Supplementary Abstract

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Estimating the burden of work at a MAC from diabetic foot disease

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Objective: Diabetic foot disease (DFD) imposes a major burden on the National Health Service. The positive impact of the multidisciplinary foot team (MDFT) approach in the management of DFD is well established. However, the workload created at individual vascular surgical units is not known. The objective of this study was to assess the workload created from patients with active DFD at a major arterial centre (MAC). Methods A 6 weeks prospective study was carried out. All patients attending the weekday diabetic podiatry clinic and fortnightly MDFT clinic were included. All patients admitted under the vascular surgical team with active DFD were included. Results 92 patients were reviewed through our elective pathway. The majority of patients (n = 60, 65%) were managed within the podiatry clinic. 32 patients (35%) were managed at the MDFT clinic. 5 patients required immediate vascular review, and only 1 patient was admitted directly under the vascular team. During the study period, there were 35 vascular admissions due to active DFD, mostly as emergency admissions (n = 27, 77%). The majority of patients (n = 18, 67%) admitted as an emergency had never been seen through the elective DFD service at the MAC. DFD admissions equate to 33% of emergency admissions and 8% of elective admissions during the study period. Conclusions Despite a well-organised elective DFD pathway, individuals frequently present with new or worsening DFD that requires emergency surgical input. Improving outcomes will require pathway re-design to place more patients identified with at risk feet on the elective pathway.

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Preventing diabetic foot disease by targeting patients' footwear choices

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Objective: Diabetic foot disease (DFD) represents a major health problem and emphasis has been placed on the role of preventative strategies. Patient education programmes have been shown to only have short-term effectiveness. However, we believe that targeting patients' choice of footwear and identifying how patients purchase footwear is essential to provide a robust prevention programme. This study aims to discover the current knowledge of high-risk diabetic patients on appropriate footwear choices. Methods 6 weeks prospective study using a standardised patient questionnaire. The study targeted diabetic patients with active DFD receiving hospital-based care. All patients received written information on the project. Results 63 patients completed the questionnaire, with 39 (62%) males and 24 (38%) females. Mean age of patient was 65 years old and mean duration of diagnosis of diabetes was 21 years. 40 (63%) patients reported having previously received advice on buying footwear, mainly in written format. The majority of respondents recognised the importance of having their feet measured when buying shoes (98%). However, a proportion of patients felt that slip-on shoes and sandals/flip-flops were recommended in patients with diabetes, 37% and 29% respectively. 49% of respondents thought that orthotic footwear was only suitable for patients who had undergone an amputation. Conclusions Knowledge on appropriate and safe footwear for diabetic patients is poor even in high-risk patients. Regular targeted patient education programmes on footcare purchasing and usage could improve knowledge and attitudes in patients with at risk feet or those with active DFD.

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Can infrapopliteal angioplasties delay the need for major amputation?

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Objective: Limb salvage for patients with critical limb ischaemia (CLI) involving the infra-popliteal (IP) segment is achievable by endovascular means. At our centre we have traditionally opted for an 'angioplasty first' approach. The objective of this study is to report limb salvage rates in this group of patients at our centre, and review complications and surgical interventions. Methods Retrospective 12 months study of all patients undergoing index IP angioplasties for Rutherford categories 4 to 6 CLI. Patients identified using the local electronic interventional radiology database. Further surgical and endovascular interventions identified using local electronic records. Results 66 patients underwent IP angioplasty for rest pain and/or tissue loss secondary to CLI. 36 (55%) patients were diabetics and 8 (12%) patients were on haemodialysis. Average follow-up time from index procedure was 156 days. The majority of patients underwent multilevel endovascular revascularisation (n = 44, 67%), and did not require further interventions (n = 40, 61%). There were 11 (17%) complications and only 2 (3%) procedures were abandoned. Limb salvage rate was 86%, with 9 major amputations. 5 (8%) patients underwent bypass. 12 (18%) patients required further endovascular interventions, with 8 patients undergoing repeat IP angioplasties. 10 (15%) patients underwent further debridement and 10 (15%) patients underwent minor amputations. Conclusions We have demonstrated that high rates of limb salvage can be achieved with an 'angioplasty first' approach for patients with IP disease. To achieve these results high levels of radiological re-intervention are required but only a minority proceed to bypass surgery

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Abdominal ultrasound versus non-contrast CT as screening method for AAA

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Objective: Establishing non-contrast-enhanced Computed Tomography (CT), as equal/or superior to current abdominal aortic aneurysm (AAA) screening standard – Ultrasound Sonography (US). Methods Participants:1000 invited, 538 attending men, all participants of the randomized Danish CardioVascular Screening trial pilot (DANCAVAS trial). Method: Participants underwent non-contrast CT and US evaluation, measurements were done outer-to-outer in both transverse and AP axial, all were done in systolic phase. Aneurysms were defined as >30 mm.Sensitivity and specificity was calculated using CT as golden standard, all measurements were tested for correlation, and variance in diameters. Differences in means were tested using paired t-test. Results Out of the 529 men examined, 30 AAA were found, giving a prevalence of 5.7%. However US failed to detect 9 of these, resulting in a sensitivity of 70%, US specificity was 99%. CT tested against US; sensitivity overall was 87.5% with a specificity of 98.2%. Analysis of paired differences showed no significance between CT and US with means varying only slightly, in both axial measurements.Measurements made in both AP and transverse plane, showed general agreement between the modalities with no tendency to increasing variance, with increasing diameters. Conclusions US sensitivity lacked the same quality as CT, there wasn't a significant difference between measurements made overall. Therefore in our application, a large-scale screening program for CVD, CT is superior to US, since it enables a more thorough, evaluation of the participants, screening not only very precisely for AAA, but allowing visualization of unknown lesions to coronary vessels, thoracic aorta and the iliac arteries.

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Pulse palpation: an effective method for population based screening for PAD

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Objective: There is a strong association between peripheral arterial disease (PAD) and future cardiovascular events. Therefore, intensive atherosclerotic risk factor reduction is recommended for people with PAD, and early detection is essential. The aim of this study was to assess whether systematic pedal pulse palpation is an effective screening method for PAD in population-based screening programmes. Methods As part of a randomised screening project, The Viborg Vascular Screening trial, 18 681 men aged 65–74 years participated in a screening programme, which included bilateral pulse palpation and ankle-brachial index measurement. PAD was defined as ABI ≤ 0.9 or ≥1.4. Analysis was conducted on sensitivity, specificity, positive predictive value and negative predictive value for PAD and for the number of pedal pulses. Results The mean age was 69.34 years, and PAD were present in 2215 (12.05%) of the participants. The pedal pulse palpation test was set to be positive for having PAD if one or more pulses were missing. Sensitivity and specificity was 71.73% and 72.26%, respectively. No palpable pulses were associated with a fifty-fifty chance of ABI-verified PAD or with a false finding. Four palpable pulses were associated with 5% false negative PAD cases. Conclusions Pedal pulse palpation was shown to be an effective initial screening tool for PAD in population-based programmes but only when four pedal pulses were present. Therefore, ABI measurement should routinely be measured in patients with less than four palpable pedal pulses in order to undergo cardiovascular preventive actions if PAD is confirmed.

3874

The rate of growth of AAA in patient taking statins and antiplatelet agents

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Objective: The effect of statins and antiplatelet agents (APA) on the rate of growth (RoG) of small abdominal aortic aneurysms (AAA) is unknown. Study (i): Identify a difference in the rate of growth of AAA in patients taking statins or APA. Study (ii): report post-operative outcomes in these patients. Methods Patients over three years with AAA were identified from the Fife AAA surveillance programme. The RoG was obtained by the difference in antero-posterior diameter at initial and follow-up surveillance scan with respect to time. Patients were categorised to not taking an APA, taking an APA for <12months before initial scan, and taking an APA for >12months before initial scan. The same was used for statins. The RoG was log-transformed and linear regression analysis performed. Results 324 RoG were calculated from 184 patients. The overall RoG of AAA was 2.35 mm/yr (95% CI 2.02–2.72). There were no significant differences in the RoG of AAA between patients taking APA or statins. Females had consistently higher RoG than males (2.70 vs 1.71 mm/yr; $p < 0.001$), and the initial size of the aneurysm (RR 3.52 [95% CI 1.91–6.51; $p < 0.001$]) was strongly associated with the RoG. 51 patients underwent intervention, of which 2 had myocardial infarctions, 1 had an acute kidney injury, and 10 required re-intervention. Conclusions No difference was observed in the rate of growth of aneurysms in patients taking APA or statins. Post-operative complications were low for statistical analysis. A randomised trial is required to inform clinical practice.

3875

A 19-year experience of secondary interventions following EVAR

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Objective: EVAR is increasingly used as the primary mode of treatment for aneurysmal disease. However, this technique is associated with complications that mandate life-long follow up. We present a 19-year single-centre experience with EVAR, specifically examining the indications for re-intervention and the methods used. Methods A retrospective analysis was conducted of all EVAR cases performed at the Freeman hospital from 1995–2014. Results In a 19-year period 1100 standard EVARs were performed (947 abdominal; 161 thoracic). There were a total of 303 re-interventions in 212 patients (19%). Indications for re-intervention included: Endoleak (n = 180;16%); sac expansion without endoleak (n = 38; 14%); limb occlusion (n = 40; 0.03%); disease progression (n = 28; 0.03%) and rupture (n = 10; 0.9%).There were 214 endovascular interventions (71%) for endoleak and disease progression. 89 open interventions were required (29%). Almost half of open interventions were for limb ischaemia or groin complications. Open conversion was required for the majority of ruptures (n = 8/10) and continued sac expansion without endoleak (n = 33). The mortality associated with open conversion was 10%. Conclusions This series represents one of the largest in the literature and has a re-intervention rate of 19%, in line with previous reports. Although re-intervention is common, most complications can be successfully treated with endovascular techniques. However, if open abdominal intervention is required, there is a high mortality and the authors therefore propose a 'stent conserving' approach to open intervention.

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Genome-wide DNA methylation is associated with abdominal aortic aneurysm

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Objective: Abdominal aortic aneurysm (AAA) is a degenerative cardiovascular disease characterised by the gradual, irreversible dilation of the abdominal aorta. Genetics plays a significant role in the development of AAA yet only a small number of low effect genetic risk loci have been identified to date. It is feasible that methylation of DNA, one cause of altered gene regulation may contribute to the overall susceptibility of disease. Methods We quantified global DNA methylation in whole-blood derived DNA from 93 male patients with AAA and 92 matched male controls using a validated colorimetric enzyme immuno-assay. Controls were matched for age and smoking history, as both factors are known to influence DNA methylation. Results Mean age of controls and patients with AAA was 69 (SD: 5.41) years and 72.1 (SD: 5.35) years respectively. Mean aortic diameter in the controls was 1.9 cm (SD: 0.1). 45 of those in the AAA group had AAA between 3.0 cm and 5.4 cm (small AAA) and 48 had AAA larger than 5.4 cm (large AAA). Global DNA methylation was higher in patients with large AAA (1.86% (SD: 0.6%)) compared to controls (0.79% (SD: 0.43%)) ($P < 0.0001$). For the patients with AAA there was a linear relationship between global DNA methylation and AAA size ($r2 = 0.32$, $P < 0.0001$). Conclusions These data suggest that DNA methylation may be associated with AAA, and AAA diameter. Further investigation may potentially reveal insight to the underlying pathology of the disease and direct future precision medicine strategies for the management of patients with small AAA.

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Analysis of the thoracic aortic aneurysm sac course after TEVAR

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Objective: The fate of the aneurysm sac after thoracic endovascular aortic repair (TEVR) remains undefined. The aim of this study was to characterize the incidence of aneurysm sac expansion after TEVR and the effect of pre-operative

aortic morphology on sac behaviour. Methods A database of patients with pre and post-operative computed tomography angiogram (CTA) was provided by M2S, Inc. (2004 to 2013). All patients underwent TEVR for thoracic aortic aneurysms. Preoperative aortic anatomy details were available for each patient. Post-TEVR sac expansion was defined as a >5 mm increase in maximum aortic diameter over follow up. The influence of pertinent aortic morphology on sac expansion was assessed using Kaplan-Meier analysis. Results Of 899 patients undergoing TEVR, 46% had a maximum aneurysm diameter above the 55-mm threshold. The 5-year freedom from sac expansion was 61%. Several preoperative morphological factors were found to be associated with significant sac expansion after TVAR. The sac expansion rate after 5 years was higher when the proximal and the distal sealing zones have shorter lengths, and wider diameters. A cumulative risk of sac expansion was determined according to the number of adverse morphological risk factors depicted in each patient. Patient with high risk have thus higher risk to expand over time ($P < .001$) Conclusions This observational study demonstrated that post-TEVR aneurysm sac expansion is higher than expected, and this appears to be significantly influenced by several preoperative morphological factors. Meticulous preoperative patient selection and procedural planning is required to ensure favourable long-term results

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Innovative Methods for Monitoring and Improving Outcome in Aortic Surgery

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Objective: Continuous monitoring of outcome in aortic aneurysm surgery using CUSUM technique can be applied, and do provide significant higher detection rate of outliers when compared to traditional audit methods. Methods Using anonymised records from National Vascular Database, three monitoring systems were applied in real time: Cumulative mortality (reflecting traditional audit process), funnel plot, and CUSUM (SPRT). VBOHM risk score used to adjust for case-mix. Outliers were detected using different detection levels (h) and odds ratios (OR) with variable mortality rates (p). Performance of the three monitoring models was compared using direct alarm signals, sensitivity and specificity analysis, receiver operating curve (ROC), and average run length (ARL). Choosing control limits to maximise efficiency was approximated using direct simulation, Markov chain, and fractional polynomial techniques. Results In-hospital mortality following elective AAA repair between 1995 and 2011 in 140 centers were monitored. CUSUM reported an average alerts number of 0.89 when there is no outlier status, rising up to 23 alerts when there is an outlier status. Maximising the sensitivity and specificity of detecting outliers by CUSUM technique while minimising false alarms was achieved using different range of values for control limits (h) and odds ratios (OR). For best CUSUM performance, values of $OR = 3$, $p = 3$, and $h = 1.25$ has been shown to have sensitivity of 80% and specificity of 80%. Fractional polynomial technique and CUSUM simulation behavior were shown to correlate well ($R > 0.88$) to the real-time NVD data analysis. Conclusions CUSUM(SPRT) technqiue is an effective modern preventiative measure against unacceptable outliers in aortic surgery.

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Safety and Efficacy of Catheter Direct Thrombolysis in Iliofemoral DVT

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Objective: Catheter direct thrombolysis CDT has been shown to be an effective treatment for deep venous thrombosis. The objective of the review is to improve safety and efficacy of the CDT by using ward based protocol, better able to predict complications and treatment outcome through monitoring of haemostatic parameters and clinical observation during thrombolysis procedure. Methods MEDLINE, EMBASE, CENTRAL and Web of Science were searched for all articles on deep venous thrombosis, thrombolysis and correlations of clinical events (bleeding, successful thrombolysis) during thrombolysis with hemostatic parameters to March 2015. Risk of bias in included studies was assessed by Cochrane Collaboration's tool and Cochrane Risk Of Bias Assessment Tool: for Non-Randomized Studies of Interventions. Results Twenty four studies were included in the review and we found that improving safety and efficacy of CDT by using ward based protocol depends on eight factors; Strict patient selection criteria, Type of Fibrinolytic drugs used, Mode of fibrinolytic drug injection, Biochemical markers monitoring (Fibrinogen, D-Dimer, aPTT, PAI-1), Timing of intervention, usage of Intermittent pneumatic calf, Ward monitoring and thrombolysis imaging assessment (Intravascular Ultrasound). These factors may help to improve safety and efficacy by reducing total thrombolytic drug dosage and at the same time ensure successful lysis. There is marked lack of randomised controlled trials discussing the safety and efficacy of catheter direct thrombolysis. Conclusions CDT can be performed safely and efficiently in the clinical ward, providing that careful ward monitoring including measurements of hemostatic parameters and proper radiological assessment are ensured.

3888

Risk Attitude and Preference in Patients Facing Aortic Surgery

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Objective: Abdominal aortic aneurysm [AAA] surgery reduces the risk of death from aortic rupture. The balance of estimated AAA rupture risk versus surgical risk has long dictated timing of surgery and was evidenced in the UKSAT. Our patients are getting older and increasingly frail, presenting us with more challenging clinical decisions. What levels of rupture risk and surgical risk patients with AAAs deem acceptable are not known. This is the first study to explore this question in patients with large aneurysms and examines if risk acceptance varies with age and quality of life. Methods Subjects were prospectively recruited at a single centre. Structured interviews were undertaken gathering demographic and co-morbidity data, Quality of life was measured using EQ-5D. Risk acceptance was explored using Standard Gamble and Time Trade Off tools. Results 50 patients were recruited. Mean age 73.8 years and AAA diameter 6.0 cm [+/− 1.1]. Median acceptable lifetime rupture risk without surgery was 5% [range 5–70], whilst patients reported a median acceptable surgical mortality risk of 20% [range 5–90]. Patients >80 years were willing to accept a greater non-operative rupture risk [17% vs. 6%; $P < 0.05$] and corresponding greater surgical risk of mortality [33% vs. 17%; $P < 0.05$] than younger patients. There was no difference in time trade off [$P = 0.58$]. Conclusions Elderly patients with AAA appear to be more accepting of higher aneurysm rupture risk without surgery. They also appear to be more accepting of high surgical mortality risk. Importantly, they are no more willing to trade-off any quality life for disease-free survival.

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Endovascular treatment vs. endarterectomy for CFA atherosclerotic disease

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Objective: To assess the comparative safety and efficacy of CFA endovascular treatment versus endarterectomy. Methods Searches were restricted to publications from 1980 onwards. Two reviewers independently extracted data and quality assessed the studies. Results We identified eight case series reporting CFA endovascular treatment (482 patients, 510 limbs), 15 case series and one registry reporting CFA endarterectomy (2519 patients, 2629 limbs), and a registered RCT. CFA endovascular treatment and endarterectomy had comparable technical success rate: median 97.0% (range 90.5% to 100%, 6 studies, $n = 378$) vs. 100% (96.7% to 100%, 10 studies, $n = 754$). Endarterectomy had a higher primary 1-year patency rate: median 94.6% (70.0% to 100%, 7 studies, $n = 357$) vs. 78.1% (range 46.9% to 92.3%, 4 studies, $n = 201$), but endovascular treatment had a lower 1-year revascularisation rate: median 11.3% (range 7.7% to

36.7%, 3 studies, n = 183) vs. 20.0% (9.1% to 36.9%, 7 studies, n = 370). Safety wise, there was one stent fracture and one stent deformity. Endovascular treatment had a lower post-operative mortality rate: median 1.1% (range 0 to 5.0%, 3 studies, n = 207) vs. 1.4% (0 to 18.2%, 9 studies, n = 615) and lower one-year mortality rate: median 16.4% (0 to 37.1%, 4 studies, n = 235) vs. 19.1% (0 to 34.5%, 8 studies, n = 555). No studies reported wound infection, haematoma or lymph leak after endovascular treatment. For endarterectomy, median rates of these complications were 4.9%, 3.7% and 4.7% respectively. Conclusions CFA endovascular treatment appeared to be a safe approach but its comparative efficacy is uncertain. A RCT is required to assess the clinical and cost-effectiveness of CFA endovascular treatment.

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Increased arterial stiffness following EVAR compared to open repair

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Objective: The initial survival advantage seen with EVAR over open repair does not persist in the long term. Pulse wave velocity (PWV) is a measure of arterial stiffness and increased PWV is an independent risk factor for increased cardiovascular morbidity and mortality. This prospective comparative pilot study examined the effect of implantation of an aortic graft on PWV in patients undergoing open or endovascular aortic aneurysm repair. Methods 34 Patients (15 Open, 19 EVAR) were recruited. Patient demographics were similar in both groups. PWV was calculated for all patients pre- and post-operatively using a standardised technique on a Phillips IU22 Vascular Ultrasound machine and the results compared. Five-year survival comparisons were also made. Results The mean post procedure PWV of 9.7 (±4.5) cm/sec in the open group was significantly lower than the elevated 12.2 (±4.5) cm/sec detected in the EVAR group. The surgical group also demonstrated a mean decrease of 0.2 (±4.9) cm/sec in PWV following open repair compared to a mean increase of 3.3 (±3.7) cm/sec in the EVAR group. 11 of 19 EVAR patients died in first 5 years, compared to 3 of 15 open repair patients (p = 0.038). Conclusions EVAR patients have a significantly higher postoperative PWV measurement than those undergoing open AAA repair. Patients who have undergone EVAR may be at a higher risk of cardiovascular morbidity in the long term. A larger scale study with a longer prospective follow up is required.

