Vascular Society of Great Britain and Ireland

The following abstracts are from the papers presented to the 42nd Annual Scientific Meeting of the Vascular Society of Great Britain and Ireland, held in Manchester UK on 28th–30th November 2007. The President of the Society, Professor George Hamilton was in the Chair. The BJS Prize was won by Mr AR Thompson from University College, London, and the Founder's Prize was won by Mr RA Weerakkody from Cambridge University Hospital. All prize abstracts are published in the print edition of BJS (vol 95: issue 2, February 2008).

The abstracts should be cited as in the following example:
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Circulating blood leucocyte telomere DNA content predicts vascular wall telomere DNA content in humans with and without vascular disease

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Introduction: Telomere length is an index of cell age and replicative capacity. Reduced telomere length in circulating leucocytes in humans is associated with premature vascular disease and by implication, accelerated vascular ageing. A link between telomere length in circulating leucocytes and the vessel wall has never been established. We thus investigated the relationship between vascular wall and circulating leukocyte telomere length in humans with and without overt vascular disease.
Methods: Two subject groups were compared: 41 patients with asymptomatic AAA, undergoing elective open repair, and 22 age-matched people with morphologically normal aortas harvested at the time of cadaveric organ donation. Telomere content was compared by quantitative PCR and expressed as the telomere : genomic DNA ratio from aortic wall biopsies and blood leucocytes.
Results: The telomere : genomic DNA content was significantly reduced in wall biopsies of AAA *versus* normal aorta (AAA; 1·77 +/− 0·17, *versus* normal aorta; 2·40 +/− 0·15, $P = 0·001$) and in the circulating leucocytes of AAA *versus* normal aorta (AAA; 0·82 +/− 0·06, *versus* normal aorta; 1·27 +/− 0·21, $P = 0·0003$) and also after age- and gender-adjustment. There was a strong correlation between leucocyte and vascular wall telomere content in both diseased and healthy cohorts (AAA; $r = 0·443$, $P = 0·050$, normal aorta; $r = 0·676$, $P = 0·016$). Taken together the correlation across all vessel and blood leucocyte pairs was highly significant ($r = 0·619$, $P = 0·0002$).
Conclusion: The findings demonstrate that leucocyte DNA content is predictive of vascular telomere content and is an accurate surrogate for human vascular age. The significant correlation between vessel and leucocyte levels supports a systemic process.

A comparison of aneurysmal and atheromatous aortic wall using a whole transcriptome analysis reveals differential expression of a number of novel genes

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Introduction: The objective of this study was to produce a gene expression profile of human aneurysmal and atheromatous aortic wall.
Methods: cDNA was prepared from full thickness aortic wall obtained during open abdominal aortic aneurysm repair and bypass for atheromatous aortic disease ($n = 5$, each). The cDNA was hybridized to a HU133 plus 2·0 micro-array that interrogates the whole human genome. Data were analysed using GeneSpring software. A significance threshold was set at $P < 0·03$ and only genes that were consistently expressed with a two-fold difference were considered.
Results: Two hundred and sixty-eight genes were differentially expressed (fold change with p value). These included genes in the following categories: i) proteolysis - folate hydrolase (2·8, $P = 0·001$), ADAM-9 (2·1, $P = 0·004$), ubiquitin-specific peptidase-31 (2·4, $P = 0·009$); ii) inflammation - interferon-γ receptor-1* (2·1, $P = 0·0001$), immunoglobulin g-1 (2·6, $P = 0·002$), prostaglandin E synthase* (2·2, $P = 0·004$); iii) angiogenesis - alanyl aminopeptidase (3·0, $P = 0·017$), angiopoietin-2 (2·2, $P = 0·018$), plexin-1 (2·1, $P = 0·02$); iv) apoptosis - LIMS-1 (2·2, $P < 0·0001$), Apo E (3·0, $P = 0·016$), effector cell peptidase receptor 1 (3·7, $P = 0·01$). (*Increased expression in AAA wall.)
Conclusion: This micro-array study reveals novel genes that are differentially expressed in abdominal aortic aneurysm wall. It also shows that MMPs are equally expressed in aneurysmal and atheromatous aortic wall.

