Session 1

Association of hospital volume with perioperative mortality of endovascular repair of complex aortic aneurysms – a nationwide cohort study

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Background
Endovascular treatment with fenestrated (FEVAR) or branched (BEVAR) endografts is progressively used for excluding complex aortic aneurysms (complex AAs). It is unclear if a volume-outcome association exists in endovascular treatment of complex AAs (complex EVAR).

Methods
All patients prospectively registered in the Dutch Surgical Aneurysm Audit who underwent complex EVAR (FEVAR or BEVAR) between January 2016 and January 2020 were included. The effect of annual hospital volume on perioperative mortality was examined using multivariable logistic regression analyses. Patients were stratified into quartiles based on annual hospital volume to determine hospital volume categories.

Results
We included 694 patients (539 FEVAR patients, 155 BEVAR patients). Perioperative mortality following FEVAR was 4.5% and 5.2% following BEVAR. Postoperative complication rates were 30.1% and 48.7%, respectively. The first quartile hospitals performed <9 procedures/yr; second, third, and fourth quartile hospitals performed 9-12, 13-22, and ≥23 procedures/yr. The highest volume hospitals treated the significantly more complex patients. Perioperative mortality of complex EVAR was 9.1% in hospitals with a volume of <9, and 2.5% in hospitals with a volume of ≥13 (P=0.008). After adjustment for confounders, an annual volume of ≥13 was associated with less perioperative mortality compared to hospitals with a volume of <9.

Conclusions
Data from this nationwide mandatory quality registry shows a significant effect of hospital volume on perioperative mortality following complex EVAR, with high volume complex EVAR centers demonstrating lower mortality rates.

Mortality associated with delayed vascular surgery during the COVID-19 pandemic disproportionately affects female patients

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Background
The COVID-19 pandemic has caused a rapid and widespread postponement of scheduled vascular surgical operations. The objective of this study was to determine the impact of surgery postponement.

Methods
A REDCap database recorded the outcomes of patients whose scheduled vascular surgeries were delayed during the pandemic. An interim data analysis of patients in North America who died before their postponed surgeries was performed.

Results
The 908 patients included in the analysis had the following conditions: 157 (17.3%) aortic, 63 (6.94%) carotid, 230 (25.4%) peripheral artery disease (PAD), 248 (27.3%) end-stage renal disease (ESRD), and 210 (23.2%) venous. Nineteen patients (2.09%) died while awaiting surgery. Seven (36.8%) were male and 12 (63.2%) were female. The average length of surgical delay to the time of death was 94.9 days (+/- 90.1 SD). Of the patients with aortic disease, 3.82% died before surgery. Of the patients with carotid disease, 3.17% died before surgery. Of the patients with PAD, 2.17% died before surgery. Of the patients with ESRD, 2.42% died before surgery. Zero patients with venous disease died before surgery. Two (50.0%) of the four patients with abdominal aortic aneurysms (AAAs) greater than 8.1 cm died before their scheduled surgeries.

Conclusions
One out of 50 (2.0%) patients with vascular disease whose surgeries were postponed died waiting for surgery. Patients who died were disproportionately female. Half of the patients with AAAs greater than 8.1 cm died waiting for surgery, which is higher than the annual estimated risk for aneurysm rupture. Further investigation is needed.

Social deprivation and the association with survival following Fenestrated Endovascular Aneurysm Repair

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Background
Social deprivation is associated with poor clinical outcomes. It is known to have an impact on length of stay and post-operative mortality across a number of other surgical specialties. This study evaluates the impact of social deprivation on outcomes following fenestrated endovascular aneurysm repair (FEVAR).

Methods
All elective FEVARs performed between 2010-2018 at a tertiary vascular centre were analysed. Deprivation data was sourced from the English indices of deprivation (IMD) 2019, by postcode. Primary outcome was overall survival. Secondary outcomes included length of hospital stay (LOS) and complications.

Results
Some 132 FEVAR patients were followed-up for 3.7 (SD 2.2) years. Fifty-seven patients lived in areas with high levels of deprivation, 34 in areas with moderate deprivation and 41 in areas with the lowest level of deprivation. Groups were comparable for age, BMI, AAA diameter and co-morbidity. Kaplan-Meier analysis demonstrated significantly poorer survival for patients living in areas with high levels of deprivation (IMD 1-3) (p=0.03). Mortality was comparable for IMD 4-6 and 7-10 groups. Patients from the most deprived areas had longer hospital stay (6 days (4-9) vs. 5 (3-7) p=0.005) and higher all-cause complication rates (21 (36.8%) vs. 14 (18.4%) p=0.02). Decreasing IMD was associated with worse survival (HR -0.85 (0.75-0.97) (p=0.02)).

Conclusions
Social deprivation was associated with increased mortality, length of stay and all-cause complication rates in patients undergoing FEVAR for complex abdominal aortic aneurysm (AAA). These results may help direct pre-optimisation measures to improve outcomes in higher risk sub-groups.

Initial UK experience using a dedicated venous mechanical thrombectomy device in patients presenting with acute deep vein thrombosis

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Background
Interventional treatment of deep vein thrombosis requires effective thrombus clearance and venoplasty/stenting of underlying stenoses. Mechanical techniques for thrombus clearance mitigate bleeding risks, and can enable single-sitting treatment. Limitations with current mechanical devices include embolization, poor thrombus clearance, and limited efficacy on sub-acute thrombus. We audit our results in treating acute and sub-acute deep vein thrombosis using the Inari Medical ClotTriever mechanical thrombectomy device.

Methods
Prospective data for all cases of venous mechanical thrombectomy using the Inari Medical ClotTriever device in our tertiary referral centre was collected.

