial.

Methods - In all, 16 768 of 46 611 men aged 65–74 years were randomly selected and invited to a cardiovascular screening using low dose non-contrast CT scan, brachial and ankle blood pressure measurements, and blood tests.
A secured web based booking and answering system was developed and used. A trained staff performed the screening. Positives were recommended general cardiovascular prevention including medication and surgery if needed (1,2).
Results - Attendance rate was 10 471 (62.4%). Of these, 5 176 (49.5%) had CAC above the age and gender standardized median. Peripheral arterial disease (ABI: ≤0.9 or > 1.4) was diagnosed in 1147 (11.0%). Thoracic aortic aneurysms were detected in 468 (4.5%), 48 (0.5%), and 233 (2.2%), regarding ascending (≥ 45 mm), arcus (≥ 40 mm) and descending aorta (≥ 35 mm), respectively. Abdominal aortic and iliac aneurysm (abdominal: ≥30 mm and iliac: ≥20 mm) was diagnosed in 533 (5.1%) and 239 (2.3%), respectively.
Coexisting aortic dilatation (>1.25 x expected size) was found in 16% of those having an infrarenal aorta +25 mm wide, and in almost half having adescending aortic aneurysm (Figure 1) (3).

Potential unknown hypertension (≥160 and/or ≥100 mmHg) was found in 835 (8.0%), unknown diabetes mellitus (HgbA1c > 48 mmol/l) in 180 (1.7%), unknown atrial fibrillation or flutter was confirmed by ECG in 50 (0.5%), and isolated severe hyperlipidemia (total-cholesterol > 8 mmol/l) in 48 (0.5%).
Statin and aspirin were the most frequent recommended medical preventive treatments: 3500 (33.4%) and 3320 (31.7%) patients, respectively. In all 4 387 (41.9%), excluding those with potential hypertension, were recommended for additional cardiovascular treatment and 3 712 out of the screening cohort (36.5%) did initiate the treatment. This corresponds to 84.6% of those recommended for additional cardiovascular prevention.

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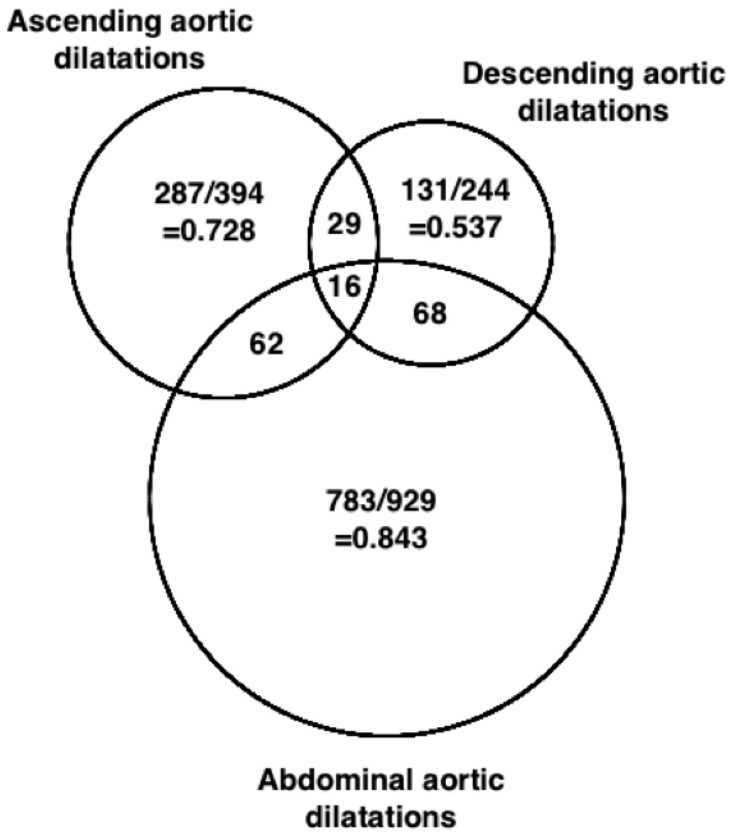

Conclusion - A complex 7-step-multifaceted CVD screening offer is feasible and may substantially optimize CVD prevention in the older male population. However, the attendance rate was relative low compared to screening for AAA in the same age group suggesting less organizational acceptability. Screening efficacy will be examined after 5 years of follow-up.

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O-210 THE SWEDISH DRUG-ELUTION TRIALS IN PERIPHERAL ARTERIAL DISEASE (SWEDEPAD) - AN UPDATE HALFWAY THROUGH THE OVERALL INCLUSION PHASE

CLINICAL TRIALS

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Introduction - Drug-eluting balloons and stents may improve outcomes after endovascular treatment of peripheral arterial disease (PAD), but current evidence for clinical efficiency and cost-effectiveness is limited. Published randomized trials have been underpowered to address patient-centered clinical endpoints. Instead, available evidence largely relies on device-specific industry-sponsored trials exploring surrogate endpoints. The SWEDEPAD trial was designed to assess the clinical efficacy and cost-effectiveness of drug-elution technology versus conventional endovascular techniques in PAD, using patient-centered endpoints in a pragmatic randomized controlled trial design incorporated within the National Registry for Vascular Surgery (Swedvasc).

Methods - The Swedvasc PAD module was supplemented with online randomization functionality and a trial database were integrated for trial purposes. All centers performing PAD interventions in Sweden were invited. Liberal inclusion criteria and few exclusion criteria enable recruitment of the majority of patients eligible for infrainguinal endovascular revascularization. The trial consists of two parallel studies, SWEDEPAD-1 (critical limb ischemia) and SWEDEPAD-2 (intermittent claudication) and although each trial will be evaluated separately, study procedures are similar. When a guide-wire is established across the obstructing lesion, patients are randomized between using or not using drug-eluting technology. Randomization is stratified for treated vascular segment and initial treatment strategy (PTA or primary stenting). All devices with a PAD CE-mark are allowed. Sample size is determined at 2400 in SWEDEPAD-1 and 1300 in SWEDEPAD-2 trial. An independent data and safety monitoring board regularly evaluates overall event rates. Patients are followed at one month and one year according to the Swedvasc routines, and other national registries are used to capture additional endpoints and long-term follow-up data. The primary endpoint for SWEDEPAD-1 is amputation rate, and the primary endpoint for SWEDEPAD-2 is health-related quality of life, assessed with VascuQol-6. Secondary endpoints include patency, target lesion revascularization and a health-economic assessment.

Results - Trial inclusion started in late 2014. Until March 2018, in total 1824 patients were randomized, of which 1181 in SWEDEPAD 1 and 643 in SWEDEPAD 2. Participating centers has gradually increased and currently 22 of the 28 Swedish centers performing PAD interventions participate. Approximately 60 patients are currently randomized per month. In SWEDEPAD 1, 57% of interventions are performed in the femoropopliteal segment, 23% in the infrapopliteal segment and 20% in both segments combined. Of the femoropopliteal interventions, 29 % are primarily stented. In the SWEDEPAD 2 trial, the majority (91 %) is treated in the femoropopliteal segment and of these, 40 % are primarily stented.

Conclusion - The SWEDEPAD trial is now halfway through the inclusion phase. No results are yet available. This trial explores the overall efficacy of drug-eluting technology in infrainguinal PAD interventions. The pragmatic clinical trial design, using a population-based registry with randomization functionality is a new and powerful tool for clinical vascular research.

O-211 FREQUENTLY ASKED QUESTIONS BY RENAL PATIENTS UNDERGOING VASCULAR ACCESS SURGERY

VASCULAR NURSING

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Introduction - A reliable vascular access is essential for chronic kidney disease patients requiring renal replacement therapy with haemodialysis. This is commonly achieved by creating an arteriovenous fistula (AVF), which is a surgically created connection between the artery and the vein. The decision to undergo AVF surgery can be stressful for patients and they try to gather

information from several sources including doctors, nurses and peers to make the right choice. During this process patients usually end up with contradictory statements, information overload and poor retention. The aim of this study is to identify frequently asked questions by patients undergoing AVF surgery and use that data to create a patient information leaflet.

Methods - This is a prospective study conducted in a tertiary referral centre. All patients admitted for vascular access surgery between 01/03/2018 and 15/03/2018 were approached to participate in the study. A face to face semi-structured interview was conducted using an open-ended questionnaire. The results of the interview were written down verbatim and common themes were determined by two independent authors.

Results - A total of 38 patients were approached to participate in the study and all of them agreed to participate. All of them confirmed receiving information regarding AVF from the treating physician. The mean age of the patients was 52.4 (range 32 to 79 years) and 24 patients (63.1%) were men. 22 (57.8%) patients had previous history of AVF surgery. Analysis of the data showed three major themes falling into preoperative, perioperative and postoperative periods.
Questions related to preoperative period

1. 1. Why do I need a fistula?
2. 2. What are the benefits of the fistula?
3. 3. How many days will it take to start using the fistula?
4. 4. Does it affect my heart condition?
5. 5. How long will the fistula last?
6. 6. If this fails, do I have further options?