NT-pro B-natriuretic peptide is an independent predictor of postoperative troponin-I release in patients undergoing major vascular surgery

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Introduction: Postoperative myocardial ischaemia remains the leading cause of morbidity and mortality in patients undergoing major vascular surgery. Pre-operative levels of B-type natriuretic peptide (BNP) released from myocardium has been shown to be an independent predictor of cardiac events after major non-cardiac surgery. We aimed to determine if the derivative N-Terminal-proBNP (longer t1/2) can predict postoperative myocardial injury in vascular patients.
Methods: One hundred and twenty-two patients undergoing elective surgery for subcritical limb ischaemia or abdominal aortic aneurysm repair were recruited. Patients in atrial fibrillation or chronic renal failure were excluded. Plasma NT-proBNP was measured pre-operatively and daily samples for troponin-I assayed until the fifth postoperative day.
Results: Twenty-four (20%) patients documented a postoperative myocardial injury (troponin > 0·1 ng/ml). The median NT-proBNP of 'troponin positive' patients was significantly higher than those who were 'troponin negative' (380 pg/ml [inter-quartile range 223–967] *versus* 209 pg/ml [109–363], $P = 0·003$). A cut-off value of 284 pg/ml was derived with a sensitivity = 71% and specificity = 64% (AUC 70%). The pre-operative NT-proBNP levels above this threshold remained an independent prognostic indicator of myocardial injury (odds ratio: 6·73, 95% c.i. 1·58–28·7, $P = 0·01$) after adjustment for cardiac risk factors, hsCRP and interleukin-6 levels.
Conclusion: Elevated pre-operative plasma NT-proBNP levels independently predict postoperative rise in troponin-I which is associated with adverse outcome

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in the short and long term regardless of the presence of symptoms or an acute coronary syndrome.

Cigarette smoking is associated with impaired endothelial function in human saphenous vein

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Introduction: The aim of this ex vivo study was to assess the effect of smoking, hypertension and diabetes mellitus on endothelial function in human saphenous vein, a commonly used conduit for coronary and peripheral arterial bypass surgery.

Methods: A segment of long saphenous vein harvested during infra-inguinal bypass surgery was divided into 3–5mm rings. Rings were mounted in an organ bath for isometric tension studies. Vein rings were pre-contracted to submaximal contraction with phenylephrine, followed by endothelium-dependent relaxation with acetylcholine. Comparison of contraction-response curves was evaluated by two-way analysis of variance for repeated measures (two-way ANOVA).

Results: Long saphenous vein segments were collected from 26 patients, including five females, with a mean age of 66·4 years (48–92). Current smokers had impaired endothelium- dependent relaxation compared to ex and non-smokers (10·2%, $n = 13$ *versus* 32·9%, $n = 13$, $P < 0·01$). However, ex-smokers and non-smokers did not have a significant difference in relaxant responses to acetylcholine (29·1%, $n = 8$ *versus* 24·6%, $n = 5$, $P =$ ns). Similarly, diabetic and non-diabetic patients did not show a significant difference in endothelium-dependent relaxation (23·1%, $n = 10$ *versus* 15·6%, $n = 16$, $P =$ ns). The relaxant responses in hypertensive and normotensive patients were not different (20·4%, $n = 12$ *versus* 22·5%, $n = 14$, $P =$ ns).

Conclusion: The current smokers show a significant reduction in the endothelial function of saphenous vein as compared to ex and non-smokers. However, there was no difference in endothelial relaxation in ex *versus* non-smokers. Thus, this study highlights the significance of impaired endothelial function as one of the mechanisms by which smoking can compromise the patency of vein graft.

The biomechanical and physical properties of connective tissue in patients with abdominal aortic aneurysm

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Introduction: To investigate a suggested link between abdominal aortic aneurysm (AAA) formation and systemic connective tissue changes by studying the physical and biomechanical properties of the skin and rectus sheath of patients with AAA and controls without.

Methods: Site-matched samples of skin and rectus sheath were obtained from patients undergoing elective open AAA repair and from controls undergoing elective laparotomies for non-inflammatory colorectal disease. Samples were prepared using a cutting jig before being tested on an Instron 6022 mechanical test frame. Thickness of skin and rectus sheath was measured using video microscopy.