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The variation of radiation dose during endovascular aneurysm repair

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Objective: Endovascular aneurysm repair (EVAR) is associated with radiation intra-operatively. This study aimed to compare EVAR related radiation in two sites with differing operative strategies. Methods All elective infra-renal EVAR procedures were included. A bifurcated stent-graft was deployed under fluoroscopic guidance in theatre, using a mobile C-arm. In Group I a consultant vascular surgeon was solely responsible for the operation, while in Group II it was jointly performed by a consultant vascular surgeon and radiologist. Radiation dose (Gycm2) and screening time (mins) were recorded and inter-group comparisons by Mann Whitney U test. Results Between 1st May 2006 and 31st December 2011, 194 (171 male) had elective EVAR in Group I. Between 1st October 1998 and 31st March 2010, 384 (321 male) underwent elective EVAR in Group II. In Group I the median screening time was 11.3 mins (8.2 – 16.6), while in Group II it was 22.8 mins (16.4 – 34.6; p < 0.0001). In Group I the median radiation dose was 32.1 Gycm2 (19.4 – 50.8), while in Group II it was 44.5 Gycm2 (27.5 – 63.4; p = 0.0001). In Group I the median contrast volume used was 120.0 mls (88.5 – 159.3) while in Group II 140.0mls (110.0 – 195.0; p < 0.0001) was the average volume required per case. Conclusions Increased awareness of radiation exposure for patients and clinicians is essentials. This may be one example where multi-disciplinary approach is not advantageous to patient safety and the emergence of the endovascular specialist will help improve radiation doses.

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EMPs are elevated in patients with unstable asymptomatic carotid plaques

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Objective: Endothelial microparticles (EMPs) are released from dysfunctional endothelial cells. We hypothesised that patients with unstable carotid plaque have higher levels of circulating microparticles compared to patients with stable plaques, and this may correlate with serum markers of plaque instability and inflammation. Methods Circulating EMPs, platelet MPs and inflammatory markers were measured in twenty healthy controls and seventy patients undergoing carotid endarterectomy. EMP/PMPs were quantified using flow cytometry. Bioplex assays profiled systemic inflammatory and bone-related proteins. Immunohistological analysis detailed the contribution of differentially-regulated systemic markers to plaque pathology. Alizarin red staining showed calcification. Results EMPs and PMPs were significantly higher in patients with carotid stenosis (≥70%) compared to controls, with no differences between asymptomatic vs symptomatic patients. Asymptomatic patients with unstable plaques exhibited higher levels of EMPs compared to those with stable plaques, with a similar trend observed in symptomatic patients. CXCL9 and SCGF-β were significantly elevated in asymptomatic patients with unstable plaques, with IL-16 and macrophage inhibitory factor significantly elevated in the stable plaque group. CXCL9, CTACK and SCGF-β were detected within all plaques, suggesting a contribution to both localised and systemic inflammation. Osteopontin and osteoprotegerin were significantly elevated in the symptomatic vs asymptomatic group, while osteocalcin was higher in asymptomatic patients with stable plaque. All plaques exhibited calcification, which was significantly greater in asymptomatic patients. This may impact on plaque stability. Conclusions Circulatory EMP, CXCL9 and SCGF-β levels are raised in asymptomatic patients with unstable plaques, which could be important in identifying patients at most benefit from intervention.

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Comparison of efficacy and cost of different venous leg ulcer dressings

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Objective: Objective: To compare the efficacy and cost effectiveness of simple non adherent dressings with other more expensive dressing types in the treatment of venous leg ulcers. Methods Design: Retrospective cohort study. Methods: The healing rates of twelve leg ulcer patients treated with simple non adherent dressings (e.g. NA Ultra) were compared with an equal number of patients treated with modern dressings to determine differences in healing rates and cost.Exclusion criteria: Patients with an Ankle Brachial Pressure Index (ABPI) < 0.8 or a history of deep vein thrombosis, diabetes mellitus, inability to move or mental health problems.Main Outcome measures: Rate of healing as determined by reduction in ulcer area over a specified period of time and total cost of dressing per patient Results Results: Simple non adherent dressings had a mean healing rate of 0.353 cm2/week (standard deviation ± 0.319) compared with a mean of 0.415 cm2/week (standard deviation ± 0.383) for modern antimicrobial dressings. This resulted in a one tailed p-value of 0.251. Multiple regression analysis gave a significance F = 0.8134.The mean cost of dressing using Non-adherent ultra is £0.702 with a standard deviation of 1.08 compared with a mean cost of £4.78 and a standard deviation of 4.816 using antimicrobial dressings. This gives a p value of 0.0045 Conclusions The results indicate that the difference in healing rate between simple and modern dressings is not statistically significant. Therefore, the cost of dressing type should be an important factor influencing dressing selection

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Changes in α2AP indicate increased fibrinolytic activity in AAA

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Objective: Clot architecture is altered in patients with abdominal aortic aneurysms (AAA) and changes in fibrinolysis are evident in the early stages of disease. Alpha-2-antiplasmin (α2AP), a direct inhibitor of plasmin, is involved in the regulation of fibrinolysis. α2AP circulates in plasma as both an intact molecule and a C-terminally cleaved form, which is a less efficient inhibitor of plasmin. We aimed to study plasma levels of α2AP in patients with AAA and controls. Methods Levels of total plasma and C-terminally cleaved α2AP were measured using ELISAs in 116 AAA patients (median aortic size 4.9(3.9-8.3)cm) and 120 controls (aorta 1.8(1.2-2.9)cm). The frequencies of the α2AP Arg6Trp and Arg407Lys polymorphisms were determined using Taqman genotyping probes and RT-PCR. Data was expressed as median (interquartile range) and analysed using independent samples T-tests. Results Age was not significantly different between the two groups; AAA 74(57–90) years and controls 69(54–93) years. Total α2AP(AU/dl) plasma levels were higher in AAA patients compared with controls (101 vs 92, $P = 0.004$). The percentage of C-terminally cleaved α2AP was significantly higher in AAA patients than controls (66% vs 36%, $P < 0.001$). In AAA patients there was an association between both the Arg407Lys and the Arg6Trp polymorphisms and total plasma α2AP ($P = 0.001$). Conclusions Higher levels of C-terminally cleaved α2AP and total plasma α2AP are found in AAA patients. These data are indicative of chronically increased plasmin generation in AAA. It may also explain the delay in lysis that can be seen in the ex-vivo fibrin clots of patients with AAA.

3900

A gene expression signature for predicting outcomes of venous leg ulcers

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Objective: Despite their widespread occurrence, sensitive prognostic markers of chronic venous leg ulcers (VLUs) are noticeable by their absence. We describe a novel gene expression signature of wound edge tissue in VLUs which allows accurate personalised outcome modelling, permitting individually tailored treatments. Methods Sequential refinement and testing of a gene signature was developed utilising three distinct cohorts of human wound tissue. Over 111 pre-selected candidate genes were first screened using a cohort of acute and chronic wound tissue ($n = 24$) by way of quantitative PCR. Genes showing significant differences were combined and examined as part of a controlled prospective study of 71 patients with VLUs. The final signature was evaluated using a prospective, blinded study comprising 85 consecutive patients with VLUs. Results The initial gene signature comprised 24 genes (WD24) that allowed distinction between healing wound from non-healing wounds ($p < 0.0001$,sensitivity:40%, specificity:98%). Subsequent refinement excluded 10 genes to create a final 14 gene signature (WD14) which demonstrated significant prognostic power in a prospective, blinded study ($p < 0.00001$,sensitivity:84%,specificity:74%). Conclusions We report a novel gene signature that can predict wounds at low propensity to heal with current treatment strategies. Advanced wound care products and therapies may be of particular benefit to this population.

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Prospective study of leg ulcer service following publication of NICE CG168

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Objective: To study duration of ulcer, aetiology and treatment of leg ulcers presenting to a specialist Leg Ulcer Service (LUS) following publication of 2013 NICE Clinical Guidelines (CG 168). Methods Prospective study of 385 consecutive patients referred to a specialist LUS between 1 January 2014 and 30 June 2015. Results There were 385 patients (166 men, mean age 76 [range 33–104] years) with 449 ulcerated legs. The mean (range) duration of ulceration at consultation was 5.7 (0.5-520) months. 42 (11%) ulcerated legs had an ABPI < 0.8 and 23 (6%) less than 0.6. Superficial, deep, and mixed venous disease was present in 187 (49%), 37 (10%), and 3 (0.8%) legs respectively. Of those with deep venous disease, 27 (7%) had reflux and 10 (3%) had obstruction. Treatment comprised arterial intervention (11 angioplasty, 8 surgery), compression only (231), superficial venous ablation (48 foam sclerotherapy, 29 radiofrequency) and 58 were managed wholly conservatively. Conclusions Despite the publication of NICE CG and Quality Statements (QS) in July/August 2013, and extensive efforts locally to promote CG/QS and the LUS in primary care, many patients with leg ulcers are still not being referred promptly. Most leg ulcers are multifactorial and require a multi-disciplinary approach to diagnosis and management. Relatively few leg ulcers appear to be amenable to simple superficial venous intervention.

3906

Effect of vein length treated with EVLT on need for adjunctive treatment

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Objective: To look at the effect of great saphenous vein (GSV) vein length treated with endovenous laser therapy (EVLT) on outcomes, using freedom from secondary intervention as a marker. Methods Analysis of a single surgeon prospective database of EVLT procedures was performed. All EVLTs performed over a two-year period using a standardized technique were analysed. Length of vein treated was measured using the EVLT catheter. Effect of GSV vein length treated was assessed at 6 weeks and the need for further adjunctive treatment with foam was assessed. Patient's records were scrutinized for 1 year post –procedure to look for any further treatment. Results During the period 103 patients underwent EVLT of the GSV (males: 42.7%). The mean age of the patients was 52 years (SD ± 15.4). Mean length of vein treated was 32.9 cm (SD ± 9.4), 8.7% of patients had <20 cm treated, 33% 20-29 cm, 26.6% 30-39 cm and 32% >40 cm. A shorter length of vein treated was significantly associated with a higher proportion of patients requiring adjunctive treatment ($p = 0.006$). There was a moderate correlation between length of vein treated and requiring adjunctive treatment ($rs = -0.321$, $p < 0.001$). Conclusions The total length of vein treated has a significant effect on re-intervention rates and thus the outcome. During EVLT it is important to try and treat more than 30 cm of vein. Patients with more than >40 cm of vein treated are unlikely to need any adjunctive treatment.

3909

Impact of gender on outcomes of AAA repair at NHS hospitals in England

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Objective: To quantify the difference in long-term survival and cardiovascular morbidity between women and men undergoing elective abdominal aortic aneurysm (AAA) repair at NHS hospitals in England. Methods Patients having elective repair of AAA were reviewed using the Hospital Episode Statistics (HES) and Office for National Statistics (ONS) datasets. The primary

outcome measure was 30-day mortality and the secondary outcomes were 1-year, 5-year and aortic-related mortality and post-operative complication rates. Multivariate regression analysis was used to identify independent risk factors for 30-day mortality. Results Between 1 April 2002 and 31 March 2013, 31090 patients (4795 women, 26295 men) underwent open AAA repair. Between January 2006 and March 2013, 16777 patients (2036 women, 14741 men) underwent EVAR. 30-day mortality was higher in women (open repair: 9.53% vs. 6.82% in men; EVAR: 4.03% vs. 2.68% in men) and remained higher after age adjustment. 1-year and 5-year mortality and aortic-related mortality were also higher in women, although the incidence of pre-operative cardiovascular risk factors was lower. Female sex was an independent risk factor for 30-day mortality after open repair (RR 1.39; 95% CI 1.25-1.56; $P < 0.0001$) as well as EVAR (RR 1.57; 95% CI 1.23-2.00; $P < 0.0001$). Conclusions Women undergoing open AAA repair and EVAR at NHS hospitals in England have higher short- and long-term mortality and peri-operative complication rates, compared with men. These findings can be used to offer better counselling and may help future studies focusing on optimisation of specific risk factors that would be potential targets for optimum AAA management in women.

3911

Predictors of Outcome following Crural Endovascular Treatment in CLI

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Objective: The management of CLI in patients with Infra-Popliteal (IP) disease remains a major challenge. This study sought to identify the predictors of clinical outcome in a large cohort of contemporary patients undergoing infrapopliteal endovascular interventions Methods A prospectively maintained database of patients undergoing percutaneous IP revascularisation for CLI in our Institution between 2012–2013 was analysed. Patients' demographic, CV risk factors, angiographic findings and follow-up results were examined. The primary end point was Amputation-Free-Survival (AFS) at 1 year; secondary endpoints were technical success, primary, assisted-primary and secondary patency rates and limb salvage (LS). Cox-Regression analysis was performed to investigate predictors of clinical outcome. Results 133 lower limbs were revascularised in 126 patients (mean age 73 years) with 266 IP target vessels successfully crossed. Adjuvant proximal revascularisation was needed in 54.9% of the cases. Median hospital stay was 5 days and median Duplex follow-up 117 days (3–1175). Perioperative mortality was 1.5%. AFS rate at 1 year was 64%. One year LS was 94%. Technical success per limb and per target vessel was 94.0% and 85.6%, respectively. Primary, assisted-primary and secondary patency at 1 year were 66%, 68% and 74%, respectively. One year LS rate was 94%. Independent favourable predictors were baseline eGFR ($P = .048$; HR 2.10; 95%CI 1.00-4.47), adjuvant inflow revascularisation ($P = .039$; HR 2.12; 95%CI 1.04-4.35) and pre-procedural dual antiplatelet therapy ($P = .023$; HR 3.90; 95%CI 1.00-17.00). Conclusions Endovascular treatment of IP disease is safe and effective in patients with CLI. Pre-procedural eGFR, dual antiplatelets and adjuvant inflow interventions are predictors of AFS following these procedures.

3915

Does diabetic foot screening prevent amputation?

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Objective: The diabetic foot screening programme aims to identify those at risk of developing foot ulceration in order to prevent amputation. Our objective is to determine the rate of uptake of this programme and the diabetic foot score of patients who subsequently require amputation. Methods A retrospective analysis of a prospectively maintained database of patients undergoing lower limb amputation in a single centre between January '11 – March '14 was carried out. Electronic hospital records and patient notes were reviewed. Results 277 patients underwent lower limb amputation, 160 major (58%) and 117 minor (42%). 158 amputees (57%) were known to be diabetic at the time of amputation. 3 patients were diagnosed with diabetes within 1 year of amputation. Of the diabetic patients 46 had type I and 112 type II respectively. 73 (46%) underwent a major and 85 (54%) a minor amputation. Prior to amputation, 93%(147/158) of diabetic patients attended diabetic foot screening at a median of 14months (range 0–69months) and 71%(112/158) had a documented foot screening score (24 low risk(21%), 19 medium risk(17%), 41 high risk(37%), 28 active ulceration(25%)).84%(61/73) of diabetic patients who had major lower limb amputation had attended foot screening. 79%(48/61) had a documented foot screening score (12 low risk(25%), 8 medium risk(17%), 14 high risk(29%), 14 active ulceration(29%)). Of the 61 patients with a documented screening score, 57(93%) were found to have PAD on hospital admission. Conclusions Diabetic patients who come to require amputation do attend foot screening. Currently screening techniques lack sensitivity for detecting PAD, which requires optimisation.

3918

UKETS: Enhancing Basic Endovascular Skills and Promoting Patient Safety

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Objective: The UK Endovascular Trainees (UKETS) was established to develop basic endovascular skills training, improve inter-specialty collaboration, encourage the structured use of VRS and enhance patient safety. Methods Established in 2012 by 3 trainees, UKETS now runs 3 courses: Foundations in Endovascular Practice (FEP), Basic Endovascular Skills (BES), Angioplasty Essentials (AE).All courses are hands-on, VRS based and expert led focusing on the training mantra "safe access, safe navigation, safe closure". Structured feedback (visual analogue scale) on confidence has been taken from all attending candidates through pre and post-course questionnaires. Agreement with several statements has been recorded on 5-point Likert scales. UKETS have also developed an online lecture portfolio to ensure maximum hands-on training during the courses, a free iPhone app integrating our VRS dedicated logbook, the worlds largest online library of basic endovascular instructional videos and 'sim-locator' ensuring trainees can find their nearest VRS. Results 289 trainees have attended, (121 BES, 144 FEP, 24 AE), 255 have completed feedback. BES and FEP trainees recorded greater confidence ($p < 0.05$) in safe arterial access, all elements of safe navigation, safe arterial closure, knowledge of endovascular kit, and improved overall confidence in endovascular intervention. FEP candidates report "more confidence making a career choice into their chosen specialty". Written testimony is overwhelmingly positive. Conclusions Established by trainees for trainees UKETS provide high-quality, affordable, hands-on VRS-based courses in basic endovascular skills. Our innovative online support ensures the ongoing use of VRS is supported to reduce the learning curve and thus enhance patient safety.

3921

Ambulance Identification Score for Ruptured Abdominal Aortic Aneurysm

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Objective: The management of ruptured aortic aneurysm (rAAA) has been centralised to reduce mortality. The best outcome requires rAAA to reach specialist attention as quickly as possible, yet up to 50% of rAAA are initially misdiagnosed. Diagnostic risk scores improve survival in other centralised emergencies (myocardial infarction/stroke/trauma) but an evidence-based system does not exist for rAAA. This study presents a diagnostic score for immediate identification of rAAA. Methods An algorithm was designed to match patients between London Ambulance data and English Hospital Episode Statistics based on age, gender, postcode, hospital and time of A&E assessment. The study included

rAAA or a control group of differential diagnoses (perforated viscus, appendicitis, myocardial infarction, diverticulitis, ureteric colic) from 2008–2011. Data were manually extracted from ambulance case reports regarding demographics, comorbidity, presenting symptoms and signs, and subjected to independent quality assurance. Binary logistic regression was performed to derive a diagnostic score for rAAA. Results 218 rAAA and 2380 controls were matched with 99.6% data validity. The rAAA risk score comprised weighted components of demographics (age and gender), symptoms (back pain or collapse), signs (blood pressure, temperature, pulse, capillary refill) and known comorbidity (peripheral vascular disease, diabetes and known malignancy). The score performed with 86.2% sensitivity and excellent discrimination (area under the Receiver-Operator-Characteristic (ROC) curve = 0.86). Conclusions A novel scoring system improves the sensitivity of rAAA detection from <50% to 83%. This has excellent translational potential, and will be subject to a London-wide prospective trial as a point-of-care diagnostic tool.

3923

Angioplasty of AVF stenoses: Plain vs paclitaxel coated balloon angioplasty

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Objective: To compare the primary patency rates of native arteriovenous fistulas (AVF) at 3, 6 and 12 months following plain balloon angioplasty (PBA) or paclitaxel coated drug eluting balloon angioplasty (DEB) of anastomotic and juxta-anastomotic stenosis. Methods Patients treated by percutaneous transluminal angioplasty of an anastomotic or juxta-anastomotic stenosis of a native AVF over a period of 2 years and 2 months at our institution were included. Data was retrospectively collected for patient demographics, angioplasty balloon type and AVF type. Primary and secondary patency rates at 3, 6 and 12 months were compared between the PBA and DEB groups. Volume flow measurements at follow-up ultrasound duplex were also compared. Results 92 patients satisfied the inclusion criteria, 74 were treated with PBA (80%) and 18 were treated with DEB (20%). There was no significant difference in the patient groups regarding age, gender, diabetes status, warfarin treatment and type of AVF.There was a statistically significant higher primary patency rate in the DEB vs. PBA groups at 6 months (92% vs. 67%, $p = 0.045$) and 12 months (80% vs. 31%, $p = 0.019$). We also observed greater secondary patency rates at 6 and 12 months and higher volume flow at 6-week duplex ultrasound for the DEB group though the difference did not reach statistical significance.There were no complications in either group. Conclusions This study demonstrates the safety and effectiveness of juxta-anastomotic fistuloplasty using DEB. Primary assisted patency rates were significantly higher in the DEB group at 6 and 12 months post-fistuloplasty.

3924

Lessons from Comparing Elective AAA Repair in England and Sweden

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Objective: Previous international comparisons of mortality for elective abdominal aortic aneurysm (AAA) repair stimulated considerable reorganisation of vascular services in England. A contemporary international study provides perspective for evaluating and improving current practice. This study compared 90-day and 5-year mortality for patients undergoing elective AAA repair in England and Sweden. Methods Patients undergoing elective AAA repair were identified from English Hospital Episode Statistics and the Swedish Vascular registry (SwedVasc) between 2003–2012. 90-day mortality and 5-year survival were compared after age/gender adjustment. Separate within-country analyses were performed to examine the impact of co-morbidity, hospital teaching status or hospital annual caseload. Results 36,702 patients in England and 7,806 patients in Sweden underwent elective AAA repair during the study period. Crude 30-day and 90-day mortality were greater after AAA repair in England compared to Sweden (3.41% vs. 2.34%, $p < 0.001$ and 5% v 3.89%, $p < 0.001$ respectively), with poorer corresponding survival at 5 years after surgery. Overall Age and Gender adjusted mortality was greater in England for AAA repair (OR 1.499, 95% CI 1.215-2.016. The uptake of EVAR was poorer in England than in Sweden. Conclusions These findings highlight potential variation in practice and the need for detailed comparative analysis of outcomes to contextualise national results. Further research should prospectively scrutinise turn-down rates, cardiovascular risk management practices and morphology data to further examine apparent variation in international results.