Results
14 patients (median age 52 years) have undergone treatment with the Inari Medical ClotTriever mechanical thrombectomy device in our centre between March 2021 and February 2022. The estimated history-based mean age of thrombus was 12 days (range 2-34 days). 12 cases had unilateral iliofemoral venous thrombosis. 2 cases had bilateral iliofemoral venous thrombosis extending into the infrarenal IVC. Only 50% of procedures were undertaken under general anaesthesia. The median number of device passes was 6 (range 2-14). Mean thrombus clearance was 85% (range 80-90%). Stenting for underlying venous stenosis was completed in the same sitting in 10 cases. In those, a mean of 1.7 stents (range 1-4) were placed.

Conclusions
Preliminary data has shown the device to offer a safe and effective single-sitting, thrombolytic-free option, with no major access site complications. It is well tolerated, with half of procedures completed successfully under local anaesthesia. The reduced incidence of stenting, particularly in the sub-acute patient group, is a promising early signal.

Small abdominal aortic aneurysms in the over 85s … Do we need to survey them?

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Background
The benefit of surveillance of Abdominal Aortic Aneurysms (AAAs) for patients aged ≥85 with small AAAs is questionable. Despite recent research showing few patients ≥85 with small AAAs undergo treatment, no guidelines exist for determining which patients should be removed from surveillance. The aim of the study was to explore whether patients aged ≥85 with small AAAs, when contacted by a vascular surgeon, opted to remain under surveillance, or not.

Methods
Telephone consultations with patients aged ≥85 on local AAA surveillance with AAAs sized 3.0-5.0cm were undertaken by a vascular consultant/registrar. Information regarding time since diagnosis, frailty, understanding of the surveillance program, and treatment was gathered. After explaining the pros and cons of ongoing surveillance, patients decided if they wished to continue surveillance, and if they wanted to be considered for AAA treatment at threshold (i.e. 5.5cm) or in the context of rupture.

Results
25 patients were contacted. The mean age was 86 years, the mean AAA size was 4.8cm (range 3.2–4.9 cm), and the mean time since diagnosis was 4.8 years (range 1–10 years).
Twelve patients (41%) decided to leave surveillance. Eleven patients reached an agreement about management of potential future rupture; six did not want treatment at threshold. Five patients (17%) reported difficulty attending screening, with all but one opting to leave the surveillance programme.

Conclusions
Almost one half of those aged ≥85 with a small/medium AAA opted to withdraw from surveillance when asked. This represents a significant cost savings for surveillance programmes.

EVAR in octogenarians is safe: A meta-analysis and meta-regression

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Background

The safety and durability of endovascular aneurysm repair (EVAR) in the elderly is contentious. This review aims to evaluate the post-operative and long term outcomes in this population.

Methods

Standard PRISMA guidelines were followed and qualitative assessment of studies. Meta-analysis was performed using Mantel – Haenszel and weighted summary proportions with meta-regression utilised where possible.

Results

25 observational studies were included for meta-analysis totalling 40,641 octogenarians with an average age of 83.5 years. Octogenarians were more likely to be female, non-smokers, comorbid and have a larger aneurysmal diameter. Octogenarians had a pooled perioperative mortality of 2.48% (CI 2.1 - 2.95) increasing to 9.14% (CI 8.32 - 10.0) and 52.9% (CI 38.7 - 66.8.) at 1 and 5 Years respectively. Meta-regression suggests an all cause mortality approaching 10% per year (10.58, R^2 0.74). Perioperative complications were 5.2% (CI 3.66 - 6.96), 2.83% (CI 1.49 - 4.81) and 3.55% (C I2.12 - 5.33) suggesting reasonable rates of cardiac, pulmonary and renal complications respectively. 19.8% (CI 13.9 - 26.4) of patients had an endoleak, however, only 3.12% (CI 2.22 - 4.16) required re-intervention within 30 days. No difference was seen in rates of post-operative re-intervention, sac diameter increase or rupture.

Conclusions

EVAR is safe and durable with reasonable peri-operative and long-term outcomes. This highlights the importance of EVAR as a treatment choice in this group of patients.

Session 2

Covered endovascular reconstruction of aortic bifurcation (CERAB) - our initial results from a regional centre

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Background
CERAB is a novel technique to treat Aorto-iliac occlusive disease (AIOD) offering an alternative approach to open Aorto-bifemoral bypass or conventional endovascular procedures like kissing iliac stents. It involves reconstructing the aortic bifurcation endovascularly with preservation of more natural flow dynamics. We present our initial results from a single centre with this novel approach.

Methods
This study was carried out through analysing our prospective database of all patients who underwent CERAB between July 2012- March 2021. We used Rutherford's classification for chronic ischaemia to grade the pre-operative clinical severity of the lesion and a detailed review of radiological images for lesion characteristics. Mean follow-up period was 14 months.

Results
There were 19 patients in total with a median age 62. 18 of them had a Trans-Atlantic inter-society consensus (TASC) D lesion. The procedure was successfully carried out in all patients. Two patients had intra-operative complications in the form of ruptured external iliac artery and acute aortic dissection with renal artery stenosis, both were managed successfully with stents. Median length of stay was 2.5 days and there were no reported deaths or limb loss during the initial 30 days or during the follow-up period. Two patients however had stent occlusions during follow-up needing iliac thrombectomy and Fem-Fem crossover graft. All patients had subjective symptom improvement during follow-up.

Conclusion
CERAB is an excellent alternative to conventional procedures for AIOD in selected patients with acceptable short-medium term outcomes.

The level of disease is associated with risk of ipsilateral major amputation after endovascular revascularisation for peripheral arterial disease

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Background
Our aim was to evaluate the association between the level of disease and 1-year outcomes after endovascular revascularisation for peripheral arterial disease (PAD).