Questions related to peri-operative period

1. 1. How long will the surgery take?
2. 2. Will the scar be visible?
3. 3. Are there any medication to improve the fistula maturation?
4. 4. Can I continue all my regular medication on the day of surgery?

Questions related to post-operative period

1. 1. How do I know that the fistula is working and how often do I need to check?
2. 2. What can I do to improve the fistula maturation?
3. 3. What food to eat or avoid?
4. 4. How to look after the surgical wound?
5. 5. Can I use the arm to do routine work after surgery?
6. 6. Can I have dialysis after the surgery?
7. 7. What do to if the fistula fails?

Conclusion - In spite of adequate counselling by doctors and nurses, patients still have several questions about their procedure. A patient information leaflet containing answers to the commonly asked questions will help the patient to understand and retain the information at their own pace.

O-212 DIGITAL PLANIMETRY: IS IT A POSSIBLE STANDARD METHOD FOR EVALUATION AND MEASUREMENT OF ULCER HEALING?

VASCULAR NURSING

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Introduction - The measurement of ulcers and the reduction of their surface, as an indicator of closure, are frequent procedures in the clinical and research fields. A medical record with digital support could provide greater precision and optimize the therapeutic approach.

The primary aim of the study was to analyze the agreement in the measurement of lesions and presence of necrotic area between digital planimetry (MOWA® and HELCOS® systems) and manual planimetry (VISITRAK®), the latter being our reference pattern. The secondary aim was to analyze the degree of inter and intra-observer agreement.

Methods - Design: Precision study of diagnostic method. Sample: 44 patients with chronic ulcers of different etiology. Variables studied: Total area (cm2) and percentage of necrotic area. Statistical analysis: Non-parametric correlation test (correlation coefficient r), Bland-Altman diagram and concordance and correlation index (CCI).
A qualified nurse from our staff took photographs with the same camera, parallel to the lesion, using the same brightness and a calibrated reference point (2.5 cm2). Two observers independently measured the different variables with the three systems and one of them repeated the procedure in the following 24 hours.

Results - The CCI for the total area between VISITRAK® / MOWA® was 0.89 (0.848- 0.92) and between VISITRAK® / HELCOS® was 0.79 (0.72- 0.85). The interobserver and intraobserver CCI (total area) was 0.99 (0.998- 0.996) and 0.76 (0.60- 0.86) for MOWA®, respectively. The interobserver and intraobserver CCI (total area) was 0.56 (0.35- 0.72) and 0.60 (0.35- 0.72) for HELCOS®, respectively.
There was a low concordance between the different systems in the area of necrosis compared to the standard reference (VISITRAK®): r 0.58 and 0.23 for MOWA® and HELCOS®.

Conclusion: The systems of digital image analysis present a high precision for the measurement of total ulcer area compared to the manual methods. However, the differentiation between the components of necrosis, granulation tissue and fibrin depends on the conditions of brightness and software parameters.

O-213 THE PATIENT´S EXPERIENCE OF AMPUTATION DUE TO PERIPHERAL ARTERIAL DISEASE

VASCULAR NURSING

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Introduction - It is not uncommon that patients with peripheral arterial disease (PAD) need to undergo a lower limb amputation, with or without previous revascularization. Despite that, the patient's experience of the amputation has been scarcely studied. The aim of this qualitative study is to describe the patient's experience of amputation due to PAD.

Methods - Thirteen interviews were conducted with vascular patients who had to undergo a lower limb amputation at tibia, knee or femoral level. Data were analysed with content analysis.

Results - Our findings ot the patient's experiences during the amputation process resulted in three themes with additional time sequences: the decision phase "From irreversible problems to amputation decision", the surgical phase " A feeling of being in a vacuum" and the rehabilitation phase "Adaption to the new life". One main finding was that the patients felt abandoned during the surgical period. Despite that, most of the participants were satisfied with the decision, some of them even regretted that they had not undergone an amputation earlier in the process.

Conclusion - It is important for the patient's well-being to develop a partnership with the surgeon to increase a feeling of being participating in the care. Vascular patients need better information on lower limb amputation and its consequences so as to be better prepared for the whole process. In order to increase the patient's quality of life and reduce unnecessary suffering, amputation may be presented earlier in the process as a valuable treatment option.

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O-214 SCREENING FOR AAA: CLINICAL EVALUATION OF A SIMPLE AND COST-EFFECTIVE HANDHELD AORTIC SCANNING DEVICE FOR USE IN AN OUTPATIENT VASCULAR SURGERY CLINIC

VASCULAR NURSING

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Introduction - Ruptured aneurysms of the abdominal aorta (rAAA) account for approximately 1000 deaths in our country each year [1]. Efforts to implement routine screening for selected patients could decrease the rAAA mortality rate. Screening programs for AAA are used in several countries [2], selecting patients based on age, sex, or cardiovascular risk profile. However, screening is costly and typically requires separate hospital visits. We hypothesized that if patients were routinely screened during planned outpatient visits, burden and costs could be greatly reduced. To this end, we evaluated whether a handheld ultrasound aortic screening device could be a useful tool to screen for asymptomatic AAA in our outpatient clinic.

Methods - We selected 96 patients diagnosed with peripheral artery disease and who had a waist-hip-circumference (WHC) < 115cm. Their abdominal aorta (AP diameter) was measured using a handheld aortic scanning device (AortaScan® BVI 9600, Auxo Medical, Richmond, VA, USA {3}). This group included 44 patients (46%) with an AAA of >3cm. As control, all patients were subjected to a conventional ultrasound of the abdominal aorta. We used SPSS 23.0 to perform statistical analysis of the data and determine specificity, sensitivity, positive and negative predictive value (PPV and NPV, respectively), and Kappa value (strength of agreement between methods).

Results - Analysis of our results yielded a sensitivity of 90% and specificity of 98% for the Aortascan as compared to conventional ultrasound. The strength of agreement (Kappa) was 0.88. PPV and NPV were 0.98 and 0.90.

Conclusion - Screening programs must balance the costs of screening with clinical benefit. The Aortascan BVI 9600 can lower costs and increase ease of use. We found that this device is reliable in screening for AAA in patients with a WHC < 115. These new findings supplement previous reports which postulated that additional research is necessary to determine the suitability of hand-held screening devices for AAA screening [4,5].

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O-215 PATIENTS' EXPERIENCES OF RECOVERY AFTER STAGED AORTIC REPAIR: A PHENOMENOLOGICAL STUDY

VASCULAR NURSING

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Introduction - An increasing number of patients with complex thoracoabdominal aortic pathologies are being treated by means of endovascular repair (EVAR) or with hybrid techniques involving both open and endovascular surgery. For extensive aortic treatment a staged strategy has proven advantageous and is often utilized. However, little is known on how these patients experience a prolonged course of repeated operations. The aim of this study was to explore how patients with complex thoracoabdominal aneurysms and aortic type B dissections experience to recover after a staged EVAR procedure, including adjunctive open surgery.

Methods - Patients who had been operated on in a staged fashion between 2012 and 2017 were asked to participate. In-depth interviews were conducted and systematically analysed, using descriptive phenomenological method.

Results - Six patients were included with a mean follow-up time of 2.5 years. The essence of the patients' experience can be described as a necessary, overwhelming, hard and prolonged process with life changing consequences. *Between the surgeries:* The patients experienced expected and manageable tiredness, with not enough time available for recovery. *Short-term after all surgeries:* Tiredness, pain and complications, mostly neurological deficits, were experienced as overwhelming where the patients lost their identity, felt depressed and struggled to manage daily life one day to another. *Long-term after all surgeries:* The patients slowly and gradually regained their identity and accepted their new life, often with permanent setbacks and limitations.

Conclusion – The findings indicate that patients with complex TAAA or aortic type B dissection operated on in a staged fashion struggle with various physical and psychological setbacks, even several years after their repair. It is important that the entire interprofessional team and the patient are aware of the high likelihood of significant and prolonged recovery process after staged EVAR for complex thoracoabdominal aortic pathologies. The patient's recovery could be facilitated by continuous information and support throughout the entire process. Furthermore, there is a need to prospectively assess different aspects of these patients' recovery processes, to identify those with impaired recovery after surgery, and establish proactive preventive strategies.

O-216 PATIENTS' EXPERIENCE OF LIVING WITH A SMALL ABDOMINAL AORTIC ANEURYSM AND ITS EFFECT ON HEALTH RELATED QUALITY OF LIFE WHILE BEING UNDER SURVEILLANCE: A SYSTEMATIC REVIEW AND SYNTHESIS

VASCULAR NURSING

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Introduction - Screening programs for finding a small abdominal aortic aneurysm (AAA) is a mean to prevent a sudden death in an undetected disease which can be prevented by surgery. Searching for a disease in asymptomatic people is however debated. There are ethical concerns of the potential risk that knowledge about the condition might do more harm than good and a discussion of 'overdiagnosis' has been the main argument against AAA screening. The aim of this study was to review the current knowledge on psychological impact, effect on health related quality of life and patients' experience of living with an AAA, while being under surveillance.