Results: There was no difference in the maximum load to break, maximum stress, maximum displacement to break or Young's modulus between the skin or rectus sheath of aneurysm patients and controls ($P > 0·05$, t-test). There was no difference in the thickness of skin from aneurysm patients (2·87 mm) or controls (2·58 mm) ($P > 0·05$, t-test). The rectus sheath of aneurysm patients (3·00 mm) was significantly thicker than that of controls (1·83 mm) ($P = 0·0399$, t-test).

Conclusion: To our knowledge this technique has not been applied before to the connective tissue of either group of patients. For a small sample group there is no difference in biomechanical characteristics of the connective tissue between patients with AAA and other patients undergoing laparotomy, despite the rectus sheath being thicker in aneurysm patients. This leads us to believe any connective tissue difference is likely to be represented in altered collagen type or markers of collagen metabolism.

Elevated plasma MMP-9 is associated with increased 30-day mortality in ruptured abdominal aortic aneurysms

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Introduction: The role of matrix metalloproteinases (MMPs) in aneurysm development and rupture is well described. However, a clear role for plasma MMPs in disease prediction has proved elusive. The plasma concentrations of various MMPs have been reported to predict the natural history of small AAAs. The elevation of specific MMPs within the vessel wall of ruptured AAA is observed but a change in plasma MMP levels at the time of rupture has not been described. The aim of this study was to determine if circulating levels of MMPs and their endogenous tissue inhibitors (TIMPs) reflect the clinical state of an AAA, namely stable *versus* ruptured.

Methods: Concentrations of MMP-1, MMP-2, MMP-3, MMP-9, and their endogenous tissue inhibitor TIMP-1 were quantified using ELISA in plasma samples taken pre-operatively from non-ruptured ($n = 52$) and ruptured AAA ($n = 16$). Statistical analysis used the Mann-Whitney U test ($P < 0·05$).

Results: MMP-1 and MMP-9 were elevated in the plasma of ruptured AAA *versus* non-ruptured AAA (MMP-1; rupture, 20·2ng/ml [16·1–28·7] *versus* non-rupture, 8·9ng/ml [5·6–15·7], $P < 0·0001$: MMP-9; rupture, 59·1ng/ml [20·8–123·7] *versus* non-rupture, 17·5ng/ml [10·3–34·2], $P = 0·006$). Death at, or within 30 days of surgery for ruptured AAA was associated with a four-fold elevation in pre-operative MMP-9 compared with those surviving for greater than 30 days (mortality ≤ 30 days [$n = 5$], 131·9 ng/ml [75·5–191·8] *versus* mortality > 30 days [$n = 11$], 32·2 ng/ml [5·9–129·5], $P = 0·017$).

Conclusion: In conclusion, these findings further support the role of MMPs in AAA pathogenesis. Elevated plasma MMP-9 is associated with aneurysm rupture and 30-day mortality. Inhibition or suppression of MMP-9 may offer the very real possibility of improving survival from rupture.

Membrane Type-1 matrix metalloproteinase: a key player in carotid plaque instability and symptomatic carotid atherosclerotic disease

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Introduction: To evaluate the role of Membrane Type-1 matrix metalloproteinase (MT1-MMP), a membrane-bound enzyme capable of degrading the extracellular matrix of the fibrous cap, as a mediator of carotid plaque instability.

Methods: Tissue samples from patients undergoing carotid endarterectomy (20 symptomatic, 8 asymptomatic, Gray-Weale classification range 1–4) were immunostained for MT1-MMP. Percentage immunopositivity for MT1-MMP in five regions of interest within each plaque was assessed using image analysis software (AnalySIS). MT1-MMP mRNA expression was evaluated by reverse transcription quantitative polymerase chain reaction (RT-QPCR). Age, sex, degree of stenosis and statin usage were used as adjustment variables.

Results: MT1-MMP staining was scant on intact fibrous caps but was strong at the site of fibrous cap rupture. The crude staining was 23·4% for ruptured caps *versus* 2·24% for intact fibrous caps, $P = 0·0028$, and remained similar after adjustment; plaques with higher Gray-Weale scores had an increased presence of ruptured plaques, χ^2, $P = 0·0001$. Higher levels of MT1-MMP mRNA were found in symptomatic *versus* asymptomatic plaques, unit difference 3·15 (95% c.i. 0·41 to 5·88), $P = 0·027$, and adjusted results were very similar; there was no correlation with Gray-Weale score.