Methods
All patients over 40 years old, who underwent endovascular revascularisation for PAD from January 2017 to December 2019 were extracted from Hospital Episode Statistics. Hybrid procedures and patients with revascularisations or major amputations 3 years prior to the index event were excluded. Level of disease was defined as the most distal treated vessel. The effect of level of disease on 1-year ipsilateral major lower limb amputation (MLLA) and mortality was modelled using two-level multinomial logistic regression, to account for patient characteristics and hospital of treatment.

Results
The study included 32,415 patients (65.4% men, 44.4% with diabetes). The most distal arteries treated were iliac (29.9%), femoral (45.0%), popliteal (10.3%) and crural (14.8%), and 14.3% of procedures included multiple vessels. Re-intervention rate at 30-days was 4.3% and at 1-year 15.1%. The unadjusted 1-year MLLA rate was 4.5% (95%CI 4.2-4.7%) and 1-year mortality 14.5% (14.1-14.8%). Adjusting for age, gender, comorbidities, frailty, deprivation, admission mode, tissue loss and number of treated vessels, distal disease was associated with significantly higher risk of 1-year MLLA (crural 4.5% [3.8-5.2%] vs. iliac: 2.2% [1.8-2.5%] and femoral 3.0% [2.6-3.4%], p<0.001) but not 1-year mortality. Independent predictors of 1-year MLLA were male gender, younger age, diabetes, tissue loss, emergency admission, increased frailty and increased deprivation.

Conclusions
The level of disease is associated with 1-year MLLA risk and should be considered during patient selection and for risk-adjusted outcome reporting.

Antithrombotic therapy for aortic and peripheral artery aneurysms: A systematic review and meta-analysis

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Background

The role of antithrombotic therapy in aneurysm progression and outcomes following surgical or endovascular intervention is unclear.

Methods

A systematic review and meta-analysis was performed. Medline, Embase, and CENTRAL databases were searched. Randomised-controlled trials and observational studies investigating the effect of antithrombotic therapy on clinical outcomes for patients with aortic or extracranial peripheral arterial aneurysms were included. Aneurysm growth rate, major adverse cardiovascular or limb events, mortality, endoleaks, re-intervention rates, and other outcomes were captured.

Results

Fifty-seven studies (26 antiplatelets, 12 anticoagulants, 16 any antithrombotic agent(s), 2 intra-operative heparin) involving 121,451 patients were included. Aspirin reduced growth rates of aortic aneurysms under surveillance (mean difference -0.9mm/y, 95%CI -1.74 to -0.07, p=0.03; GRADE certainty: moderate). For aortic aneurysms undergoing intervention, antithrombotics increased 30-day mortality (odds ratio [OR] 2.30, 95%CI 1.51 to 3.51, p<0.001; GRADE certainty: moderate). Antiplatelets reduced long-term all-cause mortality (hazard ratio [HR] 0.84, 95%CI 0.76 to 0.92, p<0.001; GRADE certainty: moderate), whilst anticoagulants increased this risk (HR 1.64, 95%CI 1.14 to 2.37, p=0.008; GRADE certainty: very low). Anticoagulants increased incidence of endoleaks under 3 years, and re-intervention rates (p<0.05 for all). Antithrombotic agents did not significantly affect rupture rates in aortic aneurysms. Meta-analysis was not possible for ruptured aneurysms and popliteal aneurysms.

Conclusions

There is moderate quality evidence that aspirin reduced aneurysm growth rates. Antiplatelet agents reduced all-cause mortality in aneurysms after intervention; whilst anticoagulants increased this risk, along with endoleaks and re-interventions. Well-designed trials are required to determine therapeutic benefits of antithrombotic agents for patients with aneurysms.

Lower limb ischaemia (LLI): An infodemiological scoping analysis

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Background
Patients are increasingly using the internet to obtain medical information. This study aims to detail the search characteristics for keywords relevant to LLI.

Methods
Google Trends™ provides data on search terms characterised by defined time-intervals. It provides relative search volumes (RSV), (0: data availability inadequate - 100: highest keyword popularity). We interrogated Google Trends™ for the 5-year period (UK based 18/02/2017 – 18/02/2022). Median RSV values were calculated.
We undertook the following searches comparing different keywords:

1. "intermittent claudication (IC)", "peripheral arterial disease (PAD)", "critical limb threatening ischaemia (CLTI)", "lower limb ischaemia (LLI)"
2. "intermittent claudication" and "poor circulation"
3. "diabetic foot ulcer", "foot ulcer", "critical limb threatening ischaemia", "gangrene", "black toe"
4. "intermittent claudication", "abdominal aortic aneurysm", "carotid endarterectomy"
5. "intermittent claudication", "heart attack", "stroke"

Results

1. Median RSV was highest for the search term IC (34.5) when compared to PAD (28), CLTI (0) and LLI (0 – $p<0.001$).
2. Median RSV for "poor circulation" was higher than for IC (10 vs. 45 – $p<0.001$).
3. Median RSV was highest for "Black toe" (17) and then "gangrene" (8), "foot ulcer" (2), "diabetic foot ulcer" (1) and CLTI (0 – $p<0.001$).
4. Median RSV score was higher for abdominal aortic aneurysm (41) than IC (15) or carotid endarterectomy (12 – $P<0.001$).
5. Median RSV for stroke and heart attack were higher than for IC (39 & 16 vs. 0 – $p<0.001$).

Conclusion
LLI is common yet is not searched for as often as other arterial conditions. Better use of lay terms may help inform our patient population.

Revascularization outcomes of COVID-19 associated acute limb ischemia

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Background

Acute limb ischemia (ALI) is one of the catastrophic thrombotic manifestations of COVID-19.

Methods

An interim analysis on 46 patients with COVID-19 associated ALI submitted to the Vascular Surgery COVID-19 Collaborative (VASCC) database from 10 USA institutions.

Results

In our cohort, the mean age was 62.2 years, 73.9% of patients were male, 67.4% were white, and 93.5% met Rutherford's criteria classes 2 or 3. On average, patients developed ALI 12.2 days after a positive COVID test.