Methods - A systematic literature review of quantitative and qualitative studies including a narrative synthesis (similar to meta-analysis when merging data from randomized controlled trials), was performed according to PRISMA statement. PubMed, Embase, CRDs DARE, NHS EED, HTA and Cochrane Library were searched with the terms abdominal aortic aneurysm and screening in Mesh term combinations and covered time period 01 Jan 1990 to Dec 2017. The included studies were quality assessed according to the GRADE system. Separate syntheses were performed for the two sets of studies and were then converged into one overall synthesis.

Results - A total of 17 studies were included; eleven with quantitative method using a case-control design and six with qualitative method using interview design. The quantitative studies included a total of 1720 patients with AAA and study size varied between 22 and 599 included. The qualitative studies included a total of 6o patients with AAA and study size varied between 3 and 15 included. No study had a follow-up period over 1 year. Overall quality was assessed as low for the quantitative studies and moderate for the qualitative studies. The overall synthesis is summarized as follows: 1) Patients with an AAA rate their General

Health and dimensions related to physical functions as lower more often than people with normal aorta. 2) No difference in anxiety or depression for patients with AAA versus controls. 3) Patients felt safe being under surveillance and had trust in health-professionals. 4) Having an AAA set thoughts and feelings in motion regarding health, ageing, mortality and life-style. 5) Patients lack of knowledge about the AAA disease, its progression, physical training, life-style changes and future planning can cause insecurity and worries.

Conclusion - The result shows no support that screening for AAA has an important negative psychological effect or a negative influence on HRQOL. Most studies had low-moderate quality, and high-quality studies controlling for co-morbidity as well as disease specific questionnaires are needed. Patients need for continuous information, education and care should be a priority clinical practice and should be further elucidated in future research.

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O-217 QUALITY OF LIFE IMPACT IN MEN WITH SCREENING-DETECTED ABDOMINAL AORTIC ANEURYSM ATTENDING REGULAR FOLLOW-UPS

VASCULAR NURSING

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Introduction - Screening for Abdominal Aortic Aneurysm (AAA) has been introduced in several countries to reduce the AAA-related mortality. Although, the awareness of having an AAA and how it influences the individuals' Quality of life (QOL) has been evaluated since the introduction of the screening programs. Previous research has addressed whether the benefits of screening programs for AAA outweight the impact on QOL, especially for men with small aneurysm <55 mm who are treated conservatively. This study aimed to review, summarise and assess the available evidence regarding the quality of life impact in men undergoing screening for abdominal aortic aneurysm and attending regular follow-ups.

Methods - For this narrative literature review the databases PubMed, MEDLINE, CINAHL, and PsycINFO were used for searching. The search was performed from April to July 2016, with an update in February to March 2018. The initial results from the search were 128 articles. Duplicates were removed, titles and abstracts were screened, and 22 full-text articles were collected. Based on the inclusion criteria, 11 quantitative studies were included. The quality of the studies was appraised with respective checklists from the Critical Appraisal Skills Programme. A narrative synthesis of the included studies was performed.

Results - Inferior quality of life among men with detected AAA was identified compared to those without the diagnosis and the general population in the included studies. The self-perceived health decreased over time for the participants with AAA. Assessments after surgery showed that the participants returned to similar QOL as before the screening. A wide variety of factors regarding the methodologies, designs, measurements, sample sizes, and the time for assessment were noted in the included studies.

Conclusion - Quality of life is an important outcome for AAA screening and studies have been conducted in an attempt to address the imbalance between benefits and harm. However, it is still difficult to draw clear conclusions, possibly due to the heterogeneity of the original studies. Nevertheless, it is important to identify men with AAA who develop conditions influencing their health and quality of life in order to understand their care needs to further support them and improve their situation.

O-218 EMERGENCY USE OF PHYSICIAN-MODIFIED FENESTRATED ENDOGRAFT IN A SYMPTOMATIC PATIENT WHO WAS WAITING FOR A MANUFACTURED GRAFT TO TREAT CHRONIC POST-DISSECTION THORACOABDOMINAL ANEURYSM

CASE REPORTS

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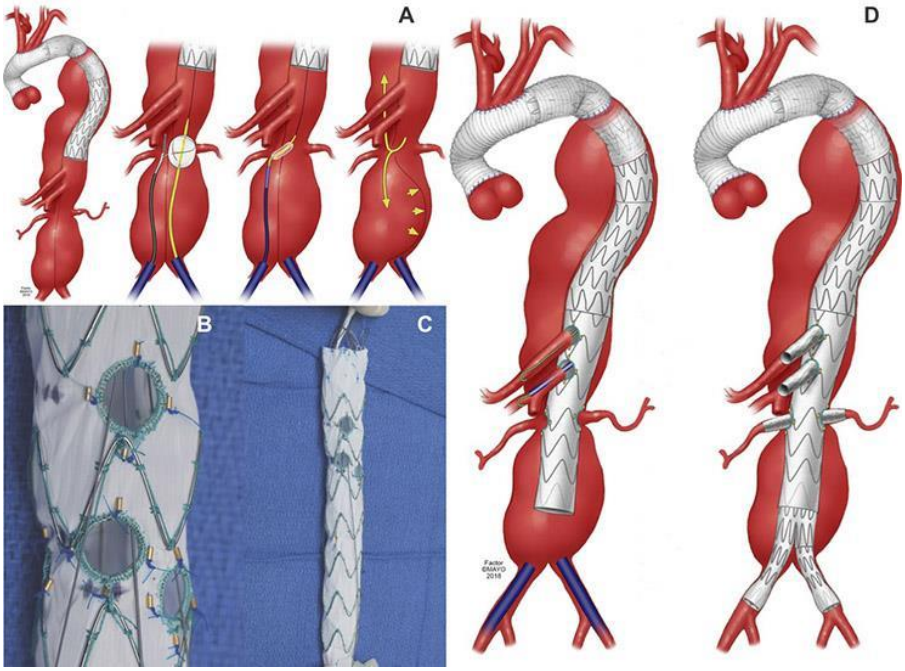
Introduction - Fenestrated-branched endovascular repair (F-BEVAR) using custom manufactured devices (CMDs) has been applied to treat post-dissection thoracoabdominal aortic aneurysms (TAAA), but the long wait period for device manufacturing limits its application in patients with symptomatic or contained ruptured aneurysms.

Methods - A 59-year-old female patient who was waiting for CMD (Cook Medical, Brisbane, Australia) presented with a symptomatic post-dissection TAAA. The patient had undergone a successful first stage thoracic endovascular repair with creation of a fenestration in the distal aortic septum to perfuse the right kidney, which originated from the false lumen. Repeat computed tomography angiography revealed compression of the true lumen below the level of the fenestration with pressurization of the false

lumen (Figure A). The patient was treated emergently using a physician-modified endovascular graft (PMEG) with four fenestrations and preloaded guidewires. The technique of PMEG using low-profile Zenith Alpha™ Thoracic stent graft (Cook Medical, Copenhagen Denmark) is presented with video and illustrations.

Results - The thoracic stent-graft was modified onsite under strict sterile technique using the same measurements obtained for the original CMD request. The active fixation bards were removed to facilitate re-sheathing. Four fenestrations were created with ophthalmologic cautery and reinforced using a double layer of nitinol wire (Figure B). Radiopaque markers were added for orientation. Four 0.014-inch preloaded guidewires were added exiting via the top of the delivery system (Figure C). Diameter-reducing sutures were applied and the device was reintroduced into the original 18Fr sheath. Using bilateral femoral and right brachial approach, a long 5Fr sheath was introduced via the brachial approach exiting via the femoral approach. The PMEG was loaded into a through-and-through wire, while the four preloaded guidewires were loaded into a long 5Fr brachial sheath. The device and sheath were advanced into position and deployed in a stepwise fashion allowing sequential catheterization of the celiac axis, superior mesenteric artery and both renal arteries in the compressed true lumen (Figure D). Once all vessels were catheterized, the bifurcated device and iliac limbs were added and flow was restored to the lower extremities. Sequential renal-mesenteric stenting was done. A completion cone beam computed tomography revealed successful aneurysm exclusion. The repair was completed with a total endovascular time of 133 minutes and the patient was dismissed on postoperative day 10. Follow-up CTA showed patent stent-graft with type 2 endoleak.
A total of 6 PMEG repairs with low profile Zenith Alpha™ Thoracic stent grafts were performed at our institution between 2016 and 2018, representing 2% of the 280 patients treated by F-BEVAR during this period. All six patients who had PMEGs did not meet inclusion criteria for an ongoing prospective study using CMDs

Image -



Conclusion - PMEGs remain a valuable option to treat TAAAs, including chronic post-dissection aneurysms, in patients with symptoms or contained rupture who are not ideally suited for off-the-shelf devices. Compared to tighter stainless-steel Z stents, the widely spaced nitinol stents of the Zenith Alpha™ Thoracic endograft offer more space for fenestration placement.