3926

Focussed Training In Renal Access Surgery – Interim Data From A Pilot Study

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Objective: Renal access training for vascular surgeons in the United Kingdom is variable. Published data from the Dialysis Outcomes and Practice Patterns Study demonstrates a clear association between training exposure and subsequent fistula failure rates. This pilot aims to explore the experiential benefits of focussed training. Methods A focussed training programme was implemented. The programme consisted of 8 full-day theatre lists, 4 half-day theatre lists and 4 out-patient clinics with 'hands-on' duplex ultrasonography. Surveys were distributed in order to establish case-load exposure and the candidates' perceptions of their surgical abilities at the outset of the programme and upon completion. Results The programme was undertaken by 8 trainee surgeons. Case-load data was obtained for 75% (6 of 8) of the candidates; over 8-weeks a mean of 55 cases were operated upon by each of the candidates and 34 were undertaken as primary surgeon. 100% (7 of 7) of the responding candidates described themselves as having insufficient experience to create a fistula without close supervision prior to starting. Upon completion, 85.7% felt able to undertake basic fistula surgery without direct supervision and felt capable of offering a basic renal access surgery service in their own practice. Conclusions The candidates had limited confidence and capability in renal access surgery prior to undertaking the programme. The programme resulted in qualitative improvements in the candidates' perceptions of their abilities. The majority felt able to practice independently after a comparatively short time-frame. All candidates felt that the programme offered significant advantages to other areas of clinical practice.

3927

Magnetic Resonance Angiography evaluation of the Great Saphenous Vein

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Objective: Duplex ultrasound scan (DUS) remains the gold standard imaging modality in the preoperative mapping of the Great Saphenous Vein (GSV). However, DUS is time consuming and highly operator dependant. We aimed to test the feasibility of GSV assessment using Magnetic Resonance Angiography (MRA) and to compare the measurements generated with the DUS. Methods Retrospective GSV evaluation was undertaken from pre-operative MRA and DUS. Maximum anteroposterior GSV diameters were obtained by two independent and blinded reviewers using transverse multiplanar reconstructions. GSV was measured on MRA at three levels: 3 cm below the saphenofemoral junction (level 1), mid thigh (level 2) and above knee (level 3). These were compared with equivalent DUS measurements. Inter-observer MRA reproducibility was evaluated using correlation coefficients. Student's t-test for paired samples was used to test the differences between the MRA and DUS diameters. Results Twenty seven veins were evaluated in 26 patients. The median age was 66 (range 47–85), 14 were women. MRA based diameters had excellent inter-observer reliability: $r = 0.76$, 95% CI: 0.527-0.882 (level1); $r = 0.81$, 95% CI: 0.625-0.910 (level 2); $r = 0.73$, 95% CI: 0.482-0.868 (level 3). Mean (SD) GSV diameters on MRA/DUS for levels 1, 2 and 3 were: 5.2(1.2)mm/5.4(1.8)mm,

4.3(1.2)mm/4.4(1.2)mm and 4.1(1.0)mm/4.2(1.1)mm respectively, without significant differences between the two modalities (P = 0.425/0.553/0.208). Conclusions MRA provides reliable assessment of the GSV with good reproducibility. Therefore, routine ultrasound vein mapping is not required in patients having conventional MRA.

3932

Detection of early endoleak after Endovascular Sealing for Infrarenal AAA

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Objective: Endovascular sealing of abdominal aortic aneurysms (EVAS) with the Nellix device is a novel treatment modality, with new challenges in the detection, classification and treatment of endoleaks. This study assessed the accuracy of endoleak detection with either duplex ultrasound or CT angiography. Methods Patients undergoing EVAS for non-ruptured infrarenal AAA were subject to an investigational surveillance programme comprising un-blinded CT and Duplex scans. The primary outcome measures were "suspected type 1a or 1b endoleak", defined by the initial scan report; and "confirmed type 1a and 1b endoleak", defined by consensus re-interpretation of all available imaging with clinical correlation. Results 116 patients underwent EVAS between March 2013 and December 2014, with median 13 months follow-up (IQR 8–19). 526 duplex scans were performed (mean 4.5 SD +/− 1.8 per patient) and 282 CT scans (mean 2.5 (SD +/− 0.9) per patient). 114 duplex/CT scan-pairs were analysed. 24 "suspected endoleaks" were identified for further scrutiny; 5/24 (20.8%) by both CT and duplex, 15/24 (62.5%) by CT alone and 4/24 (16.7%) by duplex alone. After secondary review with clinical correlation and panel discussion, 6/116 (5.2%) endoleaks were deemed clinically relevant and required reintervention (5 1a and 1 1b). 4/6 (66.6%) clinically-relevant endoleaks were detected by duplex ultrasound; 6/6 (100%) by CT. All reintervention was technically successful. Conclusions Postoperative surveillance of the Nellix EVAS system remains an area of emerging evidence. CT and duplex ultrasound should continue to be used in combination until mid-term data are available to describe the surveillance performance of both modalities for EVAS technology.

3933

FASTer surgery for stroke & TIA require more expedient referral to vascular

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Objective: Risk of recurrent transient ischemic attack (TIA) or stroke is highest within 48 hours of an index event. Carotid endarterectomy (CEA) remains the gold standard for prevention of stroke for patients with a significant ipsilateral stenosis. This study aims to identify rate-limiting steps to performing CEA. Methods A retrospective review of patients undergoing CEA for a symptomatic stenosis over a 40-month period was performed. Patients were identified from the Australasian Vascular Audit, and cross-referenced with a prospectively collected audit database. Data were collected on the dates of index symptoms, referral to the vascular service, and surgery. Results 105 patients were identified. 93 patients were included in the study. 55% of patients had CEA performed within 48 hours of referral to vascular surgery, and 92% within 7 days of referral (Median 2 days). 20% of patients had surgery within 48 hours of symptom onset, and 62% within 7 days of symptom onset (Median 6 days). 45% of patients referred Sunday to Wednesday had surgery performed with 48 hours, and 90% within 7 days, and 66% of patients referred Thursday to Saturday had surgery performed within 48 hours, and 92% within 7 days. Conclusions CEA can be performed within 48 hours of appropriate referral. The major challenge of managing symptomatic carotid stenosis is not the timing of surgery following referral, but the time from index symptom to referral. Ongoing education for other disciplines involved in the management of TIA and stroke is required regarding the expedient role of CEA in stroke prevention.

3935

The Prevalence of Carotid Artery Stenosis in Ischaemic Stroke Patients

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Objective: The prevalence of carotid stenosis in patients presenting with TIA or ischaemic stroke is reported at 2-26%, however the prevalence in a modern population in which antiplatelet therapy and statins are widely used is unknown. We therefore studied the prevalence in patients attending a Hyper-Acute Stroke Unit (HASU). Methods A one-year prospective observational study was performed from July 2014 to June 2015 at a central London HASU. Consecutive patients with suspected stroke or TIA underwent carotid duplex ultrasonography, CT angiography, or contrast-enhanced MRA including the extracranial vessels. Carotid stenosis was defined as stenosis measuring ≥ 50% on either one of the modalities. Patient demographics and treatment prior to admission were collected. The cause of the stroke was confirmed by a consultant stroke physician or neurologist. Results Carotid imaging studies was performed in 1224 out of 1476 patients diagnosed with ischaemic stroke or TIA. The prevalence of carotid artery disease was 19.2% (n = 235). Carotid disease was symptomatic in 97 patients (7.9%). 529 patients (43.2%) presented on a statin, 681 (55.6%) on anti-hypertensive therapy and 402 (32.8%) on at least one antiplatelet. Patients with significant carotid stenosis (mean 74.4 years) were older than patients without stenosis (p = 0.001). Conclusions The prevalence of carotid artery stenosis in patients presenting to HASU remains high despite the common use of prior secondary prevention treatments.

3937

Aortic endograft infection: a single-center experience

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Objective: Aortic endograft infection is uncommon and has been described in a few retrospective studies and case reports. General treatment consensus is surgical explantation. The purpose of our study was to determine the incidence, risk factors and management of stent graft infection. Methods We performed a retrospective analysis of patients treated for abdominal or thoracic endograft infections in our institution. The diagnosis of graft infection was based on a combination of criteria including clinical findings, blood tests and cultures, endoscopy and imaging studies. Results Between January 2006 and December 2014, 12 patients were treated for aortic endograft infection. The institutional incidence of infection was 0.72% (n = 10/1391). The median age at presentation was 67.5 years (range 62–81). All patients were male. Among the risk factors for infection, 9 patients (75%) had an open femoral access; 8 patients (67%) had interval infections leading to potential bacteraemia; reinterventions were performed in 8 cases (67%). The most common microorganism was staphylococcus aureus (n = 3; 25%). Graft explantation was performed in 9 patients (75%). Conservative management with long-term antibiotic therapy was commenced in 3 patients (25%). Median follow-up was 10 months (range, 0–103). Overall mortality was 50%. Mortality associated with aortic graft infection was 44% (n = 4) in explant management and 0% in medical management. Conclusions Endograft infection is a rare but potentially lethal complication. A low incidence of endograft infection precluded more in-depth analysis of risk factors. A careful selection of patients for medical management could reduce mortality rate associated with endograft infection.

3939

Can Nellix be used in place of fenestrated EVAR?

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Objective: Fenestrated stent grafts offer an endovascular option to patients with abdominal aortic aneurysm (AAA) who have anatomically unsuitable infra-renal aneurysm necks for conventional EVAR. Nellix endovascular system is a relatively new approach in which following stent deployment, endobags are filled with a biostable polymer to create a seal. Nellix was first used at our institute in 2014. We aim to retrospectively review a prospectively maintained database of patients who underwent fenestrated EVAR to assess potential suitability for Nellix repair using manufacturers' guidance for use (IFU). Methods A prospectively maintained database of all patients undergoing fenestrated EVAR at our institute was scrutinised. The pre-operative cross-sectional imaging was reviewed by two vascular interventional radiologists and one consultant vascular surgeon. The suitability for Nellix in place of fenestrated EVAR was assessed. Results 37 patients underwent fenestrated EVAR between July 2011 and May 2015. Of these, 2 patients were excluded from the study. The majority of patients were male (30/37) and the mean age was 78.8 years (range 63–91). Of the 35 patients included in the study, 16 (46%) were deemed suitable for Nellix endovascular system. The main reasons for unsuitability of Nellix were neck size and neck angulation. Conclusions In our experience, 46% of patients were potentially suitable for Nellix. This may be a feasible option in selected patients who are deemed too high risk for fenestrated EVAR and would significantly reduce procedural cost.

3942

Complications during TEVAR significantly reduce mid-term survival

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Objective: Pre-operative patient factors determine mortality risk following thoracic aortic aneurysm repair (TEVAR). We hypothesised that the occurrence of serious morbidity during the peri-operative period would adversely effect long-term survival. Methods The MOTHER database consists of 6 separate registries and 1 institutional case series. All patients underwent TEVAR for aneurysm or dissection and significant adverse events were recorded. Post-operative complications were classified as being cardiac, respiratory, neurological, renal or access related. Kaplan-Meier analysis was performed to compare survival amongst those who experienced specific complications with those that did not, and the effect of multiple complications was assessed. Results There were 1072 patients in the registry. 353 (33%) patients experienced a post-operative complication (7% cardiac, 5% renal, 7% neurological, 9% respiratory and 17% access). Mean follow-up was 2.9 years with a range of 0–12.9 years. All cause mortality was 30% at follow-up. Patients with a cardiac complications had a freedom from mortality of 54% vs. 72% in those without ($p < 0.001$), respiratory 51% vs. 73% ($p < 0.001$), neurological 51% vs. 72% ($p = 0.001$), renal 41% vs. 72% ($p < 0.001$) and access 58% vs. 73% ($p = 0.003$). Patients with 0,1,2 and 3 complications had a freedom from mortality of 78%, 60.8%, 53% and 26% respectively. Conclusions Experiencing a peri-operative complication markedly increases the risk of mortality after TEVAR well into the first year of follow-up. Patients at risk should be identified to prevent predicable complications. Appropriate use of higher dependency environments should be considered in all patients undergoing TEVAR.

3944

Duplex ultrasonography can be used to diagnose thoracic aortic pathology

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Objective: Duplex ultrasonography is used to screen for aortic aneurysms in the abdominal aorta, but the technical limitations of this modality have so far limited applicability in diagnosing thoracic aortic pathology. We hypothesised that duplex ultrasonography could potentially be used to detect thoracic aortic pathology. Methods This was a prospective, case–control cohort study. A group of patients with CT confirmed thoracic aortic pathology underwent duplex ultrasonography of the thoracic aorta, according to a novel protocol. A control group with no thoracic pathology also underwent scanning. The sonographer was blinded to this information and recorded the presence of pathology if this was directly visualised or any dilated segment of aorta was seen (>40 mm). Results In the pathology group, 19 of 20 had an adequate assessment of the thoracic aorta and in 18 the presence of pathology was indicated. One patient could not be imaged due to poor sonographic windows, and the other had a focal saccular aneurysm in the distal thoracic aorta in an otherwise normal aorta, which was missed. In the control group, all patients had an adequate assessment of the aorta and there were no false-positives. The sensitivity of thoracic duplex in identifying pathology was 94.7% (18/19), and specificity was 100% (0/20). Conclusions Duplex ultrasonography has the potential to be used as a diagnostic modality for thoracic aortic pathology, and may have a role in surveillance for some patients in whom CT scanning should be avoided. Further validation and refinements to this technique are required.

3945

Connexin 43 (Ser368) as a marker for ischaemia in diabetic foot ulceration

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Objective: The development and recurrence of diabetic foot ulceration (DFU) is multi-factorial. Identification of an ischaemic component can be difficult, given the indolent nature of neuroischaemic ulceration compounded by arterio-venous shunting and the frequently encountered distal pattern of arterial disease. We explored cutaneous expression of Connexin 43 (Ser368) in-vivo and in organotypic models of human skin. Methods Skin biopsies were performed on patients with and without diabetes undergoing arterial reconstruction or major limb amputation for critical limb ischaemia. A control group of patients undergoing elective orthopaedic foot surgery was also recruited. Immunohistochemistry was performed using a primary Connexin 43 (Ser368) antibody. In-vitro assessment using human keratinocytes and fibroblasts cultured from skin biopsies was performed after subjecting the cells to hypoxic conditions. Protein expression was evaluated using Western blot analysis. Results Immunohistochemistry provided qualitative data demonstrating expression of Connexin 43 (Ser368) in skin biopsies harvested from ischaemic feet in all cases. Connexin 43 (Ser368) was not identified in any of the control specimens or in proximal skin biopsies of patients with occlusive arterial disease. When subjected to hypoxic laboratory conditions (5% oxygen) human keratinocytes and fibroblasts (from the study population and controls) expressed Connexin 43 (Ser368), with protein expression peaking between 6 and 24 hours. These changes were not influenced by different glycaemic conditions. Conclusions Cutaneous expression of Connexin 43 (Ser368) is a novel finding. These in-vivo findings, supported by organotypic modeling suggest that Connexin 43 (Ser368) has potential utility as a biomarker for ischaemia in DFU.

3947

The National Stroke Strategy – FASTER may be better

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Objective: With NICE guidelines stating that carotid endarterectomies should be scheduled within two weeks of symptoms and the National Stroke Strategy reducing this to 48 h. This study aims to review the possible delays from symptoms to surgery. Methods This study analysed 150 patients with confirmed TIA, during a 5 month period. All patients were referred into a single tertiary centre and followed up one month after the event. A questionnaire collected data on their rapid access clinic pathway, and details on prior medications and treatment. Results All 150 patients presented with a confirmed TIA/stroke. 51/150 had a prior history of TIA/stroke and 35/150 had under gone an 'index' event in the 5 days before presentation. 45/150 experienced a reduction/loss of vision. Of this group 32/150 had a deficit in vision only, and 32/32 did not

attribute these symptoms to a cerebrovascular event.27/150 came straight to hospital, 27/150 called 999, 82/150 called their GP, 15/150 presented to other services. 92/150 had a delay in presentation.47/150 had residual symptoms at clinic appointment. 149/150 were commenced on best medical therapy. 88/150 patients did not think they were having a stroke and 54/150 patients were unaware of FAST campaign. Of the population who were aware; 13/79, all men, still delayed presentation. Conclusions Two thirds of patients were not aware they were having a stroke, one third were unaware of the FAST campaign and over one third of patients presented with eye symptoms. We propose to re-launch the stroke campaign - FASTER (FACE, ARM, SPEECH, TIME, EYES, REACT).

3948

Analysis of 1180 NRLS patient safety events in elective aortic surgery

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Objective: The National Reporting and Learning System has collated >6million patient safety reports between 2003–2013. This study explores error reports involving elective aortic patients. Methods A systematic search using terms pertaining to aortic practice was performed. Two independent researchers categorized reports according to failure and harm using the WHO classification and a modified Medication Error Reporting and Prevention index respectively. A standardised conceptual framework was applied to identify themes. Results 6,750 reports were retrieved of which 1180 were elective aortic- 448 preoperative, 321 intraoperative, 411 postoperative. The dominant failure categories were Medical devices (21.1%), Clinical processes (20.8%) and Resource Management (19.5%). 939 events reached the patient, 361 causing harm (30.6%). Reviewer agreement was Kappa > 0.7. Of the non-fatal harming events, 64.5% were attributed to process and device failures which were explored further. Harming clinical processes (114/361) were primarily procedure-failures (38.6%), these contained complications requiring intervention- bleeding, thromboembolism or gastrointestinal obstruction. General care/management errors accounted for 32.5% of harmful processes including lack of patient observations, failure to follow postoperative instructions and non-escalation of care. Intraoperative mobile imaging failure/malfunction accounted for 22.1% of medical device errors (86/361). This resulted in 8 cancellations, another 4 persevered with >1hour delay. Equipment unavailability caused harm in 19.8%, primarily in endovascular procedures. Conclusions Focused analysis of this national patient safety database to identify specialty-specific themes of patient safety is feasible. Identification of recurring harmful themes in elective aortic vascular surgery provides a basis for prospective monitoring and targeted intervention.

3949

750 preoperative elective aortic- conditioned for failure?

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Objective: An important number of intraoperative errors during major vascular procedures are attributed to planning deficiencies. The aim of this study is to investigate the type and frequency of preoperative errors in elective aortic patients which may contribute to intraoperative harm. Methods In a single centre, an experienced observer conducted an observational study to identify preoperative errors occurring along an agreed pathway for aortic interventions. A log of events occurring to patients during observation periods was recorded. Error validation and categorisation of failure type were performed by independent assessors. Results 750patients were observed over 160hours. A total of 810errors were identified. As patients progress through the pathway to preoperative admission, the number of errors rise to 8.3errors per patient per hour observed.Task omission was the leading error across all phases of care (63.2%) and rooted in communication failure (59%), technological burden (21%) and staff unavailability (20%). Endovascular procedures were planned in 68%, the only difference being a non-significant increased rate of imaging access/availability at the MDT phases.Error severity remained largely static across the care pathway- most do not reach the patient (78%) nor cause harm (96%) but do cause delays (45%). 91% were considered preventable. Of the errors not identified by existing policies but corrected by the observer (n = 95), 27 were considered to have the potential to harm the patient. Conclusions Most errors are corrected however this results in treatment delay or cancellation. Improving communication streams and standardising care pathways are likely to make care safer by 'getting it right first time'.

3951

Plaque Ulceration is Associated with Symptomatic Carotid Artery Disease

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Objective: Prophylactic carotid endarterectomy in patients with carotid stenosis can prevent long term stroke. The indication for operation is currently based mainly on severity of stenosis. The benefit of the operation could be increased if one could identify high risk plaque prior to surgery. Plaque ulceration might be one feature that can be identified on routine non-invasive imaging. We therefore assessed the association between symptoms and features of high risk plaque through post-operative histology. Methods A prospective observational study was performed over a one year period in a central London joint neurovascular HASU. Patients with carotid stenosis where appropriate were referred for endarterectomy. Plaques removed underwent routine AHA grading that includes histological analysis for; calcification, lipid core, thrombus, intra-plaque haemorrhage (IPH) and thin fibrous cap ulceration. Results 85 patients were analysed. Average age was 74 years (s.d.10); 73 symptomatic and 12 asymptomatic carotid stenosis. Preoperative imaging included 82 duplex, 64 CTA and 21 MRA. Average stenosis was 71% (s.d. 14.1), 37 patients had moderate carotid stenosis of 50-70%. Only one patient had a moderate risk plaque (AHA grade IV), 26 (30%) had very high risk plaques (grade VI) the remainder all being high risk (grade V). The distribution was similar in symptomatic severe stenosis, symptomatic moderate stenosis and asymptomatic stenosis.However, ulceration was more common in symptomatic patients (43% v 8% P = 0.02). Conclusions Patients with recently symptomatic carotid stenosis are more likely to have plaque ulceration. Current selection criteria for carotid endarterectomy did not identify those patients more likely to have a high risk plaque.

3952

The Modern Surgical Management of Lower Extremity Iliofemoral DVT and PTS

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UCL

Objective: ObjectivesDeep vein thrombosis (DVT) can lead to major morbidity and long-term disability from post-thrombotic syndrome (PTS). The mainstay of treatments is anticoagulation preventing thrombus propagation. There is developing interest to directly intervene on major DVT both acutely to clear in situ thrombi and prevent valvular damage, which may be associated with lower rates of PTS, but also on chronic PTS to open up major occluded veins. The aim of this study was to highlight the short-term results of endovenous stent deployment for DVT patients. Methods MethodsAn observational case series of patients that underwent iliofemoral venous stenting was performed. Data outlining patient demographics, medical history and region of occlusion were collated. Patency and post-operative symptoms were documented during follow-up. The clinical, etiology, anatomy and pathophysiology grades and venous clinical severity scores were reported at presentation and 30 days follow-up. Two case reports, within the case series were outlined. Results ResultsTwenty-six patients (18 women, 8 men) that underwent iliofemoral stenting were identified. On follow-up, 3 patients developed post-operative in-stent stenosis. There was an improvement in CEAP and mean VCSS ($p < 0.05$). Both case reports demonstrate an encouraging management template for acute and chronic iliofemoral DVT (ifDVT). Conclusions ConclusionThe symptomatic

improvement and low incidence of procedural complications in the case series demonstrates endovenous stenting as a promising procedure in the short-term. There is a need for continued research on ifDVT stenting with a focus on long-term patency values and symptomatic grading to enable judicious decision making for vascular patients.