Open thrombectomy attempted in 50.0%, endovascular lysis or thrombectomy in 23.9%, bypass in 2.2%, and wasn't attempted in 23.9%. Revascularization was successful in 41.3% with symptom resolution, 15.2% with limb salvage but persistent symptoms, 4.3% ultimately had a major amputation, 4.3% required reoperation, and unsuccessful revascularization in 10.9%. Average hospital stay was 13.2 days and average ICU stay was 4.66 days. Overall, in-hospital mortality was 21.7%, major amputation in 8.7%, stroke in 8.7%, major limb intervention in 6.5%, and sepsis in 2.2%.

Successful revascularization rate was 62.5% in the open surgery group (24 patients) versus 36.4% in the endovascular group (11 patients) with shorter ICU stay in the open group (mean=3.24 days) than the endovascular group (mean=8.60 days). Within the 11 patients with no revascularization, 36.4% died, 18.2% had a major amputation, 9.1% had a pulmonary embolism, and 9.1% had a stroke.

Conclusion

COVID-19 associated ALI can be managed successfully with endovascular or open surgery. In our cohort, open revascularization had reduced ICU stay with improved limb salvage than the endovascular group.

Aortic Prize Session

Fractured proximal nitinol ring in fenestrated Anaconda device: A multi-centre case series

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Background
There is an increase in the number and complexity of aortic aneurysms treated by fenestrated endovascular stent-grafts. The Terumo Aortic Anaconda™ Endovascular Aortic Stent Graft System has been used since 2010 and is one of two widely used platforms. We report a multi-centre case series of Anaconda™ Stent Graft with proximal ring fractures.

Methods
This is a multi-centre retrospective case series of proximal ring fractures in patients who underwent fenestrated endovascular aortic aneurysm repair (FEVAR) with the Anaconda Stent Graft between 2010 and 2021 in two UK tertiary vascular centres (the Freeman Hospital, Newcastle and the Royal Derby Hospital, Derby).

Results
15 patients (median age 68 years [64-88]) out of 253 patients who underwent FEVAR with the Anaconda Stent Graft System, were found to have incidental fractures of the proximal sealing ring on routine surveillance between 23/03/2013 and 12/11/2021. Four cases showed wire fracture from the proximal sealing ring and migration to the surrounding tissue/organs. One patient developed aneurysm sac expansion with type IA due to stent migration and subsequent one fenestration occlusion requiring secondary intervention. Other patients (14 out of 15) did not show stent migration or loss of the proximal sealing zone and are managed conservatively with no clinical harm identified to date.

Conclusion
Early data in this case series highlight the importance of surveillance following aortic endo-graft placement. A wider review across additional centres is required to understand the clinical consequences of stent ring fracture as well as any adverse anatomical prognostic features.

The utility of post EVAR sac size change in informing the risk of future endograft failure

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Background
A need exists for a marker of therapeutic failure post endovascular aneurysm repair (EVAR), given concerns of late device related complications. We aimed to study the utility of post-EVAR aneurysm sac size change in informing risk prediction models of endograft failure.

Methods
The ENGAGE EVAR registry was retrospectively analysed. Post-operative sac size change was modelled for patients, with reference to observed endograft complications (composite outcome of type 1 or type 3 endoleak, rupture preventing re-intervention or secondary rupture). Kaplan Meier analysis was performed to establish the event free probability of EVAR endograft complications associated with sac size change. Joint Bayesian modelling with K-fold cross validation was used to produce risk predictions of EVAR endograft complications.

Results
Of 1151 patients included for analysis (median follow-up 4.1 years; IQR 2.9-4.7), 60% had sac regression, 30% had a stable sac and 10% had sac expansion post EVAR. The 5-year event-free probability of suffering an endograft complication was 92% (95% CI 90-94), 84% (95% CI 78-90) and 45% (95% CI 35-58) for the sac regression, stable sac, and sac expansion groups respectively. Informed by changing aneurysm diameter post EVAR, a joint Bayesian modelling technique was able to predict the risk of an endograft complication at 5 years with very good discrimination and precision (AUC 0.90, prediction error 0.065).

Conclusion
Sac size change post EVAR is a promising dynamic marker of EVAR durability. Joint Bayesian modelling informed by post-EVAR sac size change provides a novel approach in obtaining risk predictions of endograft related complications.

Limb Occlusion after Endovascular Abdominal Aortic Aneurysm repair (EVAR)

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Background
Limb occlusion is a potentially serious consequence of EVAR. This case-control study identifies predisposing factors.

Methods
A consecutive series of patients from two centres undergoing EVAR from 2007- 2017 were identified retrospectively. Patient record interrogation allowed collation of demographics, intra- and peri-operative data and surveillance data. The pre-operative CTA was analysed to determine EVAR relevant anatomical data. The primary outcome was occlusion of an EVAR limb.

Results
We analysed a total of 787 patients (702 males; median age 78 years, range 53-94 years). 50 patients reached the primary outcome, resulting in an overall limb occlusion rate of 50/787 (6.35%). Factors predictive of limb occlusion were oversizing by >10% of the native vessel diameter, oversizing of >20% affecting 25/50 (50%), external iliac artery landing zone 12/50 (24%) and post-operative kinking 5/50 (10%). 50 randomly selected controls with similar baseline characteristics were studied. Oversizing of the iliac endograft was found to be significantly greater in the limb occlusion group compared to the controls. This difference was statistically significant according to the Mann-Whitney U test ($p < 0.05$). Iliac tortuosity did not contribute to limb occlusion. Binomial logistic regression excluded statistically significant confounding. The Cook endograft had a 9% limb occlusion rate across sites. Medtronic and Vascutek endografts had 2.4% and 2.5% limb occlusion rates respectively.