O-219 IN THE CURRENT ERA OF ENDOVASCULAR SURGERY, WHAT IS THE ROLE OF AXILLOFEMORAL BYPASS?

CASE REPORTS

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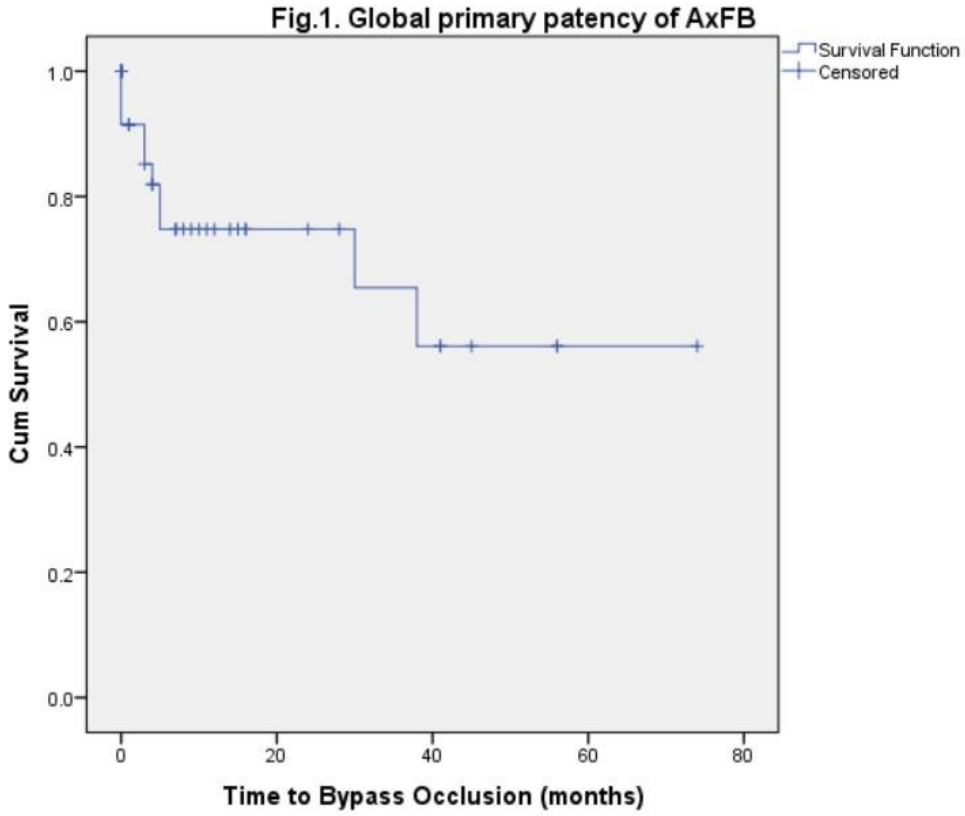
Introduction - Nowadays, axillofemoral bypass (AxFB) is viewed as an end-of-line solution for lower limb revascularization, owing to its classically described poor long-term patency and recent advances in endovascular surgery.
There is a marked difference in patient profiles in published series of AxFB, reflecting changing procedures indications. The objective of this study is to determine the contemporary profile of patients treated with AxFB and their outcome.

Methods - Patients who underwent AxFB surgery in a tertiary hospital from April 2011 to December 2017 were identified. Surgical indication, primary patency, major amputation and death rates were recorded. Patients were grouped in:

- Bypass configuration: axillouni vs axillobifemoral;
- Previous vascular surgery status: first revascularization procedure vs reintervention;
- Primary vascular disease: aortoiliac occlusive disease vs aneurysmal disease,
- Emergency character of procedure: urgent (initiated less than 24hours from patient presentation) vs planned (more than 24hours from patient presentation). Groups were compared using Kaplan-Meier survival analysis.

Results - 56 patients were included. 44 (78,6%) underwent axillobifemoral bypass; remaining patients underwent axillounifemoral bypass. Median age was 68,18±9,59 years; 94,6% were male. The most prevalent cardiovascular risk factors were HTA (77%) and history of smoking (76%).
Primary vascular disease was aneurysmal in 14 patients (25%). The remaining group had aortoiliac occlusive disease.
AxFB was an urgent procedure in 11 patients (19,6%).
In 30 patients (53,6%), AxFB was the first revascularization performed. Indications for procedure on this group were aorto-iliac occlusive disease (25; 83,3%) and AA thrombosis (5; 16,7%).
In patients previously submitted to revascularization (26; 46,4%), the most common previous procedures were aortobifemoral bypass (12; 46,2%), femoro-femoral bypass (12; 46,2%) and EVAR (9; 34,6%). Indications for AxFB on this group were: prosthesis thrombosis (17; 65,4%), secondary aorto-enteric fistulae (7; 26,9%) and prosthesis infection (2; 7,7%).
Global primary patency of AxFB was 91,5±4,1% at 1 month, 74,8±7,6% at 1 year, and 56,1±12,8% at 5 years (Fig.1). Group survival analysis showed superior primary patency in aneurysmal disease group (p=0,063), and after urgent procedures (p=0,113). Previous vascular surgery and bypass configuration did not affect long-term primary patency.
No patient with aneurysmal disease required major amputation during follow-up. In primary occlusive disease group, 83,4±5,7% patients were free-of-amputation at 1 month, 77,2±6,8% at 1 year and 5 years. Amputation rates were similar regardless previous vascular surgery status, bypass configuration and urgency character of procedure.
Median time of survival was 5,1±1,1years. Patients who underwent AxFB had a survival rate of 76,8±5,6% at 1 month, 64,7±6,6% at 1 year, and 50,0±7,8% at 5 years.
Survival rates were similar regardless bypass configuration and primary vascular disease. However, patients whose AxFB was a vascular reintervention or an urgent procedure had significant worse long-term survival (p=0,042 and p=0,017, respectively).

Image:



Conclusion - Axillofemoral bypass, although being an increasingly uncommon procedure, still allows acceptable rates of patency and limb salvage. As patients with aortoiliac disease usually have multiple comorbidities and a short life-expectancy, axillofemoral bypass is attractive owing to its less invasive character.

O-220 ENDOVASCULAR REPAIR OF AN ABERRANT LEFT SUBCLAVIAN ARTERY ARISING FROM A KOMMERELL'S DIVERTICULUM IN A RIGHT-SIDE AORTIC ARCH: REPORT OF THREE CASES

CASE REPORTS

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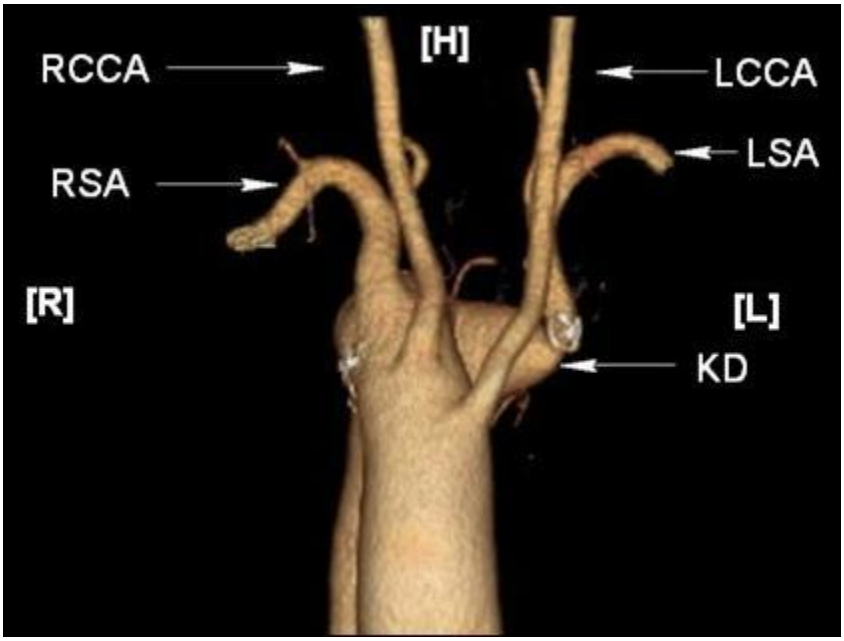
Introduction - Right-side aorta is a rare congenital malformation that is present in approximately 0.5% to 1% of the general population, and approximately half of these cases are associated with an aberrant left subclavian artery (LSA). An obviously aneurysmal change at the origin of the aberrant LSA, known as Kommerell's diverticulum (KD), is often found when performing imaging for other reasons and usually remains asymptomatic. However, Kommerell's diverticula may predispose toward aortic aneurysm, dissection or rupture. We reviewed the clinical results of 3 patients of an aberrant LSA arising from a KD in a right-side aortic arch, who underwent endovascular treatments.