Conclusion: MT1-MMP is expressed at the site of fibrous cap rupture and at increased levels within symptomatic carotid plaques. This suggests that MT1-MMP has a critical role in carotid plaque instability and the genesis of carotid symptoms.

Characterisation of fractalkine/CX3CL1 and fractalkine receptor (CX3CR1) expression in abdominal aortic aneurysm disease

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Introduction: Chronic inflammation and vascular smooth muscle cell (vSMC) apoptosis is an emerging concept in the development of AAA disease. Recent studies have demonstrated NK-cells from AAA patients display increased cytotoxicity to vSMC. The chemokine, fractalkine (CX3CL1), is expressed on vSMC and promotes adhesion and extravasation of leucocytes through interactions with the receptor CX3CR1. This study aims to analyse expression of CX3CL1 and CX3CR1 in AAA disease.

Methods: Immunohistochemistry (IHC) was used to define expression of CX3CR1 in AAA tissue ($n = 31$). Multi-parametric flow cytometry (FC) was

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used to determine CX3CR1 expression on haematopoietic cells (CD45+), T-cells (CD3+) and NK-cells (CD56+) obtained from peripheral blood (PB) of AAA patients ($n = 19$). Percentage median values were calculated with IQR.

Results: IHC demonstrated CX3CR1+ cells in 20 out of 31 AAA tissues with staining located primarily in either the media and adventitia. FC revealed that 24·6% (22·3–26·8) of CD45+ cells were CX3CR1+; 8·04% (4·4–17·6) of the CD45+ cells were CD56+/CX3CR1+; 68·6% (40·6–86·8) of all CD56+ NK-cells expressed CX3CR1. Only 10·6% (6·6–38·3) of CD3+ cells expressed CX3CR1. In contrast CD3+ cells formed the highest percentage of CX3CR1+ cells in AAA tissue (20·9%, 14·2–27·4).

Conclusion: The findings suggest a role for the CX3CL1-CX3CR1 interaction in the recruitment of inflammatory cells seen in AAA tissue. Analysis of PB mononuclear cells from patients with AAA demonstrated a high level of CD56+/CX3CR1+ NK-cells. The CX3CL1-CX3CR1 interaction could contribute to the increased NK-cell cytotoxicity to vSMC.

Prevalence and correlation of hyperhomocysteinemia to amputation-free survival (AFS), major adverse events (MAE) and mortality after intervention for critical lower limb ischaemia (CLI) in patients with peripheral vascular disease

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Introduction: The relationship between hyperhomocysteinemia and patency after PVD interventions has previously been inconclusive and controversial. We aim to assess the prevalence and correlation of hyperhomocysteinemia to clinical and technical outcome of revascularisation procedures for CLI. Composite primary endpoints include primary and secondary patency rates, AFS, MAE and all-cause mortality.

Methods: Between 2002 and 2006, 953 revascularisation procedures were performed for CLI. Fasting plasma homocysteine was measured in 229 patients. The incidence of hyper-homocysteinemia was 30%. Mild hyperhomocysteinaemia (13–20 μmol/L) was found in 88%. Patients with normal and hyperhomocysteinemia were comparable.

Results: Primary patency rate for hyperhomocysteinemia patients was less than half that of normal homocysteine patients (34·78% *versus* 73·88%, $P < 0·0001$). There was a similar finding with respect to assisted primary patency rate, though this was not statistically significant (25% *versus* 42%, $P = 0·08$). There was no significant difference between groups with regards to secondary patency rate. However, mean AFS was significantly shorter for patients with hyperhomocysteinemia (31 *versus* 34 months, $P = 0·008$). Overall, 26% of the normal homocysteine group progressed to vessel occlusion compared to 65% of the hyperhomocysteinemia group ($P < 0·0001$). There was no significant difference between groups with respect to 4-year cumulative all-cause mortality ($\chi^2 = 0·946$). In addition, we found hyperfibrinogenemia to be an independent significant variable associated with reduced primary patency rate and progression to vessel occlusion.

Conclusion: We believe that hyperhomocysteinemia is an independent risk factor for the progression of PVD and is an adverse prognostic factor for CLI patients undergoing peripheral arterial revascularisation.