Conclusion
Oversizing of EVAR limbs by >10% is a key factor contributing to limb occlusion and the Cook endograft appears more susceptible. Meticulous case planning with judicious oversizing has the potential to change practice.

Is a 14-day delay necessary when treating Uncomplicated Type B Aortic Dissection (UTBAD) with Thoracic Endovascular Aneurysm Repair (TEVAR)? A systematic review and meta-analysis

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Background
The optimal timing of early TEVAR for treating UTBAD is unknown. The INSTEAD trial, comparing TEVAR with BMT, did not recruit patients in the first 14 days. However, this early delay risks uncomplicated TBAD becoming complicated, increasing mortality. A systematic review and meta-analysis of comparative outcomes between TEVAR performed in the acute and subacute phases of TBAD was performed.

Methods
A systematic search of MEDLINE was conducted according to PRISMA guidelines. Studies comparing perioperative outcomes between TEVAR performed in the acute and subacute phases of TBAD were included. Subgroup analyses were undertaken for (1) studies reporting uncomplicated TBAD only and (2) studies permitting comparison of "delayed acute phase" treatment (3-14 days) with subacute treatment.

Results
The search yielded 13 retrospective, observational studies (2849 patients). Overall, compared to subacute phase treatment, acute phase TEVAR was associated with higher mortality (RR3.45, 95%CI 2.06-5.79, p<0.0001) and stroke (RR2.29, 95%CI 1.31-4.00, p=0.0036), but equivalent rates of retrograde dissection, spinal cord ischaemia and reintervention. Across studies reporting on uncomplicated TBAD only, acute phase TEVAR was associated with higher mortality compared to subacute TEVAR (RR3.14, 95%CI 1.37-7.21, p=0.0068) but not for other complications. There was no difference in death or complications between TEVAR performed at 3-14 days compared to subacute phase TEVAR.

Conclusions
TEVAR for UTBAD in the acute phase, compared to subacute phase, carries a higher rate of death, but not retrograde dissection, stroke, or spinal cord ischaemia. It may be necessary to wait for only 3 days and not 14 when planning TEVAR.

Medium term follow up of 254 BeGraft Peripheral stents used as bridging stents in fenestrated endovascular aneurysm repair (FEVAR)

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Background
There are no bridging stents approved for use in fenestrated aortic aneurysm repair (FEVAR). We assessed patency and re-intervention in the BeGraft Peripheral stent (Bentley InnoMed GmbH), which is now our bridging stent of choice.

Methods
Data from consecutive elective patients is collected prospectively in a unit-maintained database. All patients with Bentley BeGraft Peripheral bridging stents treated from June 2018 to January 2021 for FEVAR were included. Demographic data, stent specifications & target vessel diameters were collected. Patients with a minimum 12 month follow up were included. Follow up data collected included: mortality, stent patency & re-intervention, with outcome analysis using the Kaplan-Meier method.

Results
97 patients were included for analysis with 254 BeGraft peripheral stents used. Median follow-up was 24 months (1-42 months). The 30 day, 1 year & 3 year patency were 100%, 99.1% & 98% respectively. 3-year freedom from stent re-intervention was 98%. The 30 day, 1 year & 3 year all-cause mortality was 2%, 10% & 24% respectively.

Conclusion
In this study, the use of the BeGraft Peripheral stent for bridging in FEVAR was safe and effective in the short to medium term. BeGraft patency and need for re-bridging stent interventions are comparable with other bridging stents.

Sex-specific differences in pre-operative Standard of Care for infra-renal AAA repair and association with peri-operative major adverse cardiovascular events and death

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Background
Following elective infrarenal abdominal aortic aneurysm (IRAAA) repair, women have a higher rate of major adverse cardiovascular events and death (MACED). Disparity in pre-operative standard of care (SOC) may contribute.

Methods
Analysis using elective IRAAA repair data from the National Vascular Registry, 2013-2020. SOC defined for pre-operative assessment (multidisciplinary/anaesthetic review), waiting times, and cardiovascular risk prevention. Analyses and multivariable logistic regression conducted according to a pre-specified plan.

Results
21,810 patients (women-2380: men-19430). Women were less often repaired within SOC waiting times (51.5% vs. 59.6%, p<0.01), but received similar SOC pre-operative assessment (72.1% vs 72.5%, p=ns). Women less often had IHD (29.0% vs. 37.7%, p<0.01), but those with known cardiovascular co-morbidity more often received SOC risk prevention (52.1% vs. 47.3%, p<0.01). Overall women were less likely to receive antiplatelets (72.2% vs 75.2%, p<0.01) or statins (77.1% vs 80.6%, p<0.01). Women were at greater risk of MACED following open (12% vs. 8.9%, p<0.01), and endovascular (4.9 % vs. 2.9%, p<0.01) repair: overall odds ratio (OR) 1.51, adjusted for age and repair type; OR 1.28 following adjustment for demographics, co-morbidities and SOC. SOC waiting time was associated with a reduction in risk (OR 0.79) for both sexes. SOC pre-operative assessment reduced MACED risk for women (OR 0.80), but not men (OR 1.09). SOC cardiovascular risk prevention did not significantly influence MACED risk.

Conclusions
Treatment within SOC waiting time is independently associated with a reduction in MACED risk for both sexes, SOC pre-operative assessment is associated with risk reduction for women only.

Session 3

Outcomes following use of bovine pericardium (xenoprosthetic) grafts for aortic reconstruction of mycotic aneurysms and infected aortic grafts: A systematic review and meta-analysis

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Background
Infected aortic grafts and mycotic aneurysms represent one of the most complex challenges faced by vascular surgeons. Treatment has progressed from extra-anatomical bypass in preference of in-situ reconstruction. Additionally, Bovine pericardium reconstruction (BPR) has increased, due to accessibility and reduced lower limb morbidity. There remains, however, limited evidence for its use. The aim is to analyse mortality, infection and post-operative complications in BPR of mycotic aortic aneurysms or infected aortic grafts.