Methods - A total of 3 patients underwent endovascular treatments for an aberrant LSA arising from a KD in a right-side aortic arch. One patient was asymptomatic, one suffered from foreign body sensation, and the last patient was complicated with Debakey type III aortic dissection.

Results - Three patients all underwent thoracic endovascular aortic repair (TEVAR). One patient received Amplatzer vascular plug embolization of the aberrant LSA and endovascular repair of the KD. Another patient who suffered from foreign body sensation underwent TEVAR, embolization of the aberrant LSA and KD, and preserving the right subclavian artery (RSA) with chimney technique. The last patient underwent TEVAR and preserving the LSA, RSA and right carotid artery with chimney technique. There was no neurological deterioration at the discharge in all three patients.

Image -



Conclusion - Endovascular treatment yielded a relatively satisfactory outcome in patients with an aberrant LSA and KD.

O-221 THE ENDOVASCULAR "SANDWICH TECHNIQUE" IN A POPLITEAL ARTERY ANEURYSM WITH AN ANATOMICAL VARIATION

CASE REPORTS

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Introduction - The sandwich technique is an endovascular configuration, used in the aortic aneurysm with short or aneurysmal common iliac artery to preserve pelvic flow. It consists in placing two parallel self-expandable stent grafts between the two branches of the common iliac artery and the ipsilateral limb of the bifurcated aortic graft. In this report, we describe a case of a popliteal artery aneurysm (PAA) treated in the same fashion to preserve the patency of a branching variation pattern of the posterior tibial artery.

Methods - *Clinical presentation*

A 76-year-old male ex-smoker with a background of Diabetes mellitus disease and auricular fibrillation was admitted to another hospital following right acute rest pain.

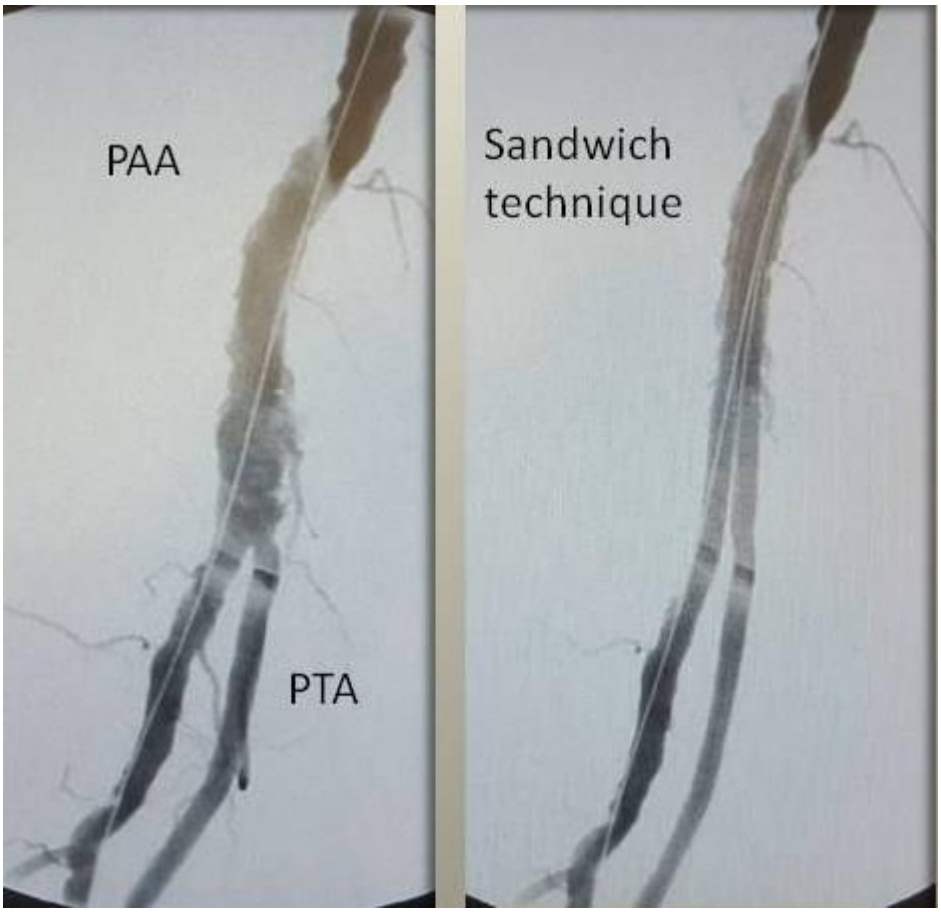
The patient was referred to the authors' vascular service for an urgent appointment

A computed tomography angiogram demonstrated a right 25 mm popliteal artery aneurysm with a type IIB popliteal artery branching variation according to Kim et al classification (posterior tibial artery arising from the aneurysm and above popliteus muscle).

Primarily because of the patient's age and heart impairment, the safest definitive management option was felt to be endovascular repair.
Endovascular technique
Three GORE® VIABAHN® stent (W.L. Gore & Associates, Flagstaff, AZ, USA) were deployed according to the "sandwich technique through a right 14 F sheath under local anesthesia (Figure 1).

Results - *Outcome:*
A 12 month follow up CT-angiogram demonstrated no evidence of endoleak with the patency of the “sandwich-like” configuration.

Image -



Conclusion - This is the first reported case of the “sandwich- like technique” performed in the popliteal artery.. Endovascular treatment is a suitable alternative to surgery in presence of good run-off vessels, even in challenging anatomy.

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O-222 TOTALLY PERCUTANEOUS THORACO-ABDOMINAL AORTIC ANEURYSM REPAIR IN A PATIENT WITH RIGHT-SIDED ARCH AND PREVIOUS KIDNEY TRANSPLANTATION

CASE REPORTS

Author(s) - Alessandro Grandi*[1], Andrea Kahlberg[1], Abdel Rahman Aly[2], Luca Bertoglio[1], Germano Melissano[1], Roberto chiesa[1]

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Introduction - To report a case of total endovascular management of thoraco-abdominal aortic aneurysm (TAAA) in a patient with right-sided aortic arch and transplanted kidney.

Methods - A 75-year old male patient presented with a 6-cm Crawford Type IV TAAA, associated with right-sided aortic arch, left aberrant subclavian artery, and history of renal transplantation in the right iliac fossa. He was treated by means of bilateral native renal artery coil embolization, and total percutaneous TAAA endovascular repair using a custom-made aortic stent-graft with two branches, avoiding right iliac artery manipulation.

Results - The procedure was accomplished without complications, and 6-month follow-up confirmed successful aneurysm exclusion.
The right axillary artery was accessed percutaneously and used to perform control fluoroscopic aortography, selective catheterization and stenting of branch vessels. A through-and-through technique from the axillary artery has been used where the snaring to the axillary access of a guidewire passing through a preloaded catheter into the Superior Mesenteric Artery was accomplished.
Downsizing of left femoral access was performed after the deployment of the main body and removal of its delivery system to restore adequate blood flow to the lower limb. A 12 Fr sheath was placed and the percutaneous closing systems were partially tightened.
Both femoral and axillary accesses closure was established using Proglide® devices that were deployed in the initial operative phase.

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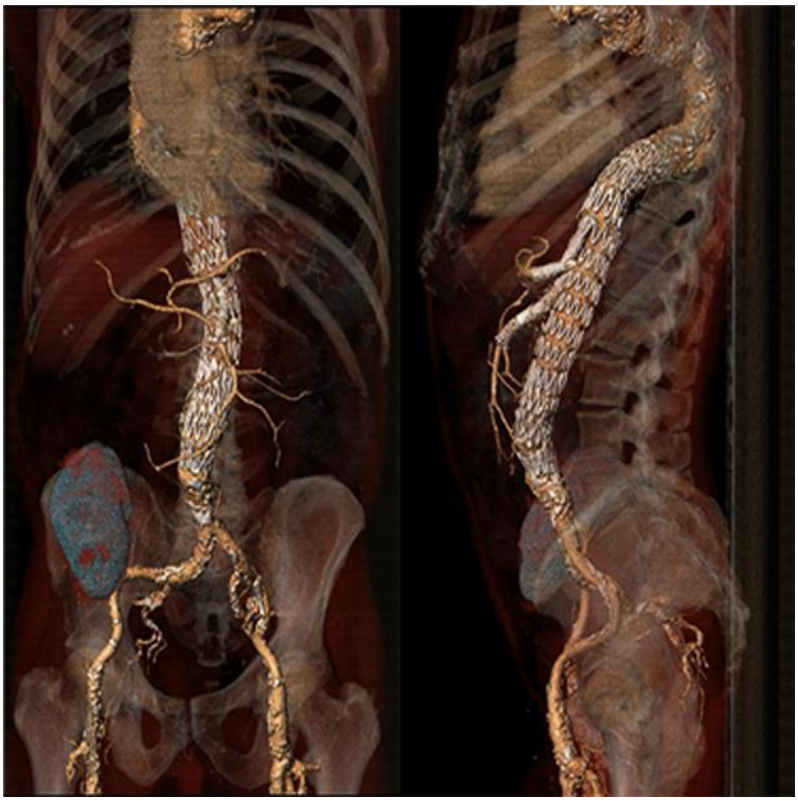

Conclusion - Total endovascular management of TAAA using custom-made devices may be performed successfully even in case of unusual anatomies, such as in renal transplant patients in coexistence of arterial anomalies (right-sided aortic arch, aberrant left subclavian artery and abnormal right hepatic artery origin from SMA). Selection of access sites was a crucial technical point.