Increased SDF-1alpha and CXCR4 but not SDF-1beta expression in human critical limb ischaemia

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Introduction: SDF-1 plays a critical role in many physiological processes, including stem cell homing and angiogenesis. SDF-1 has two spliced variants: SDF-1alpha and SDF-1beta. We have previously shown that SDF-1beta has more potent angiogenic properties compared to SDF-1alpha. The objective of this study is to determine the pathophysiological expressions of the SDF-1 variants and its cognate receptor, CXCR4, in human critical limb ischaemia (CLI).

Methods: Skeletal muscle biopsies were obtained from the lower limbs of 12 patients with CLI and 12 patients without limb ischaemia (controls), with ethical committee approval. Immunohistochemistry localised the expressions of SDF-1 variants and CXCR4. Double immunofluorescence labelling was used to colocalise cell-specific antigens by confocal microscopy. SDF-1 variants and CXCR4 protein expressions were evaluated by Western blotting. Statistical analyses used the Mann-Whitney *U* test.

Results: In CLI, SDF-1alpha is extensively expressed by skeletal muscle fibres but there was minimal expression of SDF-1beta. CXCR4 is extensively expressed and is colocalised to microvessels. A significant 2·6-fold increased protein expression ($P < 0·05$) of SDF-1alpha was noted in the CLI group. There was no significant difference in the protein expressions of SDF-1beta in both groups. CXCR4 expressions showed a 3·5-fold increase of protein expression in the CLI group.

Conclusion: SDF-1alpha expression is localised to muscle fibres only and is raised in CLI. However, there was minimal expression of SDF-1beta, either in muscle fibres or microvessels. The lack of SDF-1beta may partly explain the inadequate angiogenic response in CLI.

Topical wound oxygen (TWO_2) *versus* conventional compression dressings (CCD) in the management of refractory non-healing venous ulcers (RVU); a parallel observational pivotal study in CEAP category six patients

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Introduction: TWO_2 proposes an opportunity in the management of RVU. The aim of this study is to prove the safety and efficacy of TWO_2.

Methods: The primary endpoint is the proportion of ulcers healed, percentage of reduction in ulcer size, time to full healing and bacterial elimination at the end of therapy. Secondary endpoints are pain reduction and recurrence rates. In the TWO_2 group, the limb was placed in a TWO_2 chamber for 180 min bi-daily. The compression group was managed using Profore dressings.

Results: Forty-six chronic RVU of more than two years' duration were managed using TWO_2 and 36 with CCD. Both groups were comparable. All patients were classified as C6. At three months, 80% of TWO_2-managed ulcers ($n = 37$) were completely healed, compared to 25% ($n = 9$) of CCD ($P < 0·0001$). Mean time to 70% reduction in surface area was 22 days in the TWO_2 group as opposed to 125 days in the CCD group ($P < 0·0001$). Mean time to full healing or skin grafting was 62 days in TWO_2 patients and 187 days in CCD ($P < 0·0001$). Seventeen ulcers were MRSA-positive, nine of which became MRSA-negative after TWO_2 treatment. This is compared to 18 MRSA ulcers managed by CCD, all of which remained positive after treatment ($P = 0·033$). The pain score threshold in the TWO_2-managed patients improved from eight to three by 13 days. After 3 months' follow-up, three of the nine healed CCD ulcers showed signs of recurrence compared to none of the 37 TWO_2 healed ulcers.

Conclusion: TWO_2 is a valuable tool, safe and effective in managing chronic RVU.

Intraluminal thrombus has a selective influence on matrix metalloproteinases (MMPs) and their inhibitors (TIMPs) in the wall of abdominal aortic aneurysms (AAAs)

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Introduction: The influence of intraluminal thrombus on the proteolytic environment within the wall of an abdominal aortic aneurysm is unknown. We aimed to assess the influence of intraluminal thrombus on the expression and activity of MMPs and TIMPs within the adjacent AAA wall.

Methods: Thirty-five patients, 26 men, median age 73 (range 66-82) years undergoing elective repair of AAAs were studied. A full thickness AAA wall specimen was taken from each patient and the exact position was noted. All samples were snapped frozen and analysed for MMP-2, -8 and -9 and TIMP-1 and -2 using ELISA. Statistical analysis was performed using SPSS v14. Thrombus thickness at specimen sites was measured on the pre-operative CT scan.