3954

Challenges in the management of splenic artery aneurysms

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Objective: Natural history of splenic artery aneurysms (SAAs) remains poorly delineated. Our objective was to review our experience with SAAs over a 10-year interval. Methods Between February 2006 and January 2015, 30 patients with SAAs were evaluated for intervention by open or endovascular surgery (>2.0 cm threshold). Medical records database and imaging were reviewed. Statistical analyses used Fisher's exact test for categorical data and t-test for continuous variables. Results Of thirty patients (63 ± 13 years, 57% females), 10% had abdominal symptoms, the majority were incidental (90%), with no ruptures . Duplex ultrasound was limited by poor views (sensitivity 10%). Twelve underwent endovascular treatment (coils, plugs), while 18 underwent serial observation with no interval ruptures. Patients requiring endovascular treatment trended to be younger (58 vs. 66 years, P = 0.051), but gender distribution and risk factors were not significantly different. Mean aneurysm size at diagnosis was 17.4 mm for observation group and 24.8 mm for endovascular group (P =0.003). Primary and secondary technical success rates were 83% (2 failed primary access) and 100% respectively. Two (17%) developed splenic infarction with abscess needing drainage. There was no procedural or late aneurysm-related mortality with mean followup of 20 months and no patient required open repair. Conclusions Large SAAs can safely undergo endovascular treatment with no need for open repair; access can be challenging with a small risk of splenic infarction. Smaller SAAs (<2 cm) grow slowly, carry a negligible rupture risk and surveillance is justified . Duplex has a limited role and MRA should be the preferred investigation for surveillance.

3955

Aorto-Iliac TASC C-D lesions: Outcome of Endovascular-first approach

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Objective: To evaluate the results of endovascular treatment for TASC C & D lesions and assess the impact of adjunctive procedures on the outcomes in a consecutive group of patients. Methods Analysis of prospectively maintained database for consecutive patients who underwent endovascular treatment for TASC C and D aorto-iliac lesions during the period from Jan. 2010 to Dec. 2014. Primary endpoints were target vessel patency, Limb Salvage (LS), Amputation Free Survival (AFS) and freedom from major adverse limb events (MALE). Results Overall 132 limbs, in 89 patients were treated. Indications for treatment were life-limiting claudication (n = 36), rest pain (n = 39) and tissue loss (n = 14). Treated lesions were TASC C (n = 21- 24%) and TASC D (n = 68- 76%) according to TASC-II classification. Re-entry devices were used in 18% (n = 16). Open adjunctive procedure consisted of femoral endarterectomy (n = 60) and cross-over bypass (n = 1).Technical success was 97%. Mean follow-up was 12 (range: 1–48) months. Primary , assisted primary and secondary patency rates at 1 year were 84%, 88%, and 95% respectively. LS and AFS at 1 year were 98%,88% respectively. Freedom from MALE was 87% at 1 year. Peri-operative complications occurred in 14 (16%) patients and included: major adverse cardiovascular events (6%)(stroke n = 3, MI n = 1 and death n = 1), vessel perforation (7%), intervention for surgical site infection (1%), renal failure (3%). Conclusions Endovascular treatment of TASC C and D aorto-iliac lesions is a viable option with satisfactory clinical outcomes and high technical success rate, however, in our experience, the use of adjunctive procedures was required in the majority of the patients.

3957

The Management of Vascular Injuries in a Major Trauma Centre

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Objective: To investigate the pattern and management of vascular injuries presenting to a Major Trauma Centre Methods Data was collected prospectively as part of the Trauma Audit and research Network. A retrospective analysis over 30-months from October 2012 to April 2015 was performed looking at all vascular injuries associated with major trauma calls. Results We identified 84 patients out of 4837 major trauma calls (1.7%). Male to female ratio was 5.5:1. Median age was 34 years (12–85). Median Injury Severity Score was 19 (9–59). 73% of patients required admission to intensive care. Road traffic accidents (38%) and stabbings (36%) were the commonest mechanisms of injury. Extremity (39%) and intra-abdominal (37%) vascular injuries were the most common sites. Of the extremity injuries, 75.8% needed open repair, 9.1% were managed endovascularly and 15.1% were managed conservatively. For abdominopelvic injuries, 35.5% were managed surgically and 42% endovascularly while 22.5% were managed conservatively. In head and neck only 27.3% injuries were repaired surgically and 72.9% were managed conservatively (vertebral/carotid artery dissection). Open operative repair ranged from caval repairs, aorto-bi-iliac bypass grafts and reversed saphenous vein grafts for penetrating trauma, to iliac interposition grafts for gun shot wounds. Overall mortality in this cohort was 4.8%. Conclusions Although less than 2% of all major trauma calls had a significant vascular injury, 70% of these required an immediate open or endovascular intervention. The anatomical variation in injury is wide and the method of repair varied mandating a multi-disciplinary approach with co-located specialties.

3958

Prevalence of vascular injuries at a MTC - implications on training

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Objective: Analyse the demographics of vascular injuries and the role of vascular trainees in the management of vascular trauma at a major trauma centre (MTC). Methods A retrospective data collection over a 30 month period from Trauma Audit and research Network database was done for all vascular injuries reported with major trauma calls at a MTC. From the available records the role of vascular trainees in the procedure was recorded. Results There were 84 vascular injuries reported on 4837 trauma calls. Male to female ratio was 7:1 and median age was 34 (range 12–85 years). Median Injury severity score was 19 (range 9–59). RTA and stab injuries accounted for 74% of the vascular injuries. There was an equal number of abdominal vessel and extremity vessel injury (approximately 37% each). The vascular resident was first on call and after assessment and definitive imaging made a treatment decision along with the vascular consultant on phone. Majority (51%) required immediate open surgery, 20% needed endovascular intervention while 29% were managed conservatively. Every possible artery and vein from Aorta to IVC had been repaired with the vascular registrar/ fellow doing a significant part or all of the procedure under consultant supervision. Over 70% of the patients needed ITU/HDU care and overall mortality was 4.8% Conclusions Though vascular injuries represented only 2% of major trauma calls, greater than 70% warranted an immediate repair. The vascular hub and major trauma centre must be co-located to ensure the vascular trainee develops these life-saving procedural and leadership skills.

3959

Common Peroneal Nerve Stimulation Significantly Reduces Calf Volume

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Objective: The common peroneal nerve stimulator (CPNS) is a UK approved device for reducing venous thromboembolism risk. The aim was to quantify the

claim it empties veins and imitates walking. Methods Twelve healthy volunteers performed 10 weight bearing tip-toe movements and 10 non-weight bearing ankle dorsi-flexions to imitate walking movements. Air-plethysmography (APG) recorded the reductions in calf volume from the plateau of maximum dependent volume. The common peroneal nerve was stimulated for 10 seconds at each of the 7 increasing electrical impulse settings and the volume reductions measured likewise. Results Reduction in calf volume is expressed as median [inter-quartile range] absolute (mL) and percentage reduction. Tip-toe and dorsiflexion pumping were not significantly different 59(33.6 - 96.1), 81.9% vs 51.4(34 – 68.5), 59.7%, respectively (P = 0.53). However, they both outperformed the CPNS: 10.8(7.3 - 18), 13.2% at P = 0.002 and P = 0.002. Qualitatively, the CPNS registered on the tracings as a small spike (muscle twitch) at low settings, with higher amplitudes (ankle jerk) at higher settings. The CPNS activity spikes were separate and discrete lasting a median (range) of 0.24(0.16 - 0.3) seconds. Conclusions The claim that the CPNS empties veins with significant reductions in calf volume is supported. However, the amount is small in comparison to tip-toe and dorsiflexion movements. Furthermore, the CPNS has a very short activity profile on the APG trace. Device innovations which promote longer contractions and involve the posterior calf compartment may improve pumping.

3961

Erectile Dysfunction & Peripheral Vascular Disease:Arterial Inflow Therapy

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3963

Spoke & hub -comparing outcomes for rAAA in a new vascular regional network

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Objective: Evidence showing differences in outcomes in AAA (elective and emergency) surgery between high and low volume centres resulted in the centralisation of vascular services and the creation of regional vascular networks (Hub and Spoke). This has resulted in some patients travelling greater distances for emergency abdominal aortic aneurysm (AAA) surgery. The effect of this was assessed within our vascular network. Methods A retrospective study was performed on all patients presenting with ruptured AAA (rAAA). Comparisons were made between those patients presenting directly to the Vascular Hub and those transferred from Spoke to Hub. Pathway times, blood pressures and mortality for ruptured (rAAA) were analysed. Results Between April 2013 and August 2014 there were 87 emergency AAAs (rAAA = 63, nrAAA = 24). 46 (73%) rAAA cases were admitted directly, of which 25 (54%) underwent operative intervention (endovascular = 6, open = 19). 17 (27%) rAAA cases were transferred from a Spoke, 16 (94%) underwent operative intervention (endovascular = 3, open = 13). Significantly greater numbers of rAAA were turned down for surgery in the direct admission group versus the Spoke transfer group (P < 0.01). Thirty-day operative mortality for rAAA was 56% (14/25) for the direct Hub admission and 63% (10/16) for Spoke transfers (P = NS). There was a positive correlation between systolic blood pressure at point of transfer from Spoke to Hub and time in the Spoke (P < 0.01). Conclusions Significantly more direct Hub admissions were turned down for surgery versus Spoke transfers. Operative outcomes between the groups were similar and time in the Spoke hospital did not significantly affect 30-day operative mortality in patients who were transferred.

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The Amputation Statistically Corrected Operative Risk Evaluation (SCORE)

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Objective: The amputation quality improvement framework aims to reduce perioperative mortality after major lower limb amputation (MLLA) to less than 5%. Current data suggests that 30-day and 12-month mortality rates exceed 10% and 50% respectively. Robust estimates of surgical risk are critical for comparative audit, appropriate counselling of patients/relatives and facilitating patient selection. Methods Consecutive entries of MLLA in the UK National Vascular Database (NVD) between January 2008 and October 2012 were analysed for demographics; co-morbidity; physiological, biochemical and haematological parameters and amputation level. The primary outcome was in-hospital mortality (IHM). Model development followed established SCORE methodology, with missing data addressed using rigorous multiple imputation methodology, and minimisation of the Schwartz-Bayes criterion used to select pre-operative variables and generate an optimal logistic regression model. For comparison, amputation-specific and general outcome scores were calculated (Amputation VBHOM, POSSUM). Model performance was assessed using receiver operating characteristic (ROC) curve analysis. Results 9312 operations were analysed. Overall IHM was 12%. Parameters selected for the Amputation SCORE were age, ASA grade, statin use, urea, mode of admission, albumin, abnormalities on ECG and pre-operative heart rate. All were significant independent predictors of IHM on multivariate logistic regression (Wald p < 0.001). The amputation SCORE provided good discrimination, with area under the ROC curve (AUC) of 0.785 (95% CI:0.756-0.814); significantly better than existing models (Amputation VBHOM (AUC:0.638) and POSSUM (AUC:0.720); p < 0.001). Conclusions The Amputation SCORE is an accurate model for IHM following MLLA which significantly outperforms existing models. Following external validation, it could be instrumental in both patient counselling/selection and comparative audit.

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An RCT of Buffered Tumescent Anaesthesia for Endovenous Thermal Ablation

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Objective: Endovenous thermo-ablation (EVTA) is the first-line intervention for superficial venous insufficiency (SVI). Although well tolerated, the infiltration of perivenous-anaesthesia is the predominant source of patient-reported discomfort. A randomised clinical trial of buffered-tumescent aimed to identify an improvement in intra-operative pain. Methods Patients with primary SVI undergoing EVTA were randomised to buffered (BT) or standard tumescent (ST). Post-procedural pain scores were recorded using a 10 cm VAS immediately and over 7 days. Assessments at baseline, 1 and 12 weeks included CEAP, Venous Clinical Severity Score (VCSS), Aberdeen Varicose Vein Questionnaire (AVVQ), duplex-ultrasound and complications. Results 97-patients were randomised, 47 to the BT-group and 50 to the ST-group. Both groups (BT vs. ST) were matched for gender (31 vs. 30 women), mean age 48.5 (SD 14.8) vs. 50.9(15.7) (p = 0.277), VCSS; 7.9(4.43) vs. 8.5(3.85)(P = 0.470) and AVVQ; 14.86(8.00) vs 13.77(5.96)(P = 0.264). The mean lengths of vein ablated were equivalent; 35.09 cm (16.24) in BT-group vs. 39.96 cm (16.21) (P = 0.164).Immediate post-procedural pain-scores were significantly lower in the BT-group; 2.86(3.57) compared to 4.44(2.94) in the ST-group (P = 0.001). Subsequent pain scores on day 3 were 1.71(3.34) in BT-group and 1.66(2.38) in ST-group (P = 0.490) and 0.81(1.89) vs 0.88(1.62) (P = 0.378) on day 7.AVVQ-scores were higher in the BT-group at 1-week; 18.88(7.93) compared to 15.50(7.14) (P = 0.018); these became equivalent at 12weeks; BT 6.75(7.07) vs. 4.37(4.35)(P = 0.223).At 1week technical success was 100% in both groups. There were no differences in phlebitis or sensory disturbance. Conclusions Buffered tumescent offers a significantly lower intra-operative pain experience for patients undergoing EVTA and should replace current tumescent formulas.

3970

Can Sarcopenia Predict Post-Operative Outcomes Following AAA Surgery?

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Objective: Patients undergoing Abdominal Aortic Aneurysm (AAA) surgery are at significant risk of post-operative complications. Sarcopenia is the degenerative loss of core skeletal muscle mass and is a component of the frailty syndrome. This study aimed to assess the impact of sarcopenia on post-operative outcomes following elective AAA surgery. Methods Pre-operative CT scans were used to assess sarcopenia in patients undergoing AAA surgery. Total psoas muscle area (TPA) (mm2) was normalised for patient height (TPA/height squared (m2)), defining the L4 psoas muscle index (L4-PMI) (mm2/m2). Patients in the lowest L4-PMI quartile (n = 35) were considered sarcopenic, and the remaining patients (n = 103) non-sarcopenic. Post-operative outcomes were compared for each group. Results After applying exclusion criteria to a cohort of 356 patients, 138 patients undergoing elective endovascular (n = 132, 95.7%) or open (n = 6, 4.3%) AAA repair were analysed. Median hospital length of stay (LOS, days) was 7 (Interquartile Range (IQR) 5 to 13.5) and 5 (IQR 3 to 8)(p = 0.004), and median ICU LOS was 2.5 (IQR 1 to 4.25) and 2 (IQR 1 to 2.25) (p = 0.038) in sarcopenic and non-sarcopenic patients respectively. 7 sarcopenic patients (20.0%) required secondary operations compared to 8 non-sarcopenic patients (7.8%) (p = 0.045). In both groups 6 patients required further care, representing 17.1% and 5.8% of the respective sarcopenic and non-sarcopenic patient populations (p = 0.04). Conclusions Our study shows that sarcopenic patients undergoing elective AAA repair have worse outcomes than non-sarcopenic patients, with significantly longer in-patient and ICU length of stay, higher rates of secondary operations and further care required.

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Connexin Expression in Venous Disease Progression

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Excimer laser atherectomy for chronic occlusive femoro-popliteal disease

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Objective: The utility of excimer laser atherectomy in femoro-popliteal occlusion remains undefined. We report our experience of Excimer laser-assisted recanalisation for complex femoro – popliteal occlusive disease (CFPOD). Methods All patients on best medical therapy with symptomatic CFPOD and limited revascularisation options were reviewed at MDT for consideration of endovascular recanalisation with adjunctive Excimer laser atherectomy. The7F "TurboElite" over-the-wire system (Spectranetics, USA) was used only after successful traverse of the guidewire through the occluded artery. Post atherectomy angioplasty was carried out as standard, and where recoil, dissection or other unsatisfactory outcome pertained, a stent was placed. Results From January 2010 – June 2014, 52 consecutive patients with symptomatic recurrence after previous endovascular recanalization including occluded/stenosed stent or long SFA de novo occlusion (>15 cm) were selected. Demographics: mean age 67 ± 1SEM, 41 male; 32 Rutherford 3, and 20 Rutherford 4; all were TASC C or D ; 26 were ASA 4 . Eleven had occluded stents and 31 patients at least one previous procedure. 69% (36) received laser and angioplasty alone,,16 required stenting. Mean follow up was 27 months (range 7 – 52), 5/52 (9%) had acute re-occlusion with overall re-intervention of 12%. None required surgical bypass. Limb salvage was 100% at 12 months and ABPI improved significantly (0.61 [0.59-0.64] vs. 0.84 [0.77-0.9], P < 0.001 t-test). One year primary patency was 81%. Conclusions Excimer laser atherectomy is a valuable and effective adjunctive intervention in selected, high risk, extensive, COFPD. Outcomes are at least equivalent to current complex interventions, and further prospective evaluation is merited.

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Computational Analysis of EVAR Devices: Blood Flow, Stress and Fixation

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Objective: Our aim was to understand the possible causes of failure of the Stent-Grafts used for EVAR in order to find the best simulation and settings to simulate these phenomena and to find solution to reduce failures. Methods We reconstructed model of AAA grafts based on three patient's post EVAR CT image data, performed fully coupled simulation and analysed stress distribution and force loading of grafts on mounting points. Velocity profile was used as inflow with time dependent flow rate. The time dependent pressure was defined as outflow boundary condition at the iliac graft. The iliac ends of the graft were fixed for structure simulation. In aortic side, a few attachment points were defined according to the CT data. After simulation, total forces acting on the graft model were analysed. Results Fluid simulation suggested critical steps at 0 s and at 0.5 s when the flow changes directions. The maximum velocity occured at 0.3 s. A skewed velocity profile was found for a case with large neck angle. In the structure simulation, high stress was observed in the proximal attachment points and smaller stress in the legs and distal attachments. Maximum forces acting on the graft by fluid flow try to push down the Stent-Graft were 12.5 N, 2.7 N and 4.9 N for the three cases respectively. Conclusions Although the stress values at the attachment points were very high, the force was not large. There was no negative force acting on the graft. The solution to reducing graft migration appears to be by increasing the number of barbs.

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A Multicentre Audit of Best Medical Therapy for AAA Surveillance Patients

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Objective: The risk of cardiovascular death in patients with small abdominal aortic aneurysms (AAA) increases by approximately 3% per year. This high risk group requires secondary prevention measures, including blood pressure control, antiplatelet and lipid lowering therapy, and smoking cessation. This study aimed to determine the proportion of patients with small AAA under surveillance, receiving best medical therapy. Methods A retrospective multicentre study was conducted by the Vascular and Endovascular Research Network. Screening databases and clinical case records were interrogated to extract age, current medications and smoking status from patients under AAA surveillance. Details of advice on best medical therapy were sought. Results 986 patients (median age 75.6) were included. Only 51.3% were non-smokers on best medical therapy despite a median length of time in surveillance of 2.0 years (range 0–12.5 years) and a median of 4 scans per patient (range 1–23).73.5% were on antiplatelet therapy. 77.2% had lipid lowering therapy. 65.4% were on both antiplatelet and statin therapy. 25.1% were current smokers; 60.3% ex-smokers.Subgroup analysis of advice given to patients revealed 66.7% of patients are given full appropriate advice at clinic, with 21.5% given no advice. Conclusions AAA is a marker of high cardiovascular morbidity and mortality. Although screening for AAA reduces the risk of rupture, this opportunity for cardiovascular risk reduction is often missed. This cohort of patients would benefit from the implementation of national standards to guide best medical therapy, increasing all-cause survival and serving to make this vulnerable group of patient's, better surgical candidates in the future.

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The Influence of Neurovascular Multidisciplinary Team on Carotid Management

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Objective: Discussion of patients with carotid stenosis at a neurovascular multidisciplinary team (MDT) meeting allows consensus decisions to take account of cerebrovascular imaging, medical management, and the impact of comorbidities with ageing; but might delay surgery beyond the guideline of a maximum of two weeks from symptoms. We therefore studied the impact of an MDT on carotid management. Methods A prospective observational study was performed over a one year period. All patients with stroke or TIA underwent extracranial CT angiography or contrast enhanced MRA. Patients with carotid stenosis >50% were discussed at a joint neurovascular MDT attended by a neurologist, neuroradiologist and vascular surgeon twice weekly, if necessary. Patient demographics and results of carotid imaging techniques were collected. Proposed management plans were recorded before and after the MDT discussion. The impact of the MDT was documented as a change in plan or request for further imaging. Results The MDT meeting discussed 65 patients; 44 had symptomatic and 21 asymptomatic stenosis or occlusion. MDT discussion resulted in no change in 9 patients, 12 patients required more imaging studies, 22 had a change in management and 6 both; a further 16 underwent further review by the vascular surgeon. Conclusions A neurovascular MDT impacts on clinical management without unduly delaying surgery and is necessary for clinical governance in patients with carotid artery disease.