O-223 BLUNT HANDLEBAR INJURY OF THE COMMON FEMORAL ARTERY IN A PEDIATRIC PATIENT: CASE REPORT

CASE REPORTS

Author(s) - Edgardo E. Castillo* [1], Facundo Machado Fernández[1], José Amores[1], Marta Zaplana[1], Alberto Domenech[1], Jose Bahamonde[1], Ivan Martin[1]

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Introduction - Vascular non-iatrogenic trauma in pediatric population is rare. Generally, they are associated to bone fractures, stab or cut wounds. Less common is the blunt trauma as a cause of a vascular lesion.
There are implications in the treatment of this kind of lesion associated to the pediatric anatomy, physiology and the growth potential of the pediatric patient. Mainly by the small size of the vessels, thickness of the veins wall or the vascular spasm of the arteries.
It's still controversial which is the best treatment option in these cases, with a wide range of options from medical treatment, direct repair, autogenous saphenous vein graft, ligation and endovascular stenting.

Methods - We describe a case of a 9-year-old boy with a very small groin hematoma and an acute left limb ischemia grade IIa after a handle bike trauma 24 hours ago. Ultrasound and CT scan showed a common femoral artery occlusion as well as an absence of femoral vein thrombosis.

Results - A surgical treatment was chosen. A common femoral artery approach showed a focal contained artery transection with thrombosis. An autologous panel saphenous vein graft interposition was performed to avoid graft size mismatch.
An uneventful postoperative course was developed, and he was discharged 72 hours later.

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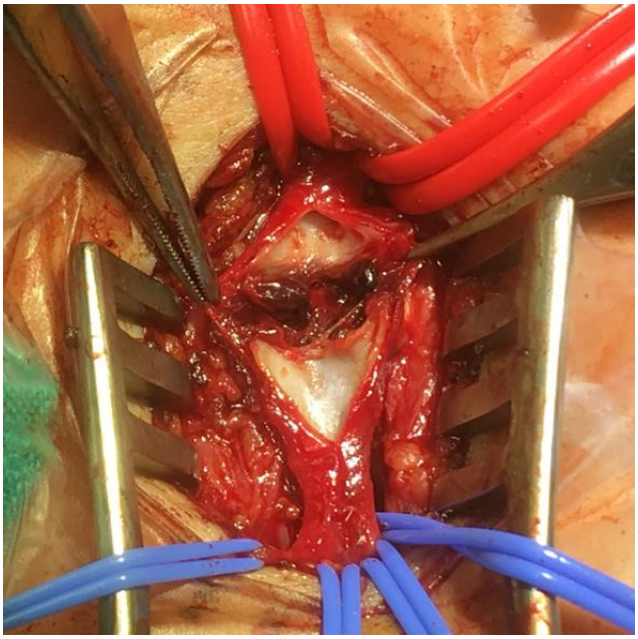

Conclusion - Blunt vascular trauma is a rare condition in pediatric population and clinical suspicion is necessary to avoid a diagnosis delay. The handlebar pressure on the femoral artery against femur or pubis bone may be a traumatic weapon even in not severe bike trauma. Special considerations and technical difficulties should be considerate in the surgical and medical pediatric treatment. There are different options of treatment that depends on the type of injury and the clinical situation.

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O-224 VENOUS ULCERS AS A RARE PRESENTATION OF BILATERAL MAY-THURNER SYNDROME IN MALE PATIENTS. CASE SERIES

CASE REPORTS

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Introduction: Objectives
May-Thurner syndrome (or iliac vein compression syndrome, IVCS), is referred to iliac vein compression by the iliac artery against the spine. It is commonly found as an underlying cause of iliofemoral deep venous thrombosis (DVT). The syndrome is mostly seen in women (in the second through the fourth decades of age) and on the left side. In this article, we describe a rare presentation of IVCS in male patients with bilateral May-Thurner syndrome.

Methods - Five male patients (mean age was 45.5, SD 14.0 year), presented with bilateral leg edema and recurrent active venous ulcers for more than one years that failed consistent compression therapy. All patient have no current or previous history of DVT. IVCS was diagnosed using Duplex ultrasound and direct multi-slice computed tomography-venogram (CTV). Endovascular treatment was performed in the form of bilateral common iliac vein stenting (WALLSTENT, Boston Scientific), Radiofrequency ablation of great saphenous vein (GSV) was done for one patients with GSV reflux. Vascular Clinical Severity Score (VCSS), Visual Analog Score (VAS), and Venous Disability Score (VDS) were assessed preoperatively, at one month and 6 months after the intervention.

Results - The intervention was technically successful with no perioperative complications in all patients. At 1-month follow-up, the venous ulcers were completely healed on both sides in all patients (9 limb), one limb in one patient need additional ablation of the refluxing GSV. VCSS, VDS, VAS have improved to 6/27, 2/4, 3/10 compared to preoperative values of 14/27, 3/4, and 7/10, respectively. All patients were free of pain with no residual edema in both legs. At 6 months follow-up: VCSS, VDS and VAS have improved to 4/27, 0/4, and 1/10, respectively, compared to the preoperative values baseline values.

Conclusion - May-Thurner syndrome is a relatively common anatomical variant where iliac vein compression is typically presented with venous insufficiency symptoms on the left lower extremity in middle aged women. This report is to describe a rare presentation of symptomatic bilateral May-Thurner syndrome in a male patient. All patients were successfully treated with stenting of both common iliac veins, which improved the patients' symptoms including complete healing of the venous ulcers in both legs. In conclusion, the conventional endovascular treatment of May-Thurner syndrome can also be an effective treatment option of male patients with atypical presentation of IVCS.

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Neglen P, Hollis KC, Olivier J, Raju S. Stenting of the venous outflow in chronic venous disease: long-term stentrelated outcome, clinical, and hemodynamic result. J Vasc Surg 2007; 46: 979–990.

O-225 COMPLEX TRAUMATIC VERTEBRAL ARTERY ARTERIOVENOUS FISTULA WITH ON TABLE RUPTURE - A CASE REPORT

CASE REPORTS

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Introduction - Arteriovenous fistulas (AVF) arising from vertebral artery are rare and can be spontaneous, congenital or traumatic in origin. They are due to an abnormal communication between the vertebral artery or one of its branches with an adjacent vein. Penetrating injury is a leading cause of non-iatrogenic, traumatic vertebral artery AVF. Patients can present with incidental finding, ischemic symptoms or myelopathy depending on the chronicity of lesion, flow velocity in the shunt and venous drainage pattern. Endovascular intervention is the preferred choice due to its diagnostic ability, precision in treating target vessel and less morbidity. We report a case of complex vertebro vertebral AVF with multiple feeders arising from external carotid artery and subclavian artery circulation with on table rupture during endovascular management.

Methods - A 32-year-old female presented, 10 days after a penetrating injury to the neck, with a gradually increasing, pulsatile swelling on the left side of the neck. She was hemodynamically stable and didn't have any neurological symptoms or signs. Examination confirmed thrill in the pulsatile mass and gaping at the site of injury. CT angiogram revealed AVF between vertebral artery and epidural venous plexus at C1 vertebral level. A conventional angiogram was performed that revealed a complex AVF sac with multiple arterial feeders arising from left vertebral artery occipital and deep cervical arteries and communicating with epidural venous plexus. There was retrograde filling of the AVF from the right vertebral artery.
Options of coil embolization, covered stent and glue were considered and in view of the anatomy, coil embolization was chosen. After inserting coils in the distal vertebral artery the AV fistula suddenly ruptures with profuse bleeding from the skin wound. Haemostasis was achieved by external compression. Rest of the procedure with coil embolization of proximal vertral artery, deep cervical and occipital arteries was uneventful

Results - Completion angiogram showed near total occlusion of AVF with no evidence of active bleeding and minimal residual AVF sac. The external wound was closed with interrupted sutures. Clinical recovery was uneventful with no neurological impairment. Residual AVF sac was found to be thrombosed at one month follow up and there were no new neurological symptoms at 3 months and 6 months review.