Results: Active concentration of MMP-9 and TIMP-1 were significantly positively correlated with thrombus thickness with a Pearson correlation coefficient r of 0·45 and 0·42, respectively. MMP-2 (active and total) and TIMP-2 showed a positive correlation although not statistically significant.

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MMP-8 (active and total) showed a non-significant negative correlation with thrombus thickness.
Conclusion: Intraluminal thrombus thickness has a significant positive correlation with active MMP-9 (elastase) and TIMP-1, and a negative correlation with MMP-8 (collagenase). This may have some implication for AAA expansion and rupture.

Patients with abdominal aortic aneurysms show changes in collagen content and type in their connective tissue

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Introduction: To see if the changes in collagen content and type seen in the wall of abdominal aortic aneurysms (AAA) are also represented in the skin and rectus sheath as part of a systemic connective tissue disorder.
Methods: Samples of skin and rectus sheath were obtained at the time of surgery from patients undergoing elective open AAA repair and controls undergoing laparotomy for non-inflammatory colorectal disease. Collagen content was measured by hydroxyproline analysis. Collagen I : III ratio was analysed by using interrupted reduction and polyacrylamide gel electrophoresis in the presence of sodium dodecyl sulphate.
Results: There was a significantly reduced amount of total collagen content in the skin of aneurysm patients compared to controls ($P = 0{\cdot}0015$, t-test) but no difference was seen in the collagen I : III ratio ($P = 0{\cdot}75$, t-test). There was no difference in the total collagen content of the rectus sheath between groups ($P = 0{\cdot}54$, t-test). AAA patients had a significantly higher collagen I : III ratio than control patients ($P = 0{\cdot}044$, t-test).
Conclusion: The increased collagen I : III ratio in the rectus sheath represents a systemic reduction in type III collagen in aneurysm patients consistent with changes seen in some familial aneurysms. Combined with the reduction in skin collagen, this further supports the idea of aneurysmal disease as being part of a systemic connective tissue disorder.

Vascular endothelial growth factor is over-expressed at the site of abdominal aortic aneurysm rupture and promotes the formation of angiotensin-II-induced aneurysms in apolipoprotein E-deficient mice

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Introduction: An abdominal aortic aneurysm (AAA) rupture site is associated with increased angiogenesis but the significance of this is unknown. This study identified candidate pro-angiogenic genes in a human AAA rupture site and investigated the functional significance of VEGF in an angiotensin-II (Ang-II) mouse aneurysm model.
Methods: Micro-array analysis and QRT-PCR validation studies were used to identify differentially expressed ($> 2{\cdot}5$-fold, $P < 0{\cdot}005$) pro-angiogenic genes at human aneurysm rupture sites ($n = 10$) using paired anterior sac as internal controls. To investigate the role of VEGF, apo E−/− mice were assigned to either: i) saline infusion (placebo control); ii) ang-II infusion (which induced aneurysm formation); iii) ang-II infusion plus 14 days 100 mcg VEGF; or iv) ang-II infusion plus 21 days 100 mcg VEGF. Aortic diameter and cross-sectional area were determined by MRI at 21 and 28 days.
Results: Four pro-angiogenic genes (PROK2, IL8, ANGPTL4, VEGF) were over-expressed at human aneurysm rupture sites. All mice in Ang-II+14dVEGF and Ang-II+21dVEGF groups developed aneurysms by day 21 compared to only 40% in the Ang-II infusion group. VEGF treatment increased diameter and cross-sectional area of aneurysms at day 21 ($P < 0{\cdot}002$) and this effect was maintained at day 28 ($P < 0{\cdot}0005$). Decreasing VEGF treatment from 21 to 14 days did not attenuate aneurysm formation. VEGF upregulated aortic wall MMP-2 gene expression ($P < 0{\cdot}0009$).
Conclusion: VEGF gene was over-expressed at human AAA rupture sites and VEGF promoted formation of ang-II-induced aneurysms. Whether anti-VEGF therapy reduces risks of aneurysm expansion or rupture merits further investigations.