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Meta-analysis of percutaneous vs open endovascular aortic aneurysm repair

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Objective: To compare the outcomes of percutaneous and open endovascular aneurysm repair on the basis of published evidence. Methods A systematic search of electronic information sources was undertaken to identify all randomised controlled trials (RCT) and observational studies investigating the outcomes of percutaneous and open endovascular aneurysm repair (EVAR) or thoracic EVAR (TEVAR). Fixed-or random-effects models were applied to calculate pooled outcome data. Results Two RCTs and 16 observational studies reporting 2,748 patients (4,775 femoral arteries) were included. Obesity and arterial calcification were not considered contraindications to a percutaneous approach in all studies. The overall success rate of percutaneous aneurysm repair was 89.7%. Percutaneous EVAR/TEVAR was associated with significantly lower incidence of groin infection (OR:0.23; 95% confidence interval (CI), 0.10-0.52, $P = 0.0004$) and lymphocele (OR:0.18; 95%CI,0.05-0.62, $P = 0.007$) than open EVAR/TEVAR. Moreover, percutaneous aneurysm repair significantly shortened mean procedure time (MD:-32.30; 95% CI,-48.48-16.13, $P < 0.0001$) and mean length of hospital stay (MD:-1.40; 95% CI,-2.68-0.12, $P = 0.03$). A percutaneous approach did not increase the incidence of groin haematoma, pseudoaneurym formation, arterial complications, all-cause mortality and cardiovascular mortality. Available data was insufficient to evaluate the impact of arterial calcification and obesity on outcome Conclusions Percutaneous aneurysm repair is safe and associated with significantly fewer access related complications than conventional surgical access for standard EVAR. It appears to be faster than femoral cut-down with shorter hospital stay. Successful percutaneous aneurysm repair in the presence of obesity and arterial calcification is feasible, but we were unable to evaluate the effect of these factors on the incidence of complications.

3993

Epidermal Grafts: The Use of cellutome to optimise out-patient wound healing

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Objective: Current wound management with the use of split thickness skin graft often requires hospital admission, a period of immobility for some, attentive donor site wound care and pain management. This study evaluates the feasibility of using a novel epidermal graft-harvesting device, allowing pain-free epidermal skin grafting in the outpatient setting. Methods A prospective analysis of 27 patients was performed, 10 acute and 17 chronic wounds. All patients underwent epidermal grafting in the outpatient clinic. The device harvests epidermal micrografts through the formation of suction blisters without the use of anaesthesia. Combining negative pressure (200 mmHg) and heat (40oC), it produces a uniform arrangement of epidermal grafts within 30 minutes, which are then transferred on a dressing to the wound bed. Results Completely healed wounds were noted in 19 patients, while more than 50% reduction in wound size was seen in another 5. There were 4 failed grafts due to underlying medical comorbidities and an infected bed prior to application, which destroyed the graft. The donor sites healed within 5 days in all patients. Our patients reported none or very minimal pain, were mobilising immediately after the procedure and returned home the same day with a lightweight, simple dressing. Conclusions This automated device offers a novel method in autologous skin harvesting resulting in minimal pain and scar free donor site. Complete wound coverage is achieved, while maintaining patient independence. It has the potential to save NHS resources by eliminating the need for theatre space and a hospital bed, while at the same time benefiting patients.

3994

Automated Ankle brachial system identifies peripheral arterial disease

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Objective: To compare an automated ankle-brachial index (ABI) system with the conventional Doppler technique for identifying peripheral arterial disease. Methods 31 patients that were referred for lower limb arterial assessment underwent an ABI measured with an automated system based on Volume Plethysmography (ABIvp). A standard ABI using a handheld Doppler was then taken on fully rested patients and used as the 'gold standard'. The analysis methods used were Bland Altman limits of agreement, equality plots, Pearson's correlation, sensitivity, specificity and Cohen's Kappa agreement, using SPSS. Results The results showed good correlation between patients with the ABIvp device and Doppler ($r = 0.88$, $p < 0.05$) and 95% limits of agreement were ± 0.24 with a bias of -0.02. Using an ABI cutoff of ≤ 0.9, the sensitivity was 79% and specificity was 83%, with an overall accuracy of 81%. The Kappa value was $k = 0.75$ (95% CI, 0.57 to 0.93), $p < 0.0005$ indicating good agreement.Average time for the ABIvp measurement was 5.2mins and for the Doppler technique was 16.3mins, including resting time. Conclusions These results show that the ABIvp device has comparable results with Doppler and a considerable reduction in time to perform the tests. The ABIvp device could be used in the hospital or community environment to reduce the number of secondary care referrals.

3996

Incidental left common iliac vein compression: is it common?

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Objective: While iliac vein compression syndromes are increasingly managed with deep venous stenting procedures, extrinsic deep venous compression is often present without symptoms. We aimed to quantify the prevalence of

incidental left iliac vein compression on computed tomography (CT) imaging, performed for unrelated indications. Methods From all contrast enhanced abdominal/pelvic CT investigations performed over a 12 month period in a large teaching hospital(>1500), a non-consecutive sample of 250 scans (125 each: male and female) was selected. A single trained observer assessed each scan (≤5 mm axial slices, augmented by 3D MPR if needed). Maximum and minimum diameters of the left common iliac vein were recorded (to allow estimation of percentage stenosis). The influence of gender and age was assessed. Results Median age was 62 years(range 17–91). The median(IQR) stenosis was 61.3% (38.3 - 70.8). The minimum diameter of the CIV was less than 5 mm in 103/250 (41.2%) of patients. Overall, 161/250 (64.4%) and 72/250 (28.8%) of patients had a stenosis >50% and >70% respectively. Median (IQR) stenosis in patients <60 years was 66.4% (49.3-73.4) compared to 53.0% (29.8-68.4) in older patients ($p < 0.001$). There was a trend towards greater degree of stenosis in female patients [63.6% (38.7-71.9) vs 55.0% (37.3-70.6),$p = 0.3$]. Interestingly, the cause of extrinsic compression was the left CIA (rather than the right) in 75/250 patients. Conclusions This study demonstrated that incidental extrinsic compression of the left common iliac vein (causing significant stenosis) is common. Careful selection criteria are needed to define the population best treated with deep venous stenting procedures.

3998

Morphometric predictors of mortality following lower limb revascularisation

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Objective: Morphometric parameters have been associated with outcomes after major surgical procedures. We hypothesized that morphometric indices could discriminate variation in one-year mortality rates after lower limb revascularisation (LLR) procedures. Methods The lower limb revascularisation procedures performed in Royal Liverpool Hospital between June 2013 and June 2014 were identified on Vascular Surgery Quality Improvement Program (VSQIP) database. Patients with no CT scans available were excluded. Morphometric parameters (subcutaneous fat and visceral depth (SCFD-VD), and total psoas area (TPA)) were measured on preoperative CT scans using a validated technique. We evaluated the effect of morphometric and clinical parameters on one-year mortality using univariate analysis. Significant predictors were entered into a multivariable logistic regression model. Results The overall one year all-cause mortality for 197 primary LLR procedures was 13.7%. Among clinical factors age, Fontaine stage and ASA grade had significant effects on one year mortality rates on univariate analysis. Morphometric parameters showed significant association of TPA and SCFD-VD with 1-year mortality. Patients whose TPA and SCFD-VD were within the first tertile had 21.9% and 28.1% 1-year mortality compared with 10% and 8.5% for cumulative second and third tertile ($p = 0.023$, OR 2.57, CI 1.01-6.26; $p < 0.001$, OR 4.43, CI 1.77-11.49). Multivariable analysis confirmed statistically significant effect on one year mortality of age and Fontaine stage for clinical factors, and SCFD-VD for morphometric parameters. Conclusions Morphometric parameters measured on pre-operative CT scans may help identify patients at risk prior to LLR procedures and aid the decision making process.

3999

GSA as an alternative to AKA in patients with peripheral vascular disease

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Objective: The application of Gritti-Stokes amputation (GSA) for patients with peripheral vascular disease is limited due to the traditional view of poor rehabilitation. The development of new prosthesis for GSA can offer a better prospect for mobility. This study aims to compare the outcomes following above knee amputation (AKA) with GSA. Methods A prospective data analysis was performed for AKAs and GSAs in a single institution between December 2012 and July 2014. The median follow-up period was 14 months (range: 5–24 months). Results During the study period, 111 AKAs and 35 GSAs were performed. Wound non-healing at 2 weeks complicated 9/111 AKAs (8%) and 2/35 (6%) GSAs. Of the latter, 1/35 (3%) needed revision to AKA. The overall 30-day mortality rates for AKAs and GSAs were 12/111 (11%) and 4/35 (11%), respectively. Prosthetics were issued for 33/99 (33%) above knee and 10/31 (32%) Gritti Stokes amputees. Of those, 7/33 AKA (21%) and 5/10 GSA (50%) achieved grade D of SIGAM (The Special Interest Group in Amputee Medicine) mobility scale at 6 month follow up. Conclusions GSA should be considered as an alternative to above knee amputation, as perioperative mortality, healing rates and functional outcomes appear equivalent.

4004

The use of CT imaging to identify high-risk carotid plaque

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Objective: 20-30% of ischaemic strokes are caused by carotid atherosclerosis. Some 'vulnerable' carotid plaque characteristics may be distinguishable on Multi-detector Computed Tomography Angiography (MDCTA) scans, due to varying amounts of X-ray absorption. This may help to identify patients at an increased risk of stroke. Methods 12 patients were selected and cross-sections of their MDCTA scans were co-registered with ex-vivo histology, and the areas classified as fibrous tissue, necrotic core or calcified plaque, were sampled. The attenuation ranges of these three high-risk characteristics were assessed using Vitrea® Cardiovascular Software. Utilising separate software, CT Plaque Maps were then created of the patients' carotid arteries, to establish if they could identify 'vulnerable' carotid plaque. Results MDCTA scans produced significantly different attenuation ranges for calcified plaque (1078 HU ± 486), fibrous tissue (135HU ± 66) and necrotic cores (47 HU ± 46), as the differences between the attenuation means were statistically significant ($p < 0.001$). From the CT Plaque Maps, 'vulnerable' plaques (those that contained an intra-plaque haemorrhage and/or ulceration) had a significantly higher Necrotic Core percentage to Fibrous Tissue percentage ratio (mean = 0.67) compared to the plaques without either of the two features (mean = 0.095) ($p = 0.01$). Conclusions Presently, readily available imaging software can distinguish between certain high-risk carotid plaque features on MDCTA scans. Furthermore, CT Plaque maps are capable of distinguishing 'vulnerable' carotid plaques, using the ratio of Necrotic Core% to Fibrous Tissue%. Further research needs to be carried out to establish how attenuation ranges could be used to accurately identify 'vulnerable' plaques.

4006

Nellix is associated with lower radiation dose than conventional stents

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Objective: Radiation exposure to the patient and medical staff is a significant disadvantage associated with endovascular aneurysm repair (EVAR). The aim of this study was to investigate the influence of device on radiation dose during infrarenal EVAR. Methods Consecutive infrarenal EVAR procedures (elective and emergency) performed in a single tertiary vascular unit over a 2 year period (Apr 2013 - Mar 2015) were investigated. Within the department, a range of suprarenal fixation, infrarenal fixation and endovascular aneurysm sealing devices were in routine use. All EVAR procedures were performed in an operating theatre using a mobile c-arm. Radiation doses were measured using dose area product (DAP) in cGycm2 and compared between different stent devices. Results Over the 2 year period evaluated in this study, a total of 236 infrarenal EVAR procedures were performed, in 201 male and 35 female patients. The mean age was 77 years. Devices used were Nellix (n = 96), Endurant (n = 88), Cook Zenith (n = 28) and Gore C3 (n = 24). Median (IQR) DAP was lower in Nellix procedures [7593.6 cGy cm2 (5349.5 - 11023)] compared to conventional stent grafts [12326.2 cGy cm2 (8392.8 - 14909.2)] ($p < 0.001$, Mann Whitney

U). There were no significant differences in DAP between Endurant, Cook or Gore stent procedures. Operation duration also influenced radiation dose, independently to the type of device. Conclusions Radiation exposure appears to be lower during Nellix procedures, in comparison to conventional suprarenal and infrarenal fixation devices. Further studies are needed to improve our understanding of radiation exposure in the era of modern endovascular devices and hybrid theatres.

4007

Incidence and management of iliac limb stenoses/occlusions after EVAR

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Objective: Secondary re-intervention after endovascular aortic aneurysm repair (EVAR) is common. Future attempts to reduce re-intervention rates require knowledge of the natural history of EVAR-related complications. We aimed to describe the incidence and subsequent management of iliac limb stenosis/occlusion detected after EVAR in our practice. Methods We retrospectively interrogated clinical records for 431 consecutive elective infrarenal EVAR procedures performed between April 2010 and August 2013. Hospital imaging records and clinical notes were used to obtain information regarding diagnosis of limb complication and management. Results 36 patients (42 limbs) developed a 50-74% stenosis. 9 (21%) of these cases were actively treated. Of the 33 (79%) patients managed conservatively, 4 (13%) progressed to higher grade stenosis or totally occluded. 79% of patients with 50-74% stenosis were diagnosed within 1 year of EVAR. 15 patients (16 limbs) had 75-99% stenosis. 13 (87%) of these patients were diagnosed with a de-novo 75-99% stenosis. 100% were treated. 87% of patients with a 75-99% stenosis were diagnosed within 1 year of EVAR. 12 patients (12 limbs) had occluded. 92% were identified de-novo and only the symptomatic cases (33%) were treated. Conclusions Moderately severe (50-74%) iliac limb stenosis occurs in 8% of patients following infra-renal EVAR. Conservative management of these cases is safe, with only 13% of untreated cases progressing to a greater stenosis or occlusion. High-grade stenosis (75-99%) or occlusion only occurs in 6% of patients, and is most often found de-novo. Centres performing EVAR should have a pre-defined strategy for the management limb stenoses detected during surveillance.

4010

Predictors of Long-Term Mortality after Thoracic Endovascular Aortic Repair

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Objective: Endovascular repair has become the mainstay of treatment for the majority of patients with thoracic aortic pathology. We aimed to study long-term outcomes after thoracic endovascular aortic repair (TEVAR) and to identify factors that predict mortality. Methods A prospective database of consecutive patients treated by TEVAR (1997–2011) was analysed. Patient and procedural characteristics were collected including age, aortic pathology, patient co-morbidities, maximal stent graft diameter, length of aortic coverage, post-operative stroke and post-operative paraplegia. These factors were related to all cause mortality using logistic regression analysis. Results A total of 348 patients (235 male, median age 71[17-90 yrs]) were treated and followed up for a median time of 10 (5-18 yrs). Aortic pathologies treated included atheromatous aneurysmal disease (n = 185), acute (n = 34) or chronic (n = 59) aortic dissection and traumatic injury (n = 23). The 1, 5 and 10year overall mortality was 14%, 35% and 54%, respectively, while the freedom from aortic re-intervention rates were 92%, 88% and 88% at 1, 5 and 10years. Age at time of surgery (OR 1.06 (1.04-1.09), P < 0.0001) and post-operative paraplegia (OR 4.07 (1.41-11.78), P = 0.01) were the only independent factors predictive of 10 yr mortality by multivariate analysis. Conclusions Late re-intervention after TEVAR is uncommon and may justify less intense surveillance after 5 years. Aside from age at time of surgery, the strongest predictor of long-term mortality after TEVAR, in this series, was paraplegia. This highlights the importance of improving our understanding of spinal cord ischaemia and developing better preventative strategies.

4012

Early Outcomes Following Endoluminal Deep Venous Stenting

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Objective: Evaluate early outcomes following endoluminal stenting using the first-generation dedicated venous stents for venous outflow obstuction in the acute and chronic setting. Methods Patients undergoing deep venous reconstruction using dedicated venous stents between 2012–2015 were identified. Duplex ultrasonography was used to assess sent patency at 1d, 2wks, 3mths, 6mths and yearly following intervention. Venous Disability Scores (VDS) and Villalta Scores (VS) taken before and after intervention (6wks, 6mths, yearly) were calculated. Results 347stents were inserted in 140pts (median age 39 yrs, 80 female) with median follow-up 16mths (1-38mths). Overall 1 yr primary, primary-assisted and secondary patency rates were 67%, 80% and 82% respectively. The 1 yr re-intervention rate was 30% with 16% occurring within the first two-weeks. 57pts had stenting of residual stenoses after catheter-directed-thrombolysis for acute iliofemoral DVT. Median post-operative VDS and VS were 0 and 0 respectively. 81pts had stenting for chronic outflow obstruction after failed medical management of which 77pts (95%) had occluded vessels prior to treatment. The median VS changed from 14 (4–23) pre-operatively to 4 (0–22, P < 0.001) follwoing stenting. Ulcer healing was achieved and maintained in 67% (n = 6 from 9). Conclusions First-generation dedicated venous stents show promise at providing symptom relief to the majority of patients in the short-term. Close surveillance is, however, required to maintain stent patency with re-intervention before occlusion yielding better results. Factors that influence stent occlusion warrant further investigation and long-term evaluation of dedicated venous stents will show whether these encouraging early results can be maintained.

4014

Trends in aortic aneurysm treatment from Hospital Episode Statistics (HES)

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Objective: This research characterises AAA workload, accounting for confounding factors including; coding anomalies, trust mergers, hospital moves and multiple site working. Methods Algorithms were developed to identify subgroups of admissions for aortic surgery from HES data for 2002/3 to 2014/5, including open/endovascular, emergency/elective and suprarenal/infrarenal procedures. Separate mapping exercises from HES location fields identified all sites carrying out such surgery, taking account of name, organizational changes and coding anomalies. Sites carrying out only suprarenal surgery or recording two or fewer cases per year were excluded from this analysis. Results Failing to adjust for coding anomalies underestimates treatment sites, thus overestimating individual site activity, with eight providers showing activity on two sites in the past three years. Compared to 12 years ago 46% fewer sites undertake approximately 25% fewer emergency and 48% more elective cases, although elective workload has stabilised over the past 5 years. Of 89 current sites, 45 (51%) undertake over 60 procedures in total, including endovascular and emergency cases. For elective open and EVAR procedures 51 (57%) and 21 (24%) sites respectively undertake fewer than 20 cases annually. 20 (22%) do no emergency EVAR and 20 (22%) undertake over 10 cases annually. 56 providers, covering 64 sites (72%) contribute over 80% of their activity to the Vascular Services Quality Improvement Programme. Conclusions With appropriate recoding and mapping HES data can provide useful information on workload trends. These confirm slow progress in meeting the national service specification and raise concerns regarding experience and capacity for training.

4015

A Pilot RCT: Neuromuscular Electrical Stimulation in Venous Disease

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Objective: Neuromuscular electrical stimulation (NMES) refers to the application of electrical impulses to elicit muscle contraction. This pilot randomised control trial investigates the effect of a 6 week programme of NMES on patients with venous disease. Methods Twenty-two patients with CEAP C2-C4 venous disease were randomised to a sham or test device. Patients used the device for 30 minutes daily over 6 weeks. Haemodynamic measurements (duplex ultrasound and laser doppler fluximetry), limb volume (perometer), and quality of life outcome measures were measured at baseline and at 6 weeks. Results The mean age of participants was 62 years, BMI 28.6, with a 15:7 female preponderance. At week 0, there was a significant improvement in femoral vein haemodynamics (from baseline) with the test compared to sham device (time averaged mean velocity (TAMV) 102.4% versus −9.1%, $p < 0.0001$; volume flow 107.9% versus −3.7%, $p < 0.0001$; peak velocity 377.7% versus −6.7%, $p < 0.0001$). A significantly smaller increase in limb volume was seen following device usage in the test group (8.3% vs 2.0%, $p = 0.0001$). There was no significant difference in limb volume or quality of life outcome measures in either group over the 6 weeks. Conclusions This trial demonstrated a significant improvement in venous haemodynamics and limb oedema with NMES. Due to the small sample size, the improvement in quality of life outcome measures were not statistically significant and subgroup analysis was not performed.

4016

Tumescent Anaesthesia in addition to GA for Ligation and Stripping; An RCT

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Objective: Surgical ligation and stripping (HTS) is still a widely performed intervention for superficial venous insufficiency (SVI). This RCT aimed to identify if the addition of perivenous tumescent anaesthesia (PVT) can improve post-operative pain, which is a significant burden to patients. Methods Patients with primary SVI undergoing HTS were randomised to either general anaesthesia (GA) alone or the addition of tumescent (PVT). 4-hour post-procedural pain scores were recorded using a 10 cm VAS. Assessments at baseline, 1 and 12 weeks included CEAP, Venous Clinical Severity Score (VCSS), Aberdeen Varicose Vein Questionnaire (AVVQ), Bodily pain (BP), duplex-ultrasound (DUS) and complications. Results 90-patients were randomised equally. The groups (PVT vs. GA) were matched for gender (29 vs. 28 women), mean age; 48.5(SD14.2) vs. 42.5(13.0)($P = 0.053$), VCSS; 8.4(4.2) vs. 9.1(4.0)($P = 0.254$) and AVVQ 17.10(7.60) vs. 15.20(7.90)($P = 0.066$). Stripped vein lengths were equivalent; 36.9(10.1) vs. 35(8.7)cm ($P = 0.097$) with comparable operative times; 65(18.9) vs. 63.7 (21.2)minutes ($P = 0.282$).4-hour post-procedural pain-scores were significantly lower in the PVT group; 2.80(2.62) compared to 4.59(2.96)cm in the GA-group ($P = 0.005$).AVVQ-scores were comparable at week-1; PVT-group 24.10(8.90) vs. 21.00(8.80)($P = 0.075$) and week 12; 6.24(6.57) vs. 3.94(4.63) ($P = 0.094$). Bodily-pain scores demonstrated no differences at week-1; 48.6(22.1) in the PVT-group vs. 45.9(22.0) in the GA-group($P = 0.299$), or week 12 81.5(20.0) vs. 87.3(13.0)($P = 0.19$).At 1-week DUS technical success was 100% with no differences in superficial wound-infection, phlebitis or sensory disturbance. Conclusions The addition of perivenous tumescent to GA HTS offers a significantly lower post-procedural pain-score without detriment to operative time or stripping and this technique is therefore recommended.