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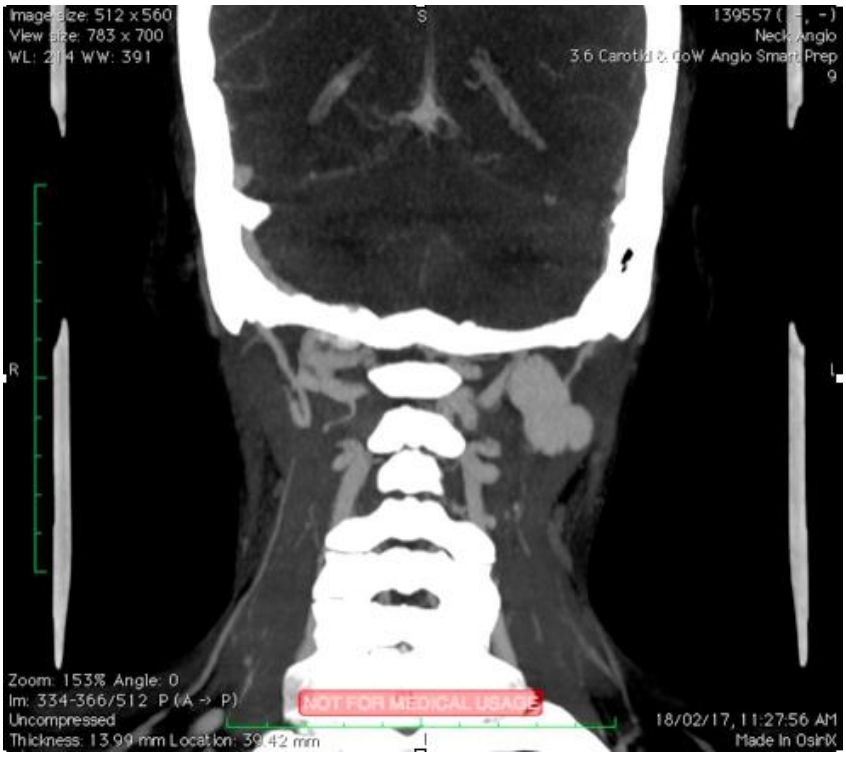

Conclusion - Traumatic AVF in cervical region can be complex with involvement of multiple vessels. These are often life threatening and can rupture at any time including the perioperative period. Endovascular management with coil embolisation is a safe and effective treatment.

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O-226 INHERITED ANTITHROMBIN III DEFICIENCY: A CASE REPORT OF FAMILIAL PEDIGREE AND GENE MUTATION SCREENING

CASE REPORTS

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Introduction - Inherited antithrombin III deficiency is an autosomal dominant genetic disease, which can lead to various forms of thrombus and is associated with pathological pregnancy.

Methods - In this study, we reported a familial pedigree with three daughters diagnosed as AT III deficiency with different clinical manifestations. The first one was diagnosed with deep vein thrombus (DVT) during pregnancy and developed into acute pulmonary embolism (PE) under anticoagulation of low molecular heparin. The second one developed unprovoked DVT in left lower extremity and received the treatment of inferior vena filter, catheter-directed thrombolysis, pharmacomechanical thrombectomy and

anticoagulation with rivaroxaban. The last one experienced an abortion because of placental abruption in the second trimester of pregnancy and the pathology indicated thrombosis in the microvessels of the placenta. We screened the whole family members for AT activity and antigen level, including the patients' parents and sister without venous thromboembolism (VTE) history. Whole exome sequencing was performed in the first case to identify variations in the AT gene and Sanger sequencing was further adopted for other family members to verify the gene mutation responsible for the pedigree. We also conducted a long-term follow up of this family to help them with the anticoagulation during pregnancy and daily life.

Results - Four members of the family, including the three sick daughters and their father, showed a deceased AT III activity and antigen level. However, their father did not have any VTE history before. The whole exome sequencing identified three nonsynonymous mutations, including c.1273C>T(p.R425C) mutation in SERPINC1, c.1200A>C(p.E400D) mutation in SERPINA1 and c.494C>T(p.T165M) mutation in F2. Then the Sanger sequencing for other family members verified the first mutation, c.1273C>T(p.R425C) mutation in SERPINC1, was the pathogenic gene for this family because of the consistence of mutation and decreased AT III activity. During the 2-year follow up, the father was attacked by DVT and two of the sick daughters gave birth to a healthy baby respectively with anticoagulation during pregnancy.

Conclusion - Inherited antithrombin III deficiency is a hypercoagulable state associated with an increased risk for venous thrombosis, which cannot be relieved by low molecular heparin except NOACs like rivaroxaban. It is a disease with low incidence, few researches and no guidelines, so when and how to give anticoagulation remain controversial, especially during pregnancy. Further studies are necessary to give clues for clinical practicing of patients with this rare disease.

O-227 SUBCLAVIAN PSEUDOANEURYSM IN A YOUNG PATIENT: RARE CAUSE TO THINK

CASE REPORTS

Author(s) - Satchithanantham Vinojan[*1], Gayan Bandara[2], Thushan Gunaratne[2], Ranjuka Ubayasiri[2]

Institution(s) - [1]Department of Surgery, Faculty of medicine, Jaffna, [2]Teaching Hospital, Karapitiya, Sri Lanka

Introduction - Tuberculosis is an extremely rare cause for pseudo aneurysm. Infected aneurysm is a diagnostic challenge that is associated with significant morbidity and mortality. Treatment consists of antibiotic therapy ,aggressive surgical debridement and selective vascular reconstruction.

Methods - Case History

A 21 year old boy presented with the history of progressively increasing size of left supraclavicular lump of 3 months duration. It was associate with mild grade of evening pyrexia, loss of appetite and loss of weight. He didn't have a history of blunt trauma or cannulation in the neck. Upon examination there was a pulsatile lump in his left supraclavicular region. His inflammatory markers were high. (CRP and ESR was 70mg/dl, 105mm/1sthr respectively) Mantoux reading was positive. Sputum and blood cultures were negative. CT angiogram revealed a pseudoaneurysm arising from the 2nd part of the left subclavian artery.

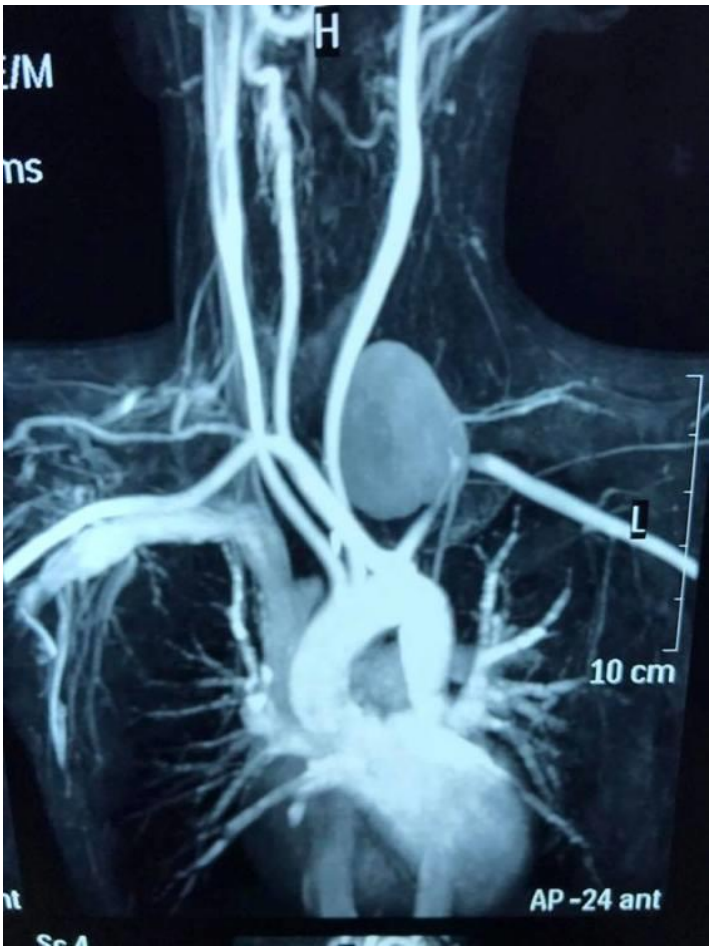
The patient underwent surgery, which revealed a pseudoaneurysm arising from the 2nd part of the subclavian artery. It was excised and thoroughly debrided. Aneurysml part was excluded by ligation and distal perfusion to the left upper limb was achieved with extra anatomical carotid to axillary artery bypass with reverse saphenous vein graft. Gram stains from the resected specimen showed only few neutrophils and there were no bacteria. Probable diagnosis of tuberculous pseudoaneurysm was made and he was started on anti TB medication.