Methods
Three databases (EMBASE, CINAHL and PUBMED) were searched for the search term "(bovine OR xenoprosthetic) AND (aneurysm)", according to PRISMA guidelines.

Results
From nine studies, there were 133 patients: 67% graft infections; 33% mycotic aneurysms. 57% of reconstructions were in the abdominal aorta; alternative sites included femoral artery, ascending, descending and thoracic aorta. 158 pathogens were identified, including Staphylococcus aureus (23%), Candida albicans (13%) and Escherichia coli (13%). In 12%, no microorganisms were identified.

30-day mortality was 23% (30/133), and long-term mortality was 41% (55/133 patients). Aneurysm-specific mortality was 33%. One patient died intra-operatively. There were 148 in-hospital complications after 30-days post-operation. Common complications were acute renal failure (17%), pneumonia (14%), delirium (12%), respiratory insufficiency (11%) and renal insufficiency (7%). Eight patients (8%) reported loss of graft patency. Reinfection rate was 2% based on one study alone.

Conclusion
This meta-analysis highlights low reinfection and high graft patency using BPR, however, there remains limited long-term and comparative data regarding options for aortic reconstruction. As expected in this complex cohort, the complication rate and 30-day mortality remain high.

Acute kidney injury following endovascular intervention for peripheral artery disease

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Background
Little is known about the incidence of acute kidney injury after endovascular treatment of peripheral arterial disease. Our aim is to investigate its risk factors and estimate its incidence.

Methods
Prospective analysis of data from patients undergoing treatment of peripheral arterial disease in three centres across a five year period. The clinical endpoints were the number of patients developing AKI at 48h, and the number developing the composite Major Adverse Kidney Events (MAKE) endpoints at 30 days and 90 days (MAKE90). Multivariable regression analysis was used to assess predictors of AKI, and the association between AKI and death.

Results
Some 2041 patients were included in the analysis. AKI developed in 239 patients (11.7 per cent), with 47 (2.3 per cent) requiring dialysis within 30 days, and 18 (0.9 per cent) requiring ongoing dialysis. The MAKE30 and MAKE90 composite endpoints were reached in 358 (17.5 per cent) and 449 (22.0 per cent) patients respectively. Risk factors for AKI were age, sex, congestive heart failure, chronic limb-threatening ischaemia, emergency procedure, and pre-existing chronic kidney disease. AKI, dementia, congestive heart failure, and major amputation were risk factors for medium-term mortality.

Conclusion
AKI is a common complication after intervention for PAD and is associated with medium-term mortality.

Outcome of surgical revascularisation of acute upper limb ischemia: A single centre experience

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Background
The purpose of this study is to report the outcomes of surgical revascularisation in AULI in terms of technical success, clinical success, and complications.

Methods
A retrospective analysis of all 141 patients (42.6% male, median age 69 years) who presented with acute upper limb ischemia. Symptomatic patients who were deemed to require surgical revascularisation, either brachial embolectomy or more complex intervention in NNUH vascular centre from January 2010 to October 2021 were included. The baseline demographic characteristics, site of arterial occlusion, cancer status, and the potential underlying aetiology were collected along with re-intervention rates. The objective endpoints were initial technical success, re-intervention rate, local and systemic complications, functional outcome at follow-up, amputation and disease related readmission rate.

Results
CTA was the first line diagnostic imaging modality, with the brachial bifurcation as the most common location for obstruction. The initial technical success rate was 68.09% (n: 96), there were 33.33% (n: 47) postoperative major adverse events, with 12.77% (n:18) early thrombosis, and total 3.55% (n: 5) perioperative stroke and 4.96% mortality. Local complications occurred in 6.38% (n: 9), In addition 5.67% required subsequent amputation. 119 patients out of 141 (84%) have a good functional outcome with no deficit during follow-up.

Conclusion
AULI is often associated with underlying systemic and cardiac disorders. Surgical intervention is not without risk with re-thrombosis and further embolic events common. 84% of patients had a good functional outcome despite only 53% being successfully revascularised without early re-occlusion, therefore a more conservative approach may be appropriate.

A systematic review and meta-analysis of Randomized Controlled Trials comparing thermal versus non-thermal endovenous ablation in superficial venous incompetence

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Background
Endovenous thermal ablation has replaced open varicose vein surgery where possible as first line treatment of superficial venous incompetency. Available endovenous thermal ablation modalities include Endovenous Laser Ablation (EVLA) or Endovenous Radiofrequency Ablation (RFA). Recently non-thermal endovenous ablation techniques have been used which avoid use of tumescent anaesthesia and thermal energy. These include Mechanochemical ablation and Cyanoacrylate Glue ablation.

Methods
We conducted meta-analysis of randomized controlled trials comparing effectiveness and complications of thermal versus non-thermal endovenous ablation technique for superficial venous incompetence. Google Scholar, Pubmed and Cochrane Database were searched systematically using terms to identify relevant studies to be included. Meta-Analysis of the included studies is performed using Review Manager Software Version 5.

Results
Total of 7 randomized controlled trials met the selection criteria. Occlusion of treated vein at or pto 3 months vein was reported in 3 trials whereas 4 trials reported occlusion at 1-2 year. There was no statistically significant difference in occlusion rate at 3 Months and 1 - 2 years [OR: 1.26 (0.12 – 12.69) And 2.63 (0.24 – 29.21) respectively]. Random effect mode was used due to significant heterogeneity ($I2 > 50\%$, $p < 0.05$). There was no significant difference in quality of life as measured by Aberdeen Varicose Veins Questionnaire and Venous Clinical Severity Score.

Conclusion
There is no significant difference in occlusion rate and quality of life after thermal vs non-thermal endovenous ablation of varicose vein up to 2 years after the treatment.