4018

Neuromuscular Electrical Stimulation For Venous Thromboprophylaxis

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Objective: Venous thromboembolism (VTE), consisting of deep vein thrombosis (DVT) and pulmonary embolism (PE), is a significant cause of morbidity and mortality, affecting 1 in 1000 adults per year. Neuromuscular electrical stimulation (NMES) is the transcutaneous application of electrical impulses to elicit muscle contraction, thereby increasing venous haemodynamics. This review aims to investigate the evidence underlying the use of NMES in thromboprophylaxis. Methods The Medline and Embase databases were systematically searched, adhering to PRISMA guidelines, for articles relating to electrical stimulation and thromboprophylaxis. Articles were screened according to a priori inclusion and exclusion criteria for qualitative analysis. Articles with imaging proven diagnosis of DVT were included in quantitative analysis. Results Sixteen articles were included in the qualitative analysis and nine in the quantitative analysis. Trials were grouped according to protocol: 4 trials compared NMES to control, favouring NMES (odds ratio (OR) of DVT 0.26, 95%CI 0.10-0.72; $p = 0.009$); 2 trials compared NMES to heparin, favouring heparin (OR of DVT 1.65, 95%CI 0.73-3.70; $p = 0.23$); 3 trials compared NMES as an adjunct to heparin versus heparin only, favouring combination therapy (OR of DVT 0.33, 95%CI 0.10-1.14; $p = 0.08$). Conclusions NMES significantly reduces the risk of deep vein thrombosis compared to no prophylaxis controls. Limitations of this meta-analysis include study heterogeneity and poor quality of historical studies. Due to the emergence of new NMES devices, a well-designed randomised control trial would be required to evaluate the role of NMES in modern day thromboprophylaxis.

4020

Robot-Assisted EVAR: Video Motion Analysis in Live Cases

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Objective: We aimed to assess the efficiency of robotic contralateral gate cannulation during robot-assisted endovascular aneurysm repair (EVAR) by determining the ratio of robotic catheter path-length (PL) to the vessel centreline. Methods Fluoroscopic video recordings of 14 EVAR cases with contralateral gate cannulation performed using the Magellan™ robotic catheter (RC) at a single centre were assessed using video motion analysis (VMA), by a single trained assessor. Actual catheter PL (cm) was generated using frame-by-frame pixel coordinates calibrated with patient-specific bony landmarks. A second trained assessor undertook motion tracking in 5 cases to determine inter-observer reliability. OsiriX DICOM viewer was used to calculate the corresponding vessel centerline length. Efficiency ratios (ER) for each case were derived: ER = PL(cm)/Centreline(cm). Procedure and anatomical factors were also noted. Results There was a high degree of inter-observer reliability (Cronbach's $\alpha = 0.997$). Median PL was 35.7 cm[IQR(30.8-51.0)] and median corresponding centreline was 24.7 cm(22.2-28.2), generating a median ER of 1.6(1.2-2.1). A non-statistically significant positive correlation between RC PL and fluoroscopy times was seen (rho = 0.52, $p = 0.06$). Catheter PL was unaffected by anatomical factors such as aneurysm size (rho = 0.14, $p = 0.62$) and tortuosity index (rho = 0.018, $p = 0.93$). Procedural efficiency was significantly lower when a high reliance on guide wire manipulation was observed ($p = 0.001$). Conclusions Robotic contralateral gate cannulation during EVAR is efficient with a median efficiency ratio approaching 1. Robotic navigation seems to be unaffected by aneurysm size and iliac tortuosity and may be therefore advantageous in complex patient anatomy. There is however, a learning curve associated with robotic use.

4021

Wearable Sensor Technology Efficacy in Peripheral Vascular Disease: A RCT

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Objective: Exercise is effective in improving walking distances and quality of life (QoL) in patients with claudication. The aim of this RCT was to determine whether the use of a wearable activity tracker (Nike FuelBand; NFB) was more effective than standard conservative therapy alone. Methods Thirty-seven claudicants were randomised to either the NFB (n = 20) or control group (n = 17). Claudication distance (CD), maximum walking distance (MWD), patient reported walking distance (PRWD) and QoL (VascuQol questionnaire) were measured at baseline, 3-months and 6-months. Results Groups were well matched for age, sex, smoking status and supervised exercise programme enrolment.At 6-months patients in the NFB group made significant improvement in median (IQR) CD(40 (23.5-61) vs 115 (60–162))m, $p < 0.001$), MWD(80 (50–117) vs 178 (133–270)m, $p < 0.001$) and PRWD(183 (100–290) vs 370 (200–650)m, $p < 0.001$). VascuQol score was also significantly improved: 4.7(3.9-5.2) vs 5.6(5.1-5.8), $p = 0.001$.At 6-months patients in the control group demonstrated significant improvement in VascuQol score compared to baseline (4.5 (2.8-5.0) vs 4.7 (3.0-5.5), $p = 0.028$). They did not demonstrate any significant difference in CD(36 (26–41) vs 45 (33–85)m, $p = 0.18$), MWD(68 (50–70) vs 83 (60–102), $p = 0.36$) or PRWD(150 (55–220) vs 150 (100–300)m, $p = 0.48$).At 6-months higher improvements were seen in the NFB group for CD(63 (34–95) vs 10 (−6-29)m, $p = 0.002$), MWD(82 (39–110) vs −5 (−8-33)m, $p = 0.009$), PRWD(137 (60–320) vs 0 (−6-70)m, $p = 0.005$) and VascuQol score(0.9 (05–1.2) vs 0.2 (0–0.6), $p = 0.031$). Conclusions The use of activity tracker technology improved MWD and QoL to a greater extent than standard conservative therapy and may be used to encourage exercise habits.

4022

AKI after aneurysm surgery is associated with cardiovascular events

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Objective: Acute kidney injury (AKI) has been associated with all-cause short and long-term mortality. However, the association with CV-events remains unclear. We sought to investigate this in patients undergoing open (OAR) or endovascular (EVAR) abdominal aortic aneurysm (AAA) repair, as they are likely to develop both AKI and CV-morbidity. A meta-analysis was subsequently performed to confirm this in other cardiovascular-interventions. Methods AKI-incidence was assessed in a multicentre-cohort of 1,068 patients undergoing EVAR (947 individuals) or OAR electively using the "Acute Kidney Injury Network" criteria. A composite-endpoint was used, consisting of: non-fatal myocardial infarction (MI), stroke, vascular event, hospitalisation due to heart-failure and CV-death. A systematic literature review identified studies reporting AKI-incidence and CV-events. Risk-ratios at 1 and 5 years were combined using meta-analysis. Results During a median follow-up of 62 months (range: 11–121) AKI was the strongest predictors of CV-events on adjusted analyses [Incidence: 36% of EVAR, 32% of OAR patients; Hazard Ratio 1.73, 95% CI 1.06-3.39, $p = 0.03$] in the aneurysm-repair population. In the meta-analysis, 7 studies reported incidence of MI on 23,936 patients 1-year after coronary-intervention (PCI) with a pooled risk-ratio (RR) of 1.76 (95%CI: 1.45-2.83, $p < 0.001$); at 2-years, 3 studies reported MI-incidence on 17,773 patients after PCI with a pooled RR of 1.34 (95%CI: 1.10-1.63, $p = 0.003$). MI-incidence was reported 5 years after cardiac-surgery by 3 studies (33,701 patients) with a pooled RR of 1.60 (95%CI: 1.43-1.81). Conclusions AKI is a strong predictor of long-term CV events after surgery or endovascular intervention. Intensive follow-up and cardiovascular-prevention strategies should be offered in these patients.

4024

Late survival in non-operated patients with infra-renal aortic aneurysms

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Objective: Historical studies report high rupture rates in patients with unoperated >5.5 cm abdominal aortic aneurysms (AAA), although a recent audit has questioned this. Methods Retrospective review of 138/764 AAA patients (18%) evaluated in a pre-assessment anaesthetic clinic (PAC) between 2006–2012, who did not undergo elective AAA repair or who underwent deferred repair. The remaining 626 underwent repair. Patients with severe co-morbidities (dementia, advanced malignancy, life-expectancy <1 year) and not referred to PAC were excluded. Results At a median of 27 months 71 (52%) died; 36 (51%) following rupture. Cumulative survival, free from rupture or surgery for acute symptoms was 96% at 1-year, 84% at 3-years and 64% at 5-years, where baseline AAA diameters were 5.5-6.9 cm. For diameters >7 cm survival free from rupture was 65% at 1-year, 29% at 3-years and 0% at 5-years. Median interval to rupture was 47 months (5.5-6.9 cm AAAs) and 21 months where baseline diameters were >7 cm. Rupture accounted for 32% of late deaths in 5.5-5.9 cm AAAs, 46% (6.0-6.9 cm) and 71% for AAAs >7 cm. Conclusions There is ample time to optimise risk-factors and improve pre-existing medical conditions in 'higher-risk' patients whose AAA measures 5.5-6.9 cm. Less than 5% will rupture within 12-months. Even if they do not undergo surgery, the risk of late rupture is relatively low. Conversely, non-operated patients with >7 cm AAAs face a very high rupture risk and will probably still benefit from elective surgery, with the caveat that a higher procedural risk might have to be incurred. This has important implications regarding surgeon-specific outcome reporting.

4026

Contemporary patterns of surgical and vascular trauma in the UK

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Objective: Blunt trauma makes up a significant proportion of injuries in most trauma series. Following the re-configuration of trauma services in the UK, the characteristics of surgical and vascular injuries in blunt trauma have not been reported. The aim of this study was to define the characteristics and outcome of patients undergoing treatment for significant blunt trauma of the torso. Methods All consecutive adult patients presenting as a major trauma call from April 2012 to April 2014 in the 3 major trauma centres in the West Midlands, UK, were included. The primary cohort was identified from the hospital trauma call registers. The local electronic clinical results reporting systems and clinical notes were reviewed to provide further data. Results Of 5401 trauma calls, 2793 patients with significant blunt injury necessitating computed tomographic imaging (CT) were identified. 179 (6.4%), had a mesenteric or hollow viscus injury, 168 (6%) had a hepatobiliary injury, 149 (5.4%) had a splenic injury and 46 (1.6%) had a vascular injury on the initial CT; 132 laparotomies were performed. Of those with vascular injury, 18 patients (0.4%) had intra-abdominal or pelvic vascular injury and 6 a thoracic aortic injury. All patients with thoracic aortic trauma and 5 (28%) of those with abdominal injuries were treated with endovascular means. In the vascular patients, in-hospital mortality was 48% (22/46). Conclusions Even though blunt trauma was very common in this contemporary series of trauma, major vascular injuries were rare but have a high mortality rate. Endovascular means are commonly used with acceptable outcomes.

4027

Bathe Those Diabetic Ulcers in Oxygen - A Phase 1 Study

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Objective: All diabetic foot wounds have a degree of hypoxia to varying degrees due to a combination of microvascular and macrovascular disease. This inhibits healing processes such as cell division and differentiation, angiogenesis, infection prevention and collagen production. The aim of this phase 1 study was to assess the effects of an ambulatory topical oxygen delivery device, Natrox, on the healing of chronic diabetic foot wounds. Methods 10 patients with diabetic foot wounds from two tertiary hospitals received treatment with the Natrox device. Data were prospectively obtained on wound size over 8 weeks using standardized digital images, which were measured by a clinician blinded to the nature of the study. Data on device satisfaction and pain were also obtained. Results The median duration of ulceration was 25 weeks prior to treatment. By week 8 the median ulcer size decreased by 53% (mean 51%). 7 of the 10 ulcers were on a healing trajectory, and one ulcer that had been present for 56 weeks healed completely. A two year old ulcer reduced by >50%, and a third that had been present for 88 weeks was down to 10% at the end of the 8 week study. Conclusions The Natrox device had a significant beneficial effect on wound size. This poses practical advantages over currently existing oxygen based wound therapies such as hyperbaric oxygen therapy due to its continuous oxygen deliveryy, accessibility, ease of use, safety and lower costs in treatment. The results warrant further studies to review its effect in comparison to standard wound therapy.

4028

Counting Down the Days - Outcome Following Turndown for Elective AAA Repair

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Objective: The outcome of patients who either decline or are unfit for AAA repair remains an important measure, with implications for preoperative discussion and patient consent. The authors aim to explore the outcome of a cohort of such patients. Methods A prospectively maintained database of patients turned down for elective AAA repair between January 2012 and March 2015 was retrospectively reviewed. Patient demographics, rationale for turndown, AAA diameter and, in the event of death, the date and cause, were recorded. Results 75 patients were included, 45 (60%) male, median age 83 years (65–98). The turndown decision was based on cardiorespiratory co-morbidity (53.3%), palliative cancer (8%) and patient choice (18.7%). Median AAA diameter was 65 mm (45 – 96 mm). 35 (46.6%) patients died, 20 (57.1%) from ruptured AAA. Rupture-related mortality was associated with larger AAA (72 mm vs. 60 mm). Median survival for all-cause mortality was 216 days (6–968). Rupture-related median survival was 149.5 days (6–747) compared to 251 days (13–968) for non-rupture survival. Rupture-related median survival depended on aneurysm size with median of 436 days for AAA ≤ 65 mm, 225 days ≤ 75 mm, 269 days ≤ 85 mm, and 56 days (21–216) > 85 mm. Conclusions The decision to turndown is based on estimation of survival benefit compared with operative risk. Patients are more likely to die from AAA rupture than their medical co-morbidities with the balance of survival changing substantially as aneurysm size increases. Reconsidering the threshold for turndown may offer survival benefit and aneurysm size should be considered in assessment, consent and decision-making.

4029

Developing an approach to prevent vascular calcification.

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Objective: Vascular calcification is a regulated process and a major complication in type II diabetes disease progression, where glycated products are thought to play a key role in the pathology. Our aim was to establish the role of glycation in the induction of calcification in vascular smooth muscle cells (VSMCs), and whether the potential anti-diabetic agent, Momordica Charantia, could inhibit mineralisation pathways. Methods VSMCs were incubated with native or glycated LDL in the presence of osteogenic media. VSMCs were also exposed to increasing concentrations of Momordica Charantia extract in osteogenic media. Determination of calcification included alizarin red staining, measurement of alkaline phosphatase (ALP) activity and expression of genes involved in osteogenic differentiation using RT-PCR. Results VSMCs incubated in osteogenic media exhibited mineralisation after 7 days, which was significantly increased after glycated-LDL treatment, but not with native LDL. In addition, ALP activity was significantly elevated at day 4 in glycated-LDL treated cells, compared to those incubated with native LDL. Furthermore after 4 days, ALP activity and gene expression of a range of biomarkers linked with vascular calcification, including osteocalcin, BMP-2, C-MET and NOX-1, were reduced in Momordica Charantia-treated cells, compared to osteogenic controls in a dose-dependent manner. Conclusions We have established that glycated LDL promotes osteogenic differentiation of VSMCs. An extract of Momordica charantia has the potential as a therapeutic agent to reduce vascular calcification. Future work will identify the active component responsible for inhibition of calcification in VSMCs, determine the mechanism involved and the link with pathological glycation-induced osteogenesis.

4030

The safety, feasibility & utility of Cone Beam Computed Tomography post-EVAR

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Objective: Introduction C-Arm Cone Beam Computed Tomography (C-A CBCT) is emerging as a useful adjunct for quality control during EVAR. We examined the safety, feasibility and utility of a new C-A CBCT option using the XperCT Allura FD20 system (Phillips Medical Systems, Eindhoven, The Netherlands). Methods Methods All patients in this prospective study underwent conventional post-EVAR uni-planar angiography (CPEA) and additional post-EVAR C-A CBCT on table. Patients with an eGFR < 30mls/min/1.73 m2 or previous renal interventions were excluded. We examined the impact of C-A CBCT on additional on-table interventions and the correlation of C-A CBCT observations with the routine 30-day surveillance CT Aortogram (CTA) Results Results Between April 2010 and July 2013, a total of 51 patients underwent CPEA and C-A CBCT post-EVAR. C-A CBCT detected new findings not identified by CPEA in 9 (17.6%) patients (1 Type1A endoleak, 5 Type2 endoleaks and 3 sub-optimal limbs). Of these 4 (7.8%) underwent further on-table intervention for a correctable technical error. Following satisfactory C-A CBCT, 7 (13.7%) patients had new surveillance CTA findings at 30-days (5 new Type 2 endoleaks and 2 limb occlusions). Renal function remained unchanged and median time for C-A CBCT acquisition was 11 (6–23) minutes. Conclusions Conclusion C-A CBCT with XperCT is feasible, safe and may be a useful adjunct to guide further intervention on table immediately post-EVAR for quality control especially in the detection and correction of sub-optimal limbs. This study shows that at present the post-EVAR 30-day surveillance CTA may not be replaced by on-table C-A CBCT.

4032

TCD detection of micro-embolic signals during endovascular aortic repair

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Objective: Thoracic endografting has been linked to high incidence of cerebral microembolisation (MES), silent ischaemia on post-operative MRI imaging and post-operative cognitive decline (POCD). However there is evidence to suggest that POCD occurs following other types of endovascular aneurysm repair. The aim of this study was to confirm presence of MES during other types of endovascular operations, warranting further research into cognitive outcomes. Methods 65 patients underwent continuous peri-operative transcranial Doppler of the left middle cerebral artery (19 bifurcated EVAR, 8 FEVAR, 19 EVAS, 5 TEVAR, 14 Chimney grafts). Procedural steps were time-stamped. Frequency of MES were correlated to procedure, anti-platelet and statin use. Results As expected, TEVAR had the highest mean number of MES, followed by chimney grafts. Newer Nellix grafts demonstrated the fewest MES. During TEVAR, MES were most frequent during arch wiring and graft positioning. During chimney procedures, MES were most frequent during manipulation via the axillary artery. Statin agents had no effect on MES counts. However patients on Aspirin demonstrated significantly fewer MES, with the most effect seen for complex procedures i.e. TEVAR and fenestrated grafts. There was no association with carotid stenosis. Conclusions This study demonstrates that any endovascular procedure involving arch wiring can cause cerebral embolisation. Aspirin's beneficial effect on MES volume during complex procedures is further evidence for its inclusion as part of patient optimisation. The high rate of MES seen during manipulation via the axillary artery could suggest a cause of emboli other than arch atheroma. Future work is being performed to link MES and POCD

4033

A Retrospective Analysis of Infrapopliteal Intervention for CLI

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Objective: Little to no evidence supports either an endovascular or surgical approach to revascularisation of the severely ischaemic lower limb secondary to infrapopliteal disease. The aim of this analysis is to compare the outcomes of such therapies at a single vascular centre. Methods A retrospective analysis was performed identifying consecutive patients undergoing revascularisation to an infrapopliteal vessel by best endovascular treatment (BET) or bypass surgery (BS) between 1st July 2009 and 30th June 2013. The primary outcome measured was all cause mortality. Secondary outcomes included re-intervention rates, amputation rates and length of hospital stay on index admission as well as 12 months from intervention. The censor date was the 1st July 2014. Statistical analysis was performed using SPSS 22. Results 144 limbs were re-vascularised, with 142 patients identified (BET n = 77 and BS n = 67). 1-year mortality rates for BET and BS were 19.5% and 13.4% respectively. Overall mortality was significantly worse in the BET group ($p = 0.01$) despite being reasonably well matched for age. Minimal differences were seen for amputation (BET 15.6%, BS 14.9%) and re-intervention (BET 19.5%, BS 24%). Length of stay on index admission was less in patients undergoing BET (10.3 days compared to BS 14.1 days) however days spent in hospital during the following 12 months were similar (BET 21.8 days, BS 22.6 days). Conclusions In this cohort BET is associated with an increased overall mortality when compared to BS. Differences in other outcomes measured were minimal. Future prospective data is needed to ascertain differences in intervention cohorts as well as non-intervention cohorts.