Quantitative bilateral photoplethysmography for peripheral arterial disease detection: a prospective assessment

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Introduction: To prospectively assess the diagnostic accuracy of a novel bilateral photoplethysmography (PPG) toe pulse measurement technique for the diagnosis of lower limb peripheral arterial disease (PAD).
Methods: Bilateral PPG toe pulse measurements were compared with ankle to brachial pressure index (ABPI) reference measurements. The setting was a controlled environment within a tertiary vascular surgical unit. Innovative pulse wave analysis techniques (device winner of national NHS HSC Award for Innovative Technology) extracted shape and timing characteristics from the great toe sites and also their right-to-left side differences. These were compared with our previously obtained normative ranges and the diagnostic performance of detecting significant PAD (i.e. ABPI $<0{\cdot}9$), assessed using accuracy and the Kappa statistic (agreement between techniques beyond chance).
Results: One hundred and eleven subjects were studied (range 40–90 years), with 63 normal and 48 PAD by ABPI. Subjects within the two ABPI groups were matched in age, sex, height and heart rate. Substantial agreement between pulse and ABPI classifications were obtained for the degree that pulse shape fell beyond the normal range of normalized shapes (accuracy 91%, Kappa 0·80) and also pulse transit time differences between the right and left toes (accuracy 86%, Kappa 0·70).
Conclusion: This technique could offer significant benefits for the diagnosis of PAD in settings such as primary care where non-invasive, quick, affordable and 'de-skilled' diagnostic techniques are desirable. Improved diagnosis and screening for PAD has the potential to allow identification and cardiovascular risk factor management for this group.

Skeletal muscle myosin heavy chain expression in claudicants; effect of a supervised exercise programme

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Introduction: There is growing evidence that supervised exercise for claudication exerts effects on local calf muscle metabolism. The relative expression of the differing myosin heavy chains (MHCs) within skeletal muscle is a key determinant of muscle metabolism. Compared to MHC II, MHC I is better able to generate ATP, switching less rapidly to anaerobic metabolism during prolonged physical activity. This study sought evidence of a shift in MHC protein expression within gastrocnemius muscle as a result of supervised exercise for claudication.
Methods: Thirty-seven claudicants were recruited. Subjects undertook a three-month supervised exercise programme. Controls were patients awaiting angioplasty for claudication. Both groups underwent paired gastrocnemius needle biopsies. Relative MHC expression was determined by SDS gel electrophoresis.
Results: Following exercise training, maximum walking distance (MWD) increased by 109% ($P < 0{\cdot}01$). At recruitment the relative MHC expression was MHC I 34·3% (±6·8), MHC IIa 42·0% (±7·1) and MHC IIx 23·7% (±4·9). Following supervised exercise training there was a significant increase in MHC I expression +11·1% (±3·9, $P < 0{\cdot}05$), not witnessed in the control group. The largest shifts in MHC expression occurred in subjects with the greatest increases in MWD.
Conclusion: Improved walking distance after supervised exercise training for claudication is associated with an increase in MHC type I expression. This increased MHC 1 expression may contribute to improved skeletal muscle oxidative capacity and is worthy of further investigation as a means to increase walking distance in patients unable to participate in supervised exercise programmes.

The impact of a diabetic foot protection team (DFPT) on outcomes for patients with diabetic vascular disease

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Introduction: Over 40% of patients with peripheral arterial disease (PAD) have diabetes and this group have a worse prognosis; the majority of lower limb amputations in the UK being performed for diabetic vascular disease. We set out to identify methods to reduce the amputation rate for patients with diabetes.
Methods: A prospective database was established for patients with diabetic foot complications. For 6 months a mapping exercise was undertaken to identify

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areas of poor practice. A protocol was then introduced and implemented by a diabetic foot protection team (DFPT) working across primary and secondary care. The results of the first 3 years of this project are presented.

Results: Minor amputations increased by 42%, but there was an overall 60% reduction in major amputations carried out over 3 years. There was a 7% yearly increase in patients treated, hospital admissions increased form 118 to 174 patients per year and revascularisation rates increased. However, despite this, median length of hospital stay reduced from 47 to 19 days, saving 5662 bed days (equating to £1·3 million savings). The DFPT also identified HRG coding inaccuracies amounting to a potential £750, 000 loss to the service. Investment in the service was £52, 000 per year.

Conclusion: We have demonstrated that a DFPT will reduce major amputation rates and hospitalisation in patients with diabetes. It is highly cost-effective, reducing length of stay by 60%. A national approach to the problem of diabetic vascular disease could make a major impact on amputation rates in the UK.