Comparison of procedures pre- and post-hybrid theatre in a UK arterial vascular surgery centre

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Background
Hybrid theatres allow delivery of endovascular & open surgical interventions simultaneously, deploying higher quality angiography, superseding mobile 'C-arm' use. The Vascular Society of Great Britain & Ireland designated '24/7' access to a hybrid theatre as a Key Performance Indicator (KPI) for arterial centres. We compared procedures performed at our institution before & after installation of a hybrid theatre.

Methods
Our hybrid theatre became available in February 2016. We examined the procedures performed in the preceding year ('pre-hybrid'), and the subsequent five years ('hybrid'). The local operative database was interrogated and results cross-referenced with operation notes to define the procedures performed. Focus was placed on lower limb revascularisation (LLR) & abdominal aortic aneurysm (AAA) procedures.

Results
There were 226 pre-hybrid LLR, none of which included endovascular interventions. In the hybrid period (670 procedures), there were 333(49.7%) combined endovascular and open surgical interventions, 302(45.1%) were purely open, and 35(5.2%) were purely endovascular.
Of the 115 pre-hybrid aortic cases, 31(27.0%) were open, with 84 (73.0%) endovascular. 75(89.3%) were EVAR/EVAS, with 4(4.8%) ChEVAR/ChEVAS and 5 (6.0%) FEVAR. In the hybrid period, of the 539 aortic procedures, there were 312(57.9%) EVAR/ EVAS, 122(22.6%) FEVAR, 51(9.5%) BEVAR, 16(3.0%) ChEVAR, 23(4.3%) TEVAR and 15(2.8%) open surgical cases.

Conclusion
The hybrid theatre at our institution has facilitated a broader range of available LLR and AAA techniques for vascular surgeons & their patients. This supports the national KPI requiring all arterial centres to have '24/7' access to hybrid theatres.

Peripheral Prize session

Eligibility of COmmoN FEmoral artery atheroSclerotic diSease for endovascular treatment – the CONFESS study

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Background
Despite advances in endovascular technologies, the proportion of CFA lesions treated with endarterectomy (CFAE) which would be amenable to endovascular treatment with modern technologies is unknown. This study aimed to describe the morphology and composition of CFA lesions treated with surgical reconstruction in two high-volume centres and report the proportion that would be amenable to endovascular treatment.

Methods
All consecutive patients presenting with symptomatic PAD from January 2014 to December 2018 who underwent CFAE were included. Extensive data relating to the anatomy and morphology of the CFA atherosclerotic lesions were collected, including in-depth analysis of the composition of the CFA plaque using 3-dimensional reconstruction based on CTA.

Results
A total of 829 CFAs in 737 patients were included (mean age 71±10 years; 526 males, 71%); 451 (62%) presented with Critical Limb Threatening Ischaemia (CLTI). Overall, 271 CFAs (33%) had a severe calcium load (>1.1 cm^3) which would have required stenting; 376 (45%) target vessels had a calcium load <1.1 cm^3 with a patent CFA, PFA, and proximal SFA and therefore would have been amenable to less complex endovascular treatment. Four (0.5%) target vessels were characterised by an occlusion of the CFA, EIA, SFA, and PFA, and 642 (77%) by a patent CFA, PFA, and EIA.

Conclusion
A significant proportion of patients with atherosclerotic CFA lesions who undergo surgery could potentially be candidates for endovascular treatment. A randomised trial comparing CFAE and new endovascular techniques in this clinical context is urgently required.

The combination of vacuum-assisted thromboaspiration and covered stent graft for acute limb ischemia due to thromboembolic complications of popliteal aneurysm

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Background
We present a protocol of endovascular revascularization for patients with Acute Limb Ischemia due to Popliteal Artery Aneurysm (PAA) thromboembolic complication, based on the combination of vacuum-assisted thromboaspiration to improve tibio-pedal outflow and covered stent graft to exclude the PAA.

Methods
The primary endpoint was the primary technical success. The 30-day overall mortality and amputation rates were considered as secondary endpoints. Patients' overall survival, limb salvage, freedom from re-occlusion and reinterventions were reported as secondary late outcomes.

Results
Seventeen male patients were enrolled with a mean age of 75.7±9 years. Rutherford grading score was IIb in 47.1%. All patients had tibial arteries involvement, and in 9 cases there was also the occlusion of the PAA. Mechanical thrombectomy with Indigo/Penumbra thromboaspiration system was used in all patients. PAAs were excluded using one or more Viabahn covered endografts. Technical success was achieved in 94.1%. Including adjuvant endovascular procedures, intraprocedural technical success was 100%. Mortality and amputations' rates at 30-day were respectively 0% and 5.9%. Survival rates at 6- 12 and 24-months were respectively 94.1%, 86.3% and 67.9%. Freedom from reintervention was 80.4%, 65.8% and 54.8% at 6, 12, 24 months follow-up. Limb salvage was 88.2% at 6-, 12-, and 24-months follow-up respectively.

Conclusion
Our experience of total endovascular rescue for complicated PAA with thromboembolic events highlighted promising rates of limb salvage at 30-days. A prompt diagnosis and an endovascular management to maximize tibio-pedal outflow by mechanical thromboembolectomy, seems to improve clinical outcomes.

Inferior vena cava reconstruction: A single centre experience

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Background
Inferior vena cava (IVC) stenting is carried out for symptomatic chronic IVC stenosis or occlusion, and for the treatment of malignant IVC obstruction. We aim to determine the patency of IVC stents placed for both acute-on-chronic and chronic venous occlusion.

Methods
We completed a retrospective analysis of prospectively collected data on all patients that underwent technically successful IVC stenting for treatment of symptomatic venous outflow obstruction or stenosis between February 2015 to November 2021. All patients had standard preoperative work up, including venography +/- intravascular ultrasound for chronic cases, and followed standard anticoagulation and surveillance programmes post-procedure, unless there was malignant disease.