4034

Regional experience with Lombard Aorfix graft for severe neck angulation

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Objective: The Lombard Aorfix endovascular stent graft is specifically targeted at treated infra-renal abdominal aortic aneurysms (AAA) with a highly angulated neck and is the only licensed graft for angles ≦90°, providing an alternative to fenestrated grafts or open repair. Here we present the first results from the Outer London North West Regional Vascular Unit. Methods Consecutive patients undergoing aortic aneurysm repair using the Aorfix stent graft were entered into a prospective database between March 2010 and February 2015 inclusive. These patients were not suitable for standard stent grafts. After treatment patients were entered into a surveillance imaging programme. Reinterventions and complications were recorded. Results 64 patients (56 males, 87.5%, median age 79 years) were treated with the Aorfix graft. 58 cases were elective (90.6%). All cause mortality was 15.6% (10 patients) - 8 elective (14%) and 2 emergency (33%), however only 3 (4.7%) were perioperative (<30 days). Overall median Kaplan-Meier survival was 50 months. Median survival of deaths after 30 days was 20 months, with one rupture at 43 months. Median supra-renal neck angulation (α) was 54° and infra-renal neck angulation (β) was 76°. Mean AAA diameter was 61.0 mm, neck diameter 23.2 mm and neck length 25.3 mm. Technical success was 100%, with primary AAA exclusion in 83% (81% elective, 100% emergency), 6.3% required additional ballooning, 7.8% aortic cuff and 3.1% sandwich technique. 9 cases (14%) required reintervention (3 cuffs for Type 1 endoleak, 2 embolisations, 3 angioplasties and 1 bypass). Conclusions The Aorfix stent graft is appropriate for use in challenging anatomy with reasonable outcomes.

4036

Endovascular non-technical skills assessment in trainees (Endo-OTAS)

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Objective: Simulation is an essential component of training. Assessment of non-technical skills is challenging, the Endovascular Observed Teamwork Assessment Skills (Endo-OTAS) tool has been validated to examine non-technical aspects of team behaviour. Its use has not been reported in the simulated environment. The pilot study objective was to assess its utility in a high fidelity simulation. Methods 10 trainee teams were tasked to treat a simulated traumatic aortic transection during a regional training day. Following completion, teams were debriefed and repeated the exercise. Video analysis was performed in real-time by independent, blinded assessors and behaviour scored using Endo-OTAS. Intra-class correlation coefficient assessment was performed between surgeons and an undergraduate medical student. Results Reviewers were able to use the Endo-OTAS tool with agreement of 0.889, demonstrating good reliability (0.702-0.967, $p < 0.001$). Trainees considered the simulation to have good face validity (realism). 40% of trainees completed the task originally, yet following debrief, 80% were successful. Conclusions Endo-OTAS is a feasible tool for the assessment of non-technical endovascular skills. Preliminary findings indicate the process of debriefing and attendance in a simulated environment may improve both technical and non-technical behaviour through attendance, irrespective of task activity. A simulated environment would appear to provide an appropriate environment for the training of non-technical skills. Further work will build on these findings to explore the novel use of simulation in endovascular training.

4038

Assessment of toe pressures in young adult: A dynamic study of angiosomes

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Objective: Angiosome studies performed in cadavers have demonstrated, toes are predominantly supplied by the posterior tibial artery (PT). Therefore, the PT is used as the vessel of choice for directed revascularization in ischemic toe ulcers. The aim of this study is to find out whether the Dorsalis Pedis (DP) or the Posterior PT contributes more to the toe pressure in normal physiological conditions. Methods Consented 35 healthy young adults with no clinically identifiable co-morbidities were studied. The toe pressure (TP) measurements were done using an arterial Photoplethysmography (PPG) and digit cuff. TP of the 1st 3 toes on both feet were measured without compressing the DP and PT and compressing DP and PT in isolation. Toe-toe pressure index (TTPI) was calculated dividing toe pressure with compression of either DP or PT by toe pressure without compression. TTPI of less than 0.9 was considered significant. Chi square test was used to calculate the significance. Results Percentage of TTPI which is less than 0.9 was significantly higher with the reading observed by compressing the DP (52.5%) in comparison to the readings observed by compressing the PT (43.6%) ($p = 0.03$). If the TTPI cutoff is reduced to 0.7 the difference between groups loses significance. Conclusions The data suggest that contrary to the anatomical based angiosome studies, contribution from DP to the perfusion of the toes is significantly higher than that of the PT. Further evaluation is needed to explain the difference between our findings and cadaver based anatomical findings on the angiosome concept.

4039

Is rEVAR durable? A comparison to elective AAA repair

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Objective: Endovascular aortic aneurysm repair (EVAR) has an increasing role in the treatment of ruptured abdominal aortic aneurysms (rAAA). Some recent trials have raised concerns about the long-term durability of EVAR and the need for re-interventions. The aim of this study was to examine re-intervention rates after EVAR for ruptured AAA and factors contributing to re-intervention. Methods Retrospective analysis of a prospectively collected database identified 87 CT-confirmed infrarenal rAAA treated with EVAR from 2006–2014. Data collected included demographics, and aneurysm morphology. Analysis was performed using SPSS. Binomial logistic regression was used to assess association with re-intervention. Results Twenty-nine (30%) patients (mean age 76.9 ± 8.5 years, 83% male) had a total of 44 re-interventions (open and endovascular), giving an incidence rate of 16.7 per 100 person-years. This is significantly higher than the re-intervention rate reported from EVAR1 ($p < 0.001$). Median follow-up was 1633 days, and overall mortality was 49%. The peak times for re-intervention were within the first 30 days (9 patients) and between 12 and 24 months (7 patients). The all-cause 30-day mortality rate was 16.9%. The analysis did not find aneurysm morphology or demographic factors to be predictive of re-intervention, but suggested a significant association between re-intervention and time elapsed since EVAR ($p = 0.015$). The commonest reasons for re-intervention were endoleak (9 patients) or an intra-abdominal event (9 patients). Conclusions Re-intervention rate following EVAR for rAAA are higher than after elective repair. This underlines the need for intense surveillance of this group, and may alter the cost effectiveness of the procedure.

4041

Major Trauma Centres: are Vascular Surgeons missing a training opportunity?

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Objective: The new Vascular Surgical Curriculum Module 6 (Assessment and management of patients with trauma including the multiply injured patient) prescribes a broad range of objectives, knowledge base, clinical and technical skills. A recent report has, however, identified a very limited number of Major Trauma Centres (MTCs) with a significant vascular lead to the major trauma response. The aim of this study was to evaluate our experience since inception of the MTC to identify potential training opportunities. Methods Using TARN and a locally collected prospective database, all patients with chest, abdominal or vascular injuries with an Injury Severity Score (ISS) ≥ 9 admitted to our MTC were identified between 2 April 2013 and 31 May 2015. Results 2176 patients were admitted with an ISS ≥ 9 during the study period of which 807 had chest, abdominal and/or vascular injuries (male:female ratio = 2.6:1, median age 43). The median ISS was 20. The blunt:penetrating injury ratio was 12.2:1. Major transfusion protocol activation in 36. Mechanism of injury was 426 vehicle incidents, 259 falls, 54 stabbings, 37 blows/blunt assaults, 14 crush incidents, 4 gun shot wounds, and 13 other mechanisms: In this cohort of 807, vascular surgeons performed 76 significant thoracic and/or abdominal operations including trauma laparotomy (splenectomy, liver packing/resection, bowel and mesentery resection/repair) and emergency thoracotomy. Conclusions When Vascular Surgeons provide the initial body cavity damage control surgery in a MTC their trainees receive a wide exposure to the current curriculum, which might be lost in general surgical attachments in smaller hospitals.

4043

Self referral to the NHS Abdominal Aortic Aneurysm Screening Programme

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Objective: The NHS Abdominal Aortic Screening Programme (NAAASP) invites men in their 65th year for screening, men over 65 may self refer into the programme. Most studies have concentrated on those invited for screening, little is known about the self referral group. Our aim was to provide a descriptive analysis of the men who self refer to NAAASP for screening. Methods Information concerning basic demographic details and ultrasound results were recorded on AAA SMaRT. During nurse assessment data collected included: smoking status, blood pressure, height, weight, aspirin and statin therapy. Statistical analysis was performed using SPSS®. Results A total of 58,999 men have self referred to the NAAASP since its inception. Mean age at self referral was 73 (47–100). Mean aortic diameter was 1.93 cm (0.8-12.1). Increased self referral rates were observed following organised publicity. The incidence of AAA was 4.13% (n = 2438) compared to 1.4% in the invited cohort, of these 7.6% (n = 186) were > 5.5 cm. Of the 186, 152 (81.7%) underwent surgery, EVAR in 55.3% (n = 84) patients. 30 day mortality was 0%. Mean time from referral to surgery was 69 (2–361) days, with 57.9% (n = 88) being treated within 8 weeks of detection. Conclusions Self referral has yielded higher detection rates than the invited cohort, more than justifying its cost. Now that NAAASP is fully operational it is important to continue media campaigns and publicity to target the at risk men over 65 who would otherwise miss the benefits of AAA screening. Some key areas still need to be addressed.

4044

Carotid Endarterectomy in 50-59%Stenosis, a grey area?

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Objective: Carotid Endarterectomy Trialist Collaborative (CETC) recommends carotid endarterectomy (CEA) after TIA/CVA in those with significant stenosis (70-99%). For moderate stenosis (50-69%) there is less reduction in the risk of stroke than those with higher stenosis. NICE recommendations is to consider all symptomatic stenosis >50% for CEA. Our concern is patients with Duplex detected stenosis of 50-59% and the benefit from surgery (CEA). At our Institution we routinely request second imaging with MRA/CTA to confirm the stenosis in those suitable for surgery. This study looks at the outcome of

these patients. Methods Retrospective review of all carotid duplex scans for patients with symptomatic 50-59% stenosis over a 39 month period (January 2012-March 2015) was performed. All patients with symptomatic disease were included. Exclusion factors were patients not having second imaging (due to asymptomatic disease or unfit for surgery). Results 60 patients had secondary imaging with either MRA/CTA. This confirmed 25 patients (42%) with equal or higher grade stenosis and 35 (58%) with less than 50% stenosis. Of the 25 patients, 16 were offered surgery. 9 patients were not offered surgery, based on clinical review with second imaging. Of the 16 offered surgery, 2 were declined surgery after anaesthetic review and 1 patient declined surgery. Thus 13 (22%) CEA were performed. Conclusions CEA benefit in severe stenosis is clear. For more moderate stenosis, especially those with 50-59% stenosis the role of CEA remains a clinical decision of risk/benefit. Dual imaging with duplex ultrasound and MRA/CTA may help in this decision making.

4045

Aortic volumes changes following endovascular sealing with a Nellix device

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Objective: Endovascular Sealing (EVAS) with the Nellix® endoprosthesis is a new technique to treat abdominal aortic aneurysms. The interaction between the Nellix® endoprosthesis and the native aortic anatomy is poorly understood. The aim of this study was to investigate the effects of EVAS on aortic volumes. Methods We reviewed 25 consecutive patients who underwent EVAS in our unit and whose aneurysms contained thrombus. Pre- and post-EVAS CT scans were reviewed to document changes in aortic volumes, including that of the whole aneurysmal aorta, that of the lumen, and that of the intra-luminal thrombus. Results Twenty-five patients, 17 men, with a mean age of 78 (SD 7.1) years were included in the study. All procedures were performed successfully, without endoleaks or peri-operative deaths. Total aortic volume was greater on post-operative scans, by a median (95%CI) of 17 (10.0-23.5) ml ($P < .001$). The volume occupied by the endobags was greater than the pre-operative luminal volume, by a mean (95%CI) of 28 (24.7-31.7) ml ($P = .002$). Post-operatively, the aortic volume occupied by thrombus had decreased by a median (95%CI) of 11 (4.7-18.2) ml ($P < .001$). There was a strong correlation between changes in thrombus volume and the time elapsed between the planning CT and surgery ($r = .626$; $P = .001$). Conclusions There are significant changes in aortic volumes post-EVAS. These changes may be a direct consequence of the technique and have implications for the planning and performance of EVAS. Further research is necessary to ascertain the clinical relevance of these findings.

4046

UK patients are at higher stroke risk - an analysis of 5000 ACST patients

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Objective: National rates of carotid intervention in asymptomatic patients vary widely. Of the 5000 patients randomised in the ACST trials to date, over one quarter were recruited from UK centres, allowing comparison of baseline stroke risk characteristics of patients in both trials (age, gender, diabetes, coronary disease, stenosis, prior symptoms/ brain infarction, drug therapy) in the UK versus other countries. Methods 4989 patients randomized in ACST-1 and ACST-2 were analysed; 1393 (28%) were entered by UK centres (34% in ACST-1 and 17% in ACST-2). Standard descriptive statistics (chi-square, Mann–Whitney) were used to compare prospectively recorded baseline characteristics between UK and non-UK patients. Results Age, gender, ipsilateral stenosis and coronary artery disease were similar in both patient groups and fewer UK diabetic patients (17% vs 26%, $p < 0.001$) were entered. However, nearly twice as many UK patients had previous symptoms (52% vs 26%, $p < 0.001$) or CT infarction (42% vs 27%, $p < 0.001$) and they had more severe median contralateral stenosis (40% vs 30%, $p < 0.001$). Fewer UK patients received blood pressure lowering treatment ($p < 0.001$) although they were more likely to receive lipid-lowering therapy. Whilst ACST-2 is ongoing, in ACST-1 a higher proportion of UK patients had a non-perioperative stroke (113/1069 vs 174/2051, 10.6% vs 8.5%). Conclusions UK asymptomatic carotid patients randomised to ACST-1 (surgery vs no procedure) and ACST-2 (surgery vs stenting) have a higher baseline stroke risk than those from other countries. Continued recruitment to ongoing trials is essential to help clarify the role of CEA, CAS and medical therapy in carotid disease.

4047

Secondary Intervention of Type 1 endoleak using Nellix Endovascular Sealing

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Objective: Late Type 1 endoleaks following endovascular abdominal aortic aneurysm repair are life threatening complications and must be treated to prevent rupture of a repressurised aneurysm sac. Reintervention is often challenging with limited sealing zones and proximity to visceral vessels. The Nellix Endovascular Sealing System is a new paradigm in the treatment of abdominal aortic aneurysms and may offer a solution in certain patients. Methods Data were collected in a prospectively maintained local database of all Nellix endovascular sealing cases performed at our institution. Results 9 patients with type 1 endoleak were treated in an 24 month period between March 2013 and May 2015. 7 were men and 2 women with mean age of 78 and ASA score 3. 6 were proximal type 1a leaks and 3 distal type 1b. All were treated with the Nellix Endovascular Sealing device with abolition of the endoleak at end of the procedure and no recurrence out to median 18 month follow up (IQR 8–19). 30 day mortality in this subgroup of patients was 0% and there was no peri-procedural complications associated with the procedure. Conclusions The Nellix Endovascular Sealing system offers a safe and effective option for secondary reintervention in patients with type 1 endoleak following conventional EVAR.

4048

An investigation of kin perfusion in venous leg ulcer (VLU) after exercise

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Objective: To identify the changes induced by exercise in VLU patients on microvascular level aiming for better understanding of venous ulcer pathophysiology. Methods 78 participants were randomised into four groups. Non exercise groups include, Control group ($n = 18$) and compression therapy group ($n = 20$) and exercise groups include, exercise group ($n = 20$) and compression and exercise group ($n = 20$). Exercise groups subjected to regular exercise for 3 months. Measurements include basic parameters, tcPO2, laser Doppler (LDF) and ulcer size. Measurements for all groups were taken on 2 occasions, at the beginning and the end of 3 months. Results All participants showed low level of tcPO2, exercise groups showed significant increase after 3 months of regular exercise ($p < 0.001$). tcPO2 level remains the same in non-exercise groups.LDF parameters decreased significantly ($p < 0.001$) after 3 months of exercise in stockings and exercise group and decreased to a lesser extent in exercise group. There are no LDF changes in non-exercise group.Exercise groups showed significant change in ulcer size, size decreased significantly ($p < 0.001$) in both exercise groups while there is no change in non-exercise groups.In exercise groups the change in perfusion and ulcer size measurements were more obvious in the exercise and compression group compared with exercise group only. Conclusions Skin perfusion measurements showed significant change after 3 months of regular exercise, same for the ulcer size. We can conclude that exercise has significant effect on tissue perfusion and ulcer size in venous ulcer, this effect may play a role in understanding the pathophysiology and management of VLU.

4049

Cognitive Decline after endovascular aortic surgery: A clinical study

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Objective: Post-operative cognitive decline (POCD) following open aneurysm repair has been reported as high as 50% at 3 months, and remains a potentially devastating consequence of surgery. POCD following endovascular aortic aneurysm repair is far less studied. Here we report the initial results of a prospective observational study examining incidence of POCD following both standard and complex endovascular aneurysm repair. Methods Tests were designed with specialist input. Testing was performed pre- and three months post-operatively. Tester and scorer were blinded to each other. Data for 31 patients was available for analysis. Significant decline was defined as a ≥20% drop in domain score from individual's baseline. Results 6/31 patients reached threshold for POCD at a mean post-operative period of 109 days. Trail B test and visuospatial function were most commonly affected, demonstrating greatest degree of decline. All 6 patients with decline in 2 domains were within the high risk age range suggested by the literature (>64). Years in education appeared to be significant for risk of POCD. POCD was seen following both standard and complex procedures. Conclusions Our early results confirm patients remain at risk of cognitive decline after all endovascular surgery, not just TEVAR. Trail B and visuospatial tests are linked to frontal and parietal (dominant) lobe function, areas of the brain supplied by the middle cerebral artery. Endovascular surgery has been linked to cerebral microembolisation via the middle cerebral artery and new ischaemic brain lesions linked to POCD. This suggests mechanisms such as microembolisation could play an important role in POCD following EVAR.

4053

Measurement of flow lumen volume in AAA: implications for EVAS

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Objective: Planning of endovascular sealing of abdominal aortic aneurysms requires measurement of the aortic flow lumen volume. The aim of this study was to investigate the effect of intra- and interobserver variability error, as well as cardiac cycle-related variability, on these measurements. Methods Mean (±2SD) intra- and inter-observer error in flow lumen measurements and mean (+2SD) cardiac cycle-related variability were obtained from published literature and added to the measurement of the flow lumen volume of a 57 mm abdominal aortic aneurysm to calculate average and extreme error possibilities. Results The aneurysm volume was measured at 165 ml. The calculated possible mean measurement error due to cardiac cycle variation, intra- and inter-observer variability was +11.0%, resulting in a potential measurement of 183.1 ml. The calculated extreme errors were +24.3% (if 2SD of all errors were added to the mean) and +3.5% (if 2SD of all errors, except cardiac cycle related, were subtracted from the mean), resulting in potential measurements of 170.8 ml and 205.1 ml, respectively. When considering the errors combined, the proportion of patients who may have volume measurement differences of up to ±2.5 ml, ±2.6 to ±5.0 ml and ±5.1 to ±7.5 ml were 18%, 17% and 15%, respectively. Conclusions Measurement of flow volume volumes in abdominal aortic aneurysms is imprecise. This has practical implications for the planning and the performance of endovascular aneurysm sealing.

4054

A single centre experience of endovascular stents in popliteal aneurysms

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Objective: This study reviews a single-center experience of endovascular popliteal aneurysm (PAA) repair. Methods A retrospective review was performed of all cases of endovascular PAA repair performed between November 2004 and June 2015. Results We identified 26 popliteal aneurysms in 18 patients (16 males, 2 females) in the study period. Median patient age was 77 years (range 61–87 years). 8 patients had bilateral aneurysms. 21 PAAs were stented using Viabahn covered stent grafts. Follow-up data for 14 (67%) stents was reviewed, over a follow up period of 0–64 months. 9/21 (43%) patients were followed up for a 2 years or more. 7 (33%) procedural complications included: 2 endoleaks - spontaneously resolution, 1 residual thrombus - overnight catheter directed thrombolysis, 1 femoral tear - open surgical repair, 2 technical failures - 1 procedure abandoned, completed the next day and 1 converted to open surgery (subsequent in-hospital mortality). 1 infected graft was removed at 7 weeks. 1 graft occlusion at 14 months was managed conservatively. 1 patient presented at 61 months with rest pain and is awaiting imaging. There were no limb amputations. 6, 12 and 24 month patency were 92%(11/12), 92%(11/12) and 80% (2/10) respectively. 4 non-related deaths were identified in the follow up period. Conclusions Endovascular repair of PAAs offered a feasible option with good mid term results in this small cohort. Prospective data with longer follow up is needed to bolster the current evidence base and to better inform practice, particularly in similar patient populations where advanced age and comorbidity are key considerations.

4058

Numbers needed to treat-to make your center financially viable

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Objective: With most hospitals facing tough financial times is there a magic number of case mix that can make your vascular unit remain financially viable? Methods The minimum number of procedures needed to qualify as a hub hospital, were matched with the NHS reference manager costs and HRG4 codes to calculate the expected revenue. This was offset against the fixed costs the capital costs of a Hybrid theatre, the direct costs and the variable costs. Also to be considered are the cross specialty cover costs. Results An average vascular unit doing over 50 Aortic surgery/year, 50 carotids and 80 peripheral bypasses in an arterial hub is likely to be a making a loss of £500,000 per year for the trust if all the above costs are calculated. To make a profit of £500,000/year the unit needs to do not only a definite case mix but also ensure that these procedures are done and patients discharged within a defined time frame to attract the maximum tariffs. A unit with a new Hybrid theatre will take at least 3 years for financial viability. A toe amputation can attract a tariff from £95 to £6000 and a non elective Major amputation a tariff of £14000. Outpatient department is one loss making activity as is day surgery VNUS procedures Conclusions With increasing financial pressures faced by all trusts it is imperative that the ownership of cost effectiveness of vascular surgery services be taken over by clinicians rather than be left to the administrators.