Results - Discussion

Subclavian artery pseudo aneurysms are rare. Pseudo aneurysms in this location usually occurs after trauma. (1) But rarely it happens after infections. Staphylococcus aureus, salmonella and streptococcus species are the commonest organisms causing mycotic aneurysms. (2) Mycobacterium tuberculosis is the common organism among the mycobacterium species. Even though we didn't have any positive cultures for these organisms our case is most probably due to infection because he had constitutional symptoms associated with raised inflammatory markers and his symptoms diminished following a resection and anti TB treatment. We have started him on anti TB treatment based on his symptoms, high inflammatory markers and positive mantoux test. Inaddition tuberculosis is quite common in south Asian countries. There are several other case reports of tuberculosis arterial infections have been reported without positive microbiology results. (3)

Seeding of mycobacterium in the vessel wall is explained by several theories. It can be due to haematogenous spread, inoculation from vasovasorum or direct local spread.(4)
Treatment of mycotic aneurysms can be endovascular or open surgical repair. Endovascular treatment is less invasive one and can be done in patients who are at high risk for open surgical intervention. As this aneurysm harbors infection some authors don't prefer stent placement in addition stent has its own complications like thrombosis, migration , rupture and endoleaks. (1) As our patient was young and fit for surgery and the aneurysm also was in the second part of the subclavian artery we offered him open surgical repair. Direct reconstruction in this case after exclusion is difficult because of short segment of the 1st part of the subclavian artery so we did extra anatomical bypass.

Image -



Conclusion - Tuberculosis mycotic aneurysms are very rare. Even though endovascular treatment options are emerging open surgical repair remains as a standard option in patients who are fit for surgery.

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O-228 HYBRID APPROACH TO SYMPTOMATIC INNOMINATE ARTERY STENOSIS WITH DIRECT EMBOLIC PROTECTION

CASE REPORTS

Author(s) - Nelson Camacho*[1], Frederico B. Gonçalves[2], Gonçalo Alves[1], Rita S. Ferreira[1], Joana Catarino[1], Ricardo Correia[1], Rita Bento[1], Maria E. Ferreira[1]

Institution(s) - [1]Angiology and Vascular Surgery, [2]Centro Hospitalar Lisboa Central, Hospital de Santa Marta, Lisbon, Portugal

Introduction - Innominate artery (IA) lesions are an uncommon but important source of symptomatic extracranial cerebrovascular disease and may be associated with significant morbidity. For symptomatic lesions, open surgery or endovascular techniques are valuable options. While endovascular repair offers a minimally invasive alternative to extra-anatomic bypass or arch debranching techniques, cerebral embolic complications remain an important concern, especially in highly calcified or more extensive lesions.

Methods - The authors present a retrospective analysis of 5 patients with symptomatic stenosis of the IA treated with a hybrid operation. We evaluate short and medium term results of the procedure on these patients. The primary endpoints were symptoms after the surgery and restenosis on follow-up.

Results - All five patients were symptomatic and clinical presentation included dizziness (n=2), vertigo (n=1), gait ataxia (n=1), transient ischemic attack with hemiparesis (n=2) and right upper limb claudication (n=1). Mean age was 66±8 years (54-75 years) with male gender predominance (n=4). Radiological features of the lesions at the IA included ulcerated plaque (n=1), pre-occlusive stenosis with or without mural thrombus (n=4) and occlusion of the right subclavian artery (SCA) (n=1).
All patients were submitted to a hybrid operation under general anesthesia with surgical exposure of the right common carotid artery (CCA). Complete cerebral protection was achieved by direct clamping after systemic heparin was given. Retrograde carotid access was then obtained. All patients were implanted with a balloon-expandable stent over the lesion. In two patients a kissing stent technique was performed, with surgical exposure of axillary artery in one patient and ultrasound-guided puncture in the other, due to extensive lesions of the IA with extension to the right SCA. Direct removal of potential embolic material was performed prior to clamp removal. Clamping time of the CCA was under 15 minutes in all patients. The postoperative period was uneventful, without cerebrovascular ischemic events and resolution of the admission symptoms.
Mean follow-up time was 19.8 months. During follow-up, all patients remained asymptomatic and there were no signs of restenosis.

Conclusion - The present case series demonstrates the feasibility of a hybrid approach to treat IA lesions with complete cerebral embolic protection. This method allows safer embolic protection compared to a totally endovascular approach with lesser morbidity than open surgery.

O-229 THORACIC ENDOVASCULAR AORTIC REPAIR (TEVAR) IN A CASE OF GRADE 3 BLUNT AORTIC INJURY WITH AN ABERRANT VERTEBRAL ARTERY ORIGIN

CASE REPORTS

Author(s) - Mirza Anzar A. Baig*[1], Abdullah Al Fozan[1], Tania Guzman[1], Izzat A. Basahai[2], Isam S. Osman[1]

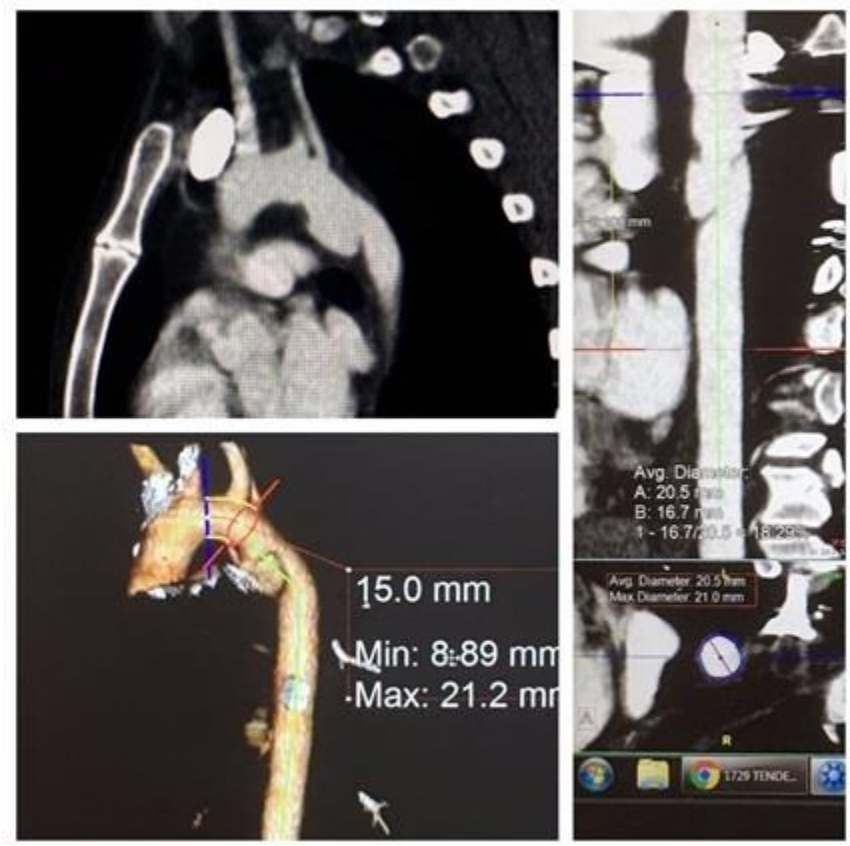
Institution(s) - [1]Vascular & Endovascular Surgery, [2]Interventional Radiology Department, King Saud Medical City, Riyadh, Saudi Arabia

Introduction - A 22-year-old male presented to our hospital with a history of an unrestrained high-speed motor vehicle accident. On presentation he was hemodynamically stable with a right humerus fracture and facial injuries. Trauma CT protocol revealed a grade-3 aortic tear of the descending thoracic aorta with an anomalous origin of left vertebral artery (VA) distal to the left subclavian artery. At a multidisciplinary team meeting it was noted that the left VA was dominant and the right VA was stenosed in part of its course. CT angiography suggested that the direct re-implantation of left vertebral artery onto the left carotid artery was not possible due to the unusually short cervical portion of the pre-foraminal VA due to its early entry into foramen transversarium of C7 instead of C6. It was therefore decided to proceed with left carotid to left vertebral artery and left carotico-subclavian artery bypass prior to TEVAR of the descending aorta.

Methods - Using a transverse left cervical approach the left VA was dissected out as it ascended towards the foramen transversarium of C7. Using the great saphenous vein an interposition graft was raised between the left common carotid and left VA using 7/0 prolene. Intraoperative Doppler assessment confirmed satisfactory flow. An ipsilateral carotico-subclavian bypass was then performed with Dacron graft using 6/0 prolene. TEVAR was then performed with a 26 mm x100 mm C-Tag ® stent.

Results - CT angiography on the 2nd postoperative day confirmed patency of both carotico-vertebral and carotico-subclavian grafts and satisfactory placement of the TEVAR stent. The patient was noted to have a left Horner's syndrome but otherwise made an uneventful recovery. He was discharged on the 3rd postoperative day. At follow up one month later he remained well with no complications and complete resolution of Horner's syndrome.

Image –



Conclusion - Patients with traumatic Aortic tears undergoing emergency TEVAR and in whom a proximal landing zone will seal the origin of an aberrant dominant left vertebral artery arising from aortic arch (proximal or distal to the LSA) should have vertebral artery revascularization prior to deployment of the TEVAR.

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