Results
16 patients underwent IVC stenting. 7 cases (43%) presented acutely with deep vein thrombosis and chronic underlying IVC stenosis or occlusion. 5 cases (31%) were for symptomatic malignant external IVC compression. In 4 cases (25%), kissing iliac stents were placed into the IVC to treat infrarenal IVC disease. The remainder required single stents in the IVC, or were combined with double-barrelled iliac stents. Re-intervention occurred in 4 cases (25%) for in-stent thrombosis. Primary patency was 75%, and primary-assisted patency was 88%. Stenting the IVC in all cases for malignant obstruction gave symptomatic relief.

Conclusions
Stenting of the occluded / atretic IVC may require additional access from the right internal jugular vein. Stenting above and across the renal veins did not cause any additional complications in our series. Stenting of the IVC is safe, and can give significant improvement in symptoms in patients with limited alternative options for treatment.

Medium term outcomes in patients undergoing atherectomy and anti-restenotic therapy vs. bypass, for long infrainguinal in-stent occlusions

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Background
The purpose of this study was to report medium term clinical outcomes following atherectomy and anti-restenotic therapy (DAART) for in-stent occlusions below the inguinal ligament and compare these to femoro-popliteal bypass.

Methods
Data were prospectively collected for all consecutive patients who presented with chronic limb threatening ischaemia (CLTI) and had undergone previous arterial stenting (femoro-popliteal segment) between October 2018 and October 2021 in a single tertiary vascular unit. Outcomes, including amputation free survival, patency, and target lesion revascularisation (TLR) were compared between those having DAART vs. bypass. All patients were entered into a uniform surveillance programme, including 3-monthly Duplex scans.

Results
Of 26 patients, 14 (4 female; 28%) underwent DAART vs. 22 who underwent femoro-popliteal bypass (3 female; 14%). Lesions were comparable in terms of length of occlusion (19cm vs. 21cm, p=0.09) and number of occluded stents (2 vs. 2, p=0.44). Severe calcification of target lesions was common and did not differ between groups (65% vs. 63%, p=0.19). Over a median follow-up of 18 months (range: 4-36 months), there were no differences in amputation free survival (71% vs. 68%, p=0.10) or primary assisted patency (86% vs. 90%). Patients having DAART were more likely to require TLR (42% vs. 32%, p=0.01).

Conclusions
This series with prospective uniform follow-up including frequent imaging shows that percutaneous DAART for in-stent occlusions below the inguinal ligament has promising results, even when compared with bypass. Re-intervention rates, however, are high in both arms, especially those having DAART.

A Single Centre Early Experience of Directional Atherectomy in Managing Lower Limb Ischaemia

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Background
Directional atherectomy has increasingly become an effective and safe endovascular technique in treating patient with claudication and critical limb threatening ischaemia. This study reports a single centre early experience of using directional atherectomy.

Methods
This is a retrospective study of a prospectively collected data of patients who underwent directional atherectomy for short distance claudication or critical limb threatening ischaemia in the Northern Vascular Centre, Freeman hospital, Newcastle. 3-months primary patency, secondary patency, limb salvage/amputation, technical success, adverse events, and median lesion length were analysed.

Results
25 patients (median age 69 years [35-88]) underwent directional atherectomy between 2019 and 2021 for debilitating short distance claudication and critical limb threatening ischaemia. Patients were either unfit for major open revascularisation bypass or had hostile groin. HawkOne™ Directional Atherectomy System (Medtronic, USA) was used to treat 18 Femoral-Popliteal arteries, 3 External Iliac arteries, and 4 External Iliac and Common Femoral arteries with a median lesion length of 96.3 mm (70-109). 96% technical success with primary patency of 88%, with 100% success in resolving rest pain in CLTI and improving claudication distance to more than 200 meters. 4 patients who required re-intervention with secondary patency of 96%. 3 adverse events were observed (2 distal embolisation and one intimal dissection). 96% limb salvage rate and 4% mortality was recorded from intra-operative bleeding.

Conclusion
Directional atherectomy showed promising technical and clinical short-term outcomes in selective cases. Multi-centre randomised controlled trials are required for better understanding the long-term outcomes in managing patients with peripheral arterial disease.

Perception and acceptability of Open vs Endovascular treatment of Common Femoral Artery disease: Barriers and facilitators for Randomised Controlled Trials

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Background
Endarterectomy remains the standard of care for CFA atherosclerotic disease; however, there have been advances in endovascular CFA therapies. RCTs comparing CFA treatments, though, have suffered from multiple pitfalls. This research assessed barriers and enablers of delivering high-quality RCTs in this context, from a healthcare professionals' point-of-view.

Methods
A mixed-methods qualitative study was performed, including a structured online survey and face-to-face semi-structured interviews with healthcare professionals. Survey content and interview topic guides were developed following a literature review to identify ongoing and completed RCTs. Results were analysed using thematic analysis.

Results
A total of 121 participants completed the online survey, including vascular surgeons (75, 62%) and interventional radiologists (22, 18%), mostly from the United Kingdom (92, 76%). A total of 61 participants (51%) would be willing to take part in a RCT comparing open vs. endovascular CFA revascularisation. The majority (89, 74%) believed that such an RCT is urgently needed. 15 participants were interviewed face-to-face. Five main themes emerged regarding barriers and facilitators for a high-quality RCT: factors directly limiting patient recruitment; clinicians' attitudes towards equipoise between treatments; clinicians' attitudes towards endovascular therapies; attitudes towards outcomes examined in a potential RCT; factors facilitating patient recruitment.

Conclusion
The vast majority of those surveyed believed an RCT comparing CFA treatments is necessary and would not oppose taking part in it. We have also identified important barriers and enablers, grouped in five overarching themes, which should be taken into consideration when designing and delivering such an RCT.