4060

Experience using covered heparin-bonded stents for infra-inguinal disease

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Objective: Treatment of infrainguinal disease with angioplasty and stents has recently been shown to be a viable alternative to bypass surgery in selected patients. Heparin bonded covered stents such as the Gore Viabahn offer the advantage of reduced neo-intimal hyperplasia over bare metal stents, as shown by the VIASTAR trial. This series aims to describe the real world experience with covered stents in unselected patients. Methods Patients undergoing placement of infrainguinal Gore Viabahn arterial stents were identified from April 2012-December 2014 (30 months) from retrospective case note review and duplex ultrasound surveillance programme review. Outcomes, complications and reinterventions were recorded on a dedicated database. Results 25

patients were treated with a Viabahn stent (68% male). 15 were elective cases and 10 were emergency. Mean follow-up was 12 months (0–21 months). Patency rate was 76%, limb salvage rate was 80%, mortality was 4%. Mean length of coverage was 165 mm (50-400 mm). Fontaine classification was significantly improved after stent placement (p = 0.029). Conclusions Covered stenting using the Viabahn device offers an acceptable alternative to surgery for infrainguinal occlusive disease in unfit patients. Stent grafts may appear occluded when patent when imaged with duplex ultrasound due to difficulty of insonation and this requires experienced assessment of distal flow.

4063

Adipose Stem Cells Regulate the Angiogenic Phenotype of Monocytes in CLI

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Objective: Monocytes/macrophages (Mo/MΦ) expressing TIE2 are increased in critical limb ischaemia (CLI) and regulate revascularisation. Despite their upregulation in these patients, their absolute numbers are low, limiting potential use in autologous cell therapy for CLI. Adipose-derived stem cells (ASCs) have pro-angiogenic properties and modulate the function of other cells. We hypothesised that ASCs can upregulate TIE2 and promote angiogenic activity on monocytes. Methods ASCs, isolated from CLI and control patients, were co-cultured with blood monocytes and the expression of TIE2 and the pro-angiogenic marker, MRC1, were assessed on monocytes after 7days. ASCs where injected into the hindlimbs of nude, athymic mice following hindlimb ischaemia (HLI) and reperfusion measured by laser Doppler. Endogenous Mo/MΦs, isolated from injected limbs, were phenotyped by flow cytometry. Results Expression of classical ASC markers (CD29,CD73,CD90 and CD105) was not significantly different in ASCs isolated from CLI patients compared with ASCs from controls (P > 0.1 for all markers). TIE2 and MRC1 expression was greater in monocytes co-cultured with ASCs compared with monocytes cultured alone (P < 0.05). Delivery of ASCs into ischaemic hindlimbs resulted in greater limb salvage compared with vehicle control (86vs14%,n = 7/group,P < 0.05). ASCs injected into ischaemic muscle also upregulated expression of TIE2 and MRC1 on endogenous infiltrating Mo/MΦs (P < 0.05). Conclusions ASCs skew Mo/MΦs towards a pro-angiogenic phenotype, which may represent a novel mechanism for the mode of action of these stem cells in revascularising ischaemic tissue. Co-delivery of ASCs with whole population monocytes, or ex-vivo skewing of Mo/MΦ prior to delivery, may provide a novel strategy for cell therapy in "no option" patients.

4065

Acute limb ischaemia in patients with cancer – A poor prognostic sign

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Objective: Acute limb ischaemia in patients with advanced cancer is a challenging problem. The aim of this study was to determine the 30 day amputation rate and mortality in cancer patients presenting with acute limb ischaemia. Methods A retrospective review of a prospectively maintained departmental database was conducted from 1st January 2010 to 31st December 2014. Patient demographics, type of presentation (acute limb ischaemia: onset within 24 hours or sub-acute: onset beyond 24 hours) and oncological details were recorded. Outcome measures were 30-day major amputation and mortality rates. Results Fifty three patients (27 women, 23 men) with a median age of 71 years (range 41 to 94) were identified. The majority of the patients presented with acute lower limb ischaemia 66% (n = 31). Lung cancer was the commonest (32%) followed by gastrointestinal cancers (24%). 70% were receiving chemo or radiotherapy at the time of presentation and 47% had metastasis. Conservative management with subcutaneous low molecular weight heparin or antiplatelet therapy was utilised in 49% (n = 30). 30-day mortality rate was high in the conservative group at 43.3% (n = 13) compared to 23.8% (n = 5) in the surgical group. 30-day major amputation rate was equal in both the groups (6.7%, n = 2). 35% of the patients had palliative team and fast track involvement. Conclusions Acute arterial limb ischaemia in patients with cancer is a poor prognostic sign associated with high 30 day mortality. Limb preservation is possible with conservative treatment and the causes of death are due to advanced cancer rather than limb ischaemia-related complications.

4066

Comparison of operative parameters during EVAS with standard EVAR

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Objective: To compare intra-operative procedural differences between EVAS using Nellix® with standard EVAR. Methods 80 patients treated with either EVAS using Nellix® (Endologix, N = 40) or a standard EVAR device (N = 40) were included in this study. All patients were treated over the same time period and by the same group of surgeons. Data collected included: number of endoleaks; operative time; screening time; fluoroscopic dose and volume of contrast media used. Results All devices were deployed successfully with no endoleaks on completion angiography. The median operative time was significantly lower in the in the EVAS group compared with those having EVAR (median 2.2 hrs EVAS vs. 2.55 hrs EVAR, P = 0.003). The median screening time was 10.1mins in the EVAS group compared with 25.2mins in the standard EVAR group (P = <0.001) and this was associated with a significantly lower flouroscopic median skin dose (171mGy EVAS vs. 465mGy EVAR P = 0.0003) and a significantly lower median total fluoroscopic dose (38592mGy/cm2 EVAS vs. 89672mGy/cm2 EVAR P = 0.0002). The median contrast dose was also 80mls in EVAS and 140mls in EVAR P = 0.0003). Conclusions Our initial experience of EVAS using Nellix® has demonstrated that this device can be deployed faster than standard EVAR using significantly smaller doses of radiation and requiring less volume of contrast agent.

4067

CD16+ monocytes are retained in the ischaemic limb and promote limb salvage

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Objective: An angiogenic subset of monocytes (CD14 + ve), characterised by co-expression of CD16, is mobilised in patients with critical limb ischaemia (CLI) and is a potent regulator of revascularisation in the murine hindlimb ischaemia model (HLI). We aimed to determine the retention of these cells and the mechanisms by which they promote revascualrisation. Methods Peripheral monocytes were phenotyped by flow cytometry in CLI patients (n = 24) and matched controls (n = 12). 1x106 of CD16 + ve and CD16-ve monocytes were isolated from CLI patients with immunomagnetic beads, labelled (QuantumDots) and injected into the HLI model in nude mice; The proportion of CD16 + ve vs CD16-ve retained after injection was measured by flow cytometry of digested muscle. Limb revascularization was assessed using capillary:fibre ratio (angiogenesis) and number/size of arterioles (arteriogenesis). Results Monocytes from CLI patients expressed higher levels of CD31 and P-Selectin compared with matched controls (P < 0.05). The CD16 + ve subset expressed higher levels of CD11c, VLA and ICAM-1 (P < 0.05) in CLI. Proportionately higher numbers of CD16 + ve were retained in the ischaemic limb after 72hours (81 ± 5 vs 19 ± 5% [P < 0.05, [n = 5/group]). Limb salvage for mice treated with CD16 + ve compared with CD16-ve monocytes was 78% vs 22% respectively (n = 9/group, P < 0.05) and was associated with greater arteriogenesis (P < 0.05). Conclusions CLI upregulates the expression of adhesion molecules on CD16 + ve monocytes which may in turn account for their preferential retention in ischaemic muscle (compared with CD16-ve monocytes) and their ability to revascularise the limb by promoting arteriogenesis. These promising preclinical data have led to a first in man study to assess their therapeutic potential in CLI patients.

4068

Are Referral Delays leading to Limb loss in Diabetic Patients?

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Objective: Major lower limb amputation rates in patients with diabetes remain unacceptably high with many patients presenting too late for revascularisation. Methods A root cause analysis (RCA) was performed for major amputations (MA) in diabetic patients to identify preventable causes for limb loss. Data was collected retrospectively using HES codes for Diabetes and MA (above knee/through knee/below knee) and analysed using the London Diabetes Network RCA tool for MA. All 36 consecutive diabetic patients who underwent MA between 1st April 2010 and 31st October 2013 were analysed. Results Median time from initial onset of symptoms (IOS) to any secondary care review was 4 weeks while median time from IOS to diabetic foot multidisciplinary team (DFMDT) review was 12 weeks. 14 patients (39%) had no DFMDT clinic review before MA. 29 patients (78%) underwent in-patient vascular imaging. Median interval from admission to vascular imaging was 1 day (1–64). 17 patients (47%) underwent revascularisation (Endovascular therapy n = 9 / Surgical bypass n = 3 / Endovascular Therapy and Surgical Bypass n = 5). Median time from IOS to revascularisation was 70 days (2–1080) and median time from hospitalisation to revascularisation was 1 day (1–64). The 30-day post-MA mortality was 14%. Conclusions Our RCA highlights significant delays in referral to the DFMDT in this cohort with adverse limb salvage outcomes. Since completion of the RCA, a Diabetic Hot Foot Number at Frimley Park Hospital has been launched to enable primary care practitioners in the community to access rapid referral to the DFMDT for diabetic foot emergencies.

4069

Reducing Peri-operative Mortality in Lower Limb Major Amputations

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Objective: The 2014 NCEPOD lower limb amputation study confirmed mortality following major amputations remains unacceptably high. The Vascular Society Quality improvement framework aims to significantly reduce mortality following amputations in the UK. We present the mortality rates for major amputations seen with the changes in practice in our vascular network. Methods Historical data on major amputations for the years 2011 and 2012 were obtained from the National Vascular Database (NVD) and cross referenced with HES data on Dr Foster. A retrospective audit for the year 2013 was followed by prospective audit for 2014 were performed examining pre-, peri- and post-operative factors. Results The combined mortality rates in 2011 and 2012 for major amputations were 12.6% on NVD data were examined and 15.5% on HES data. With changes implemented with formation of the vascular network, the mortality dropped to 8.9% in 2013 with a further reduction to 7.8% in 2014. The data were similar in NVD and HES reflecting improvements in data quality and entry onto the NVD/NVR. There has been an increase in elective procedures over emergency from 54% to 76%, with an improvement in the BK:AK ratio from 1.09 to1.38. Conclusions We have demonstrated that implementing the recommendations of the VSQIP guidelines with improvements in pre-operative care, major amputations done on planned vascular lists rather than emergency lists with consultant vascular surgical and anaesthesia presence and changes in the post-operative pathways were amongst the main reasons for a significant improvement in the mortality seen from lower limb major amputations.

4073

Fenestrated endovascular repair for failing Infrarenal stent grafts

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Objective: We present our experience of fenestrated endovascular repair (FEVAR) after failed standard infra-renal endovascular aortic aneurysm repair (EVAR). Methods A prospective database was used to identify all FEVAR carried out between October 2012 and October 2014 to treat failed EVAR. Results The mean time between EVAR and FEVAR was 4.6 (+/– 3.0) years. Indications for intervention in the eleven patients [(10 male), median age 78 (65–80)] were either (i) type Ia endoleak alone (n = 5), (ii) sac expansion alone (n = 4) or (iii) a combination of both (n = 2). The devices implanted were either a proximal fenestrated cuff (n = 9) or a bifurcated fenestrated stent graft incorporating an inverted limb (n = 2). 43 patent visceral arteries were targeted. Five coeliac fenestrations were left unstented because of difficulties with vessel catheterisation and stent tracking. Technical success was achieved in all patients, with no type Ia endoleak post-operatively. There was no in hospital or 30 day mortality.There were two aortic re-interventions: (i) Amplazter plug to unstented coeliac fenestration (persistent sac enlargement) and (ii) embolization of type II endoleak. There was one late death, at 2 years, from sepsis secondary to aorto-enteric fistula. Conclusions FEVAR is an effective solution for failing EVAR and it is associated with low morbidity and mortality.

4075

Effect of early needling on survival of arteriovenous fistulae

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Objective: To study the effect of time to needling on arterio-venous fistula (AVF) survival. Methods Analysis of two prospective databases of access operations and dialysis sessions from 2002 till 31/12/2014. Follow up till 1/7/2015. Time to needling defined as time from operation-date to first needling date. AVF survival defined till date AVF abandoned. Functional dialysis use defined as six consecutive cannulations of the AVF with 2 needles. Results 1633 AVF's were created: 957 (57%) radio-cephalic AVF, 502 (31%) brachio-cephalic AVF, 164 (10%) brachio-basilic AVF, and 10 other AVF. Some 1150 AVF (70%) were needled of which 1127 AVF (98%) reached functional dialysis. These were analysed. Needling-time varied from 1 day to 5 years. Thirty-one AVF (3%) were needled within 2 weeks and 372 (33%) AVF were needled after 16 weeks. Early needling, before 2 weeks, was not associated with worse AVF survival (logrank test p = 0.95) compared to needling between 4 and 16 weeks. Late needling, after 16 weeks, was associated with improved survival (logrank test p = 0.0002). Six consecutive successful cannulations from the start was associated with significantly improved AVF survival (logrank test p = 0.0002). Type AVF, diabetes, pre-dialysis state at operation, and six successful cannulations from the start were independent predictors for AVF survival. Conclusions Needling after 16 weeks or ensuring six successful AVF cannulations from the start are strong predictors of better AVF survival. AVF can be needled early if required and suitable

4077

Hybrid Revascularization in the Treatment of Critical Leg Ischemia

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Objective: Hybrid procedures (Hyb), defined as combined open surgical with endovascular procedures are increasingly being applied in the treatment of critical leg ischaemia (CLI). The aim of our study was to evaluate the patency rates and amputation free survival of all hybrid revascularization procedures performed at a single tertiary referral centre. Methods Patients requiring angioplasty of inflow arteries prior to a distal bypass were classified as Hyb-1. Those that required angioplasty of outflow arteries following peripheral bypasses were classified as Hyb-2, whilst Hyb-3 patients included those requiring endovascular intervention of both inflow and outflow vessels. Primary outcomes used were patency rates and amputation free survival at 1 year. Data were collected prospectively. Analysis of the re-intervention rate within 1 year was also performed. All patients were recruited into a 1-year duplex surveillance program. Kaplan-Meier survival analysis was performed. Results One hundred and twenty four patients underwent hybrid revascularization for CLI. The primary, assisted

primary and secondary patency rates at 1 year were 57%, 80% and 89% respectively. The amputation-free survival at 1 year was 92%. At 1 year, 82% of the patients were free of endovascular re-intervention. There were no early 30-day mortalities, however, 6 patients died within one year (4.8%). Conclusions Hyb allows for treatment of multilevel disease in CLI patients. Amputation-free survival at 1 year was 92% whilst primary, assisted primary and secondary patency rates were 57%, 80% and 89%. Duplex surveillance and salvage angioplasty are essential in maintaining graft patency.

4078

Improved Foot Salvage through Pedal Bypasses and Pedal Arch Angioplasty

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Objective: Although surgical bypass remains the mainstay in the treatment of critical limb ischemia (CLI), many centres now perform endovascular techniques as the first-line treatment. The success rate of pedal arch angioplasty varies and subsequent bypass after failed pedal angioplasty may be the only option left for limb salvage. The aim of this study is to asses the outcome of ultra-distal bypass following failed pedal arch angioplasty in comparison to primary bypass Methods Consecutive patients with CLI between January 2006 and May 2014 undergoing ultra-distal bypasses were included.Patients were divided into the following two groups:Group A: ultra-distal bypass following failed pedal angioplasty and Group B: primary ultra-distal bypass.Graft patency, major amputation, amputation-free survival as well as 30-day and 1-year mortality rates were analysed and compared between the two groups. Results Fifty one consecutive patients underwent 51 ultra-distal bypasses. Venous conduit was used in all cases. Group A consisted of 26 and group B consisted of 25 patients. There were no 30 day mortalities in either group. The 1 year overall survival was 88% and 92% for group A and B respectively ($p = 0.96$). the Major amputation rates in group A and B were 3.9%($n = 1$) and 4% ($n = 1$) respectively. There was no statiscally significant difference between the patency rates and amputation-free survival between both groups. Conclusions This study showed no statistically significant difference in outcomes between ultra-distal bypass after failed pedal angioplasty in comparison to primary ultra-distal bypass. Ultra-distal bypass should be considered even after failed angioplasty.

4081

DVT following Radiofrequency Ablation: does proximity to the SFJ matter?

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Objective: Venous thromboembolism (VTE) is variably reported after Radiofrequency Ablation (RFA). Inclusion of non-occlusive thrombus protruding from treated saphenous trunks into the deep venous system, the so-named endovenous heat-induced thrombus (EHIT), overestimates the incidence of VTE. To reduce the risk of EHIT (and hopefully saphenous junction VTE) some manufacturers recommend catheter tip placement away from the saphenous junction. The incidence of EHIT and VTE were assessed for three modalities of RFA as part of a randomised trial. Methods Patients presenting with symptomatic primary great saphenous vein (GSV) varicose veins were randomised to undergo Venefit, RFITT or EVRF by an operator experienced with all three devices. Patients on hormonal therapy received enoxaparin for 5 days post-procedure in addition to compression bandaging (48 hours) and hosiery (2 weeks) and immediate mobilisation. Patients were assessed by duplex for incidence of EHIT and VTE after 2 weeks. The assessor was blinded to the intervention performed. Results 70 patients (age range 21–83 years, 42 women) were randomised to Venefit (24), RFITT (25) and EVRF (21). No VTEs or EHITs were observed after any treatment and all treated veins were successfully ablated. 89% occlusions were within 10 mm of the saphenous junction including 26% flush occlusions (38%, 16% and 25% respectively). The Inferior Epigastric Vein (IEV) was confirmed as patent in 74% of all patients. Conclusions Early EHIT and VTE are rare after RFA treatments performed by an experienced operator; neither having been identified in this ongoing study. Abolition of IEV patency was not associated with VTE in this study.

4083

Risk of CV events in people with diabetes and microvascular disease

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Objective: Diabetes confers a 2-fold excess risk of cardiovascular disease. The effect of microvascular disease burden on cardiovascular disease risk among individuals with diabetes is unknown. This study aimed to evaluate the association between microvascular disease and cardiovascular events. Methods A population-based cohort of patients with type 2 diabetes from the UK Clinical practice Research Datalink was studied ($n = 48\,367$). Data on retinopathy, nephropathy and peripheral neuropathy were used to classify patients into four mutually exclusive groups according to the cumulative burden of microvascular disease. We used Poisson regression to calculate adjusted relative rates of the primary outcome measure (fatal and non-fatal MI and stroke) during follow-up for the four risk groups. Adjustment was performed for established cardiovascular risk factors. Results During a median follow-up of 5.5 years, 2689 (5.6%) individuals experienced a cardiovascular event. Unadjusted rates of the composite endpoint were highest among people with three microvascular disease states (22.5 per 1000 person years) compared to those with one, two or three (5.7, 10.4, 15.5 per 1000 person years, respectively). Compared to individuals with no microvascular disease at baseline, the adjusted relative rate of the primary endpoint among individuals with one, two or three microvascular disease states was 1.37 (95% CI 1.28-1.46), 1.79 (1.66-1.94) and 2.55 (2.26-2.87), respectively. Conclusions We observed excess risk of cardiovascular disease with cumulative burden of microvascular disease among individuals with type 2 diabetes. The strength of association between microvascular disease and cardiovascular events indicates risk equivalence with many risk factors considered in contemporary risk equations.

4084

Feasibility of a home-based walking programme for intermittent claudication

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Objective: Walking exercise is an effective but underused treatment for intermittent claudication (IC), due to limited programme availability and accessibility. This study evaluated the feasibility and acceptability of a randomised trial comparing a brief physiotherapist-led home-based walking intervention with an attention-control in people with IC. Methods 24 individuals with IC were recruited from three vascular outpatient clinics in London, UK. Participants were randomised 1:1 to the intervention or attention-control. Both groups received two 60-minute home visits and two 20-minute telephone calls by a physiotherapist trained in psychological behaviour-change techniques. Outcomes included 6-minute walk distance (6MWD) and mean daily walking activity (pedometer). Baseline and 16-week follow-up assessments were conducted by a blinded investigator. Interviews with a subsample of 12 participants were conducted to determine acceptability of the trial and intervention. Results Participants in the intervention ($n = 12$) and attention-control ($n = 12$) groups were 75% and 83% male, mean age 66.3 ($SD = 8.8$) and 67.1 ($SD = 11.2$) years, respectively. Study retention at 16-weeks was 92% ($n = 2$ lost to follow-up in the attention-control), and compliance with the intervention/attention-control protocols was 77% overall. The intervention increased mean daily walking activity by 836.9 ($SD = 625.8$) steps/day compared with a decrease of 29.4 (1471.43) steps/day in the attention-control (Hedges $g = 0.39$, 60% CI 0.02, 0.76), but not 6MWD (Hedges $g = -0.42$, 60% CI −0.73, −0.11). Participants' and the physiotherapist reported the study as a positive and acceptable experience. Conclusions This study of a physiotherapist-led home-based intervention targeting walking is feasible and acceptable to individuals with IC and the clinician, and provides a template for a definitive trial.