Inherent functional differences between saphenous vein smooth muscle cells cultured from non-diabetic and Type 2 diabetic patients

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Introduction: Compared with their non-diabetic counterparts, individuals with Type 2 diabetes mellitus (T2DM) are at increased risk of coronary artery disease and saphenous vein (SV) graft stenosis following coronary artery bypass grafting (CABG). The primary cause of graft failure is intimal hyperplasia, characterised by smooth muscle cell (SMC) proliferation and migration. We hypothesised that SV-SMC from T2DM patients are intrinsically more proliferative and migratory, thereby contributing to this difference.

Methods: SV-SMC were explanted from six non-diabetic and six T2DM undergoing CABG. Cell proliferation was determined over 7 days in response to 10% foetal calf serum (FCS), or insulin (100 nM) combined with platelet-derived growth factor (PDGF, 10 ng/ml). Migration was quantified with modified Boyden chambers. Western blotting was used to assess activation of ERK-1/2 and AKT signalling pathways. Data were analysed using unpaired ratio t-tests.

Results: SV-SMC from T2DM were morphologically distinct from non-diabetic patients and were less proliferative in 10% FCS ($P < 0{\cdot}01$). The proliferative rate of the two populations was similar in insulin+PDGF. In the presence of insulin, the migratory capacity of diabetic SV-SMC was significantly greater than those of non-diabetic patients ($P < 0{\cdot}05$). All the observed differences were independent of glucose concentration. No consistent differences in ERK and AKT signalling existed between the two populations.

Conclusion: This study has revealed a number of inherent functional differences between cultured SV-SMC from non-diabetic and T2DM patients that may account for the inferior patency of SV bypass grafts in T2DM patients. Determining the mechanisms underlying these effects may be of major clinical importance.

Development of a vascular bypass graft with polyhedral oligomeric silsequioxane nanocomposite (POSS PCU)

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Introduction: It is desirable to have a compliant and spontaneously endothelialising small diameter bypass graft. Therefore, it was aimed to: i) use a nanocomposite-containing biomaterial, which has been shown to have ideal properties for vascular implants to develop a graft; and ii) surface modify the polymer with peptides/proteins, which have been recognised to adhere to endothelial progenitor cells (EPC) and thus aimed to promote endothelialisation of grafts.

Methods: Bioactive peptides RGD/protein stem cell factor were incorporated and covalently attached to POSS PCU polymer and a coagulation technique was used to produce 3·5mm bypass grafts. Changes in diameter of graft segments were measured at physiological pulse pressure and flow, and diametrical compliance was calculated over a range of mean pressures. Both modified and unmodified graft segments were exposed to culture medium with peripheral blood mononuclear cells containing EPC, and EPC adhesion was tested. Also, the grafts were connected in a flow circuit and circulated with a similar EPC culture medium. Confirmation of cell markers was carried out using FACS analysis, RT-PCR and immunostaining.

Results: The grafts possess a porous interior and visco-elastic properties with a greater degree of compliance match compared to Dacron/ePTFE. Peptide/protein modification increased the number of EPC colonies and exposure to flow led to differentiation of cells. Cells expressed mRNA for the EPC markers CD34, CD31, CD133 and F1K-1/KDR. Endothelial cell-colony forming units were formed and were confirmed as endothelial-like cells by immunostaining.

Conclusion: A novel, compliant small diameter vascular bypass graft proved the potential to endothelialise *in situ*.

The proposed 18-week target - is there time for investigations?

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Introduction: Major aortic cases require detailed cardiac, renal and respiratory assessments. In light of current NHS initiatives to reduce length of stay (LOS) and limit time from referral to treatment to 18 weeks, we examined the effect of a dedicated nurse specialist to co-ordinate the work-up period.

Methods: With the appointment of a nurse specialist, clinic referrals were managed based on investigation results according to a pre-determined protocol. Dedicated diagnostic investigation slots and clinic appointments allowed timely management. We studied 44 patients before (group 1) and 193 consecutive patients after (group 2) employment of a nurse specialist. Data were collected prospectively. Data are presented as median values with inter-quartile range. Statistical analysis was performed using the Mann-Whitney *U* test.

Results: All patients in both groups completed a full set of investigations prior to surgery or stenting. The median LOS in group 1 was 12 days (IQR 9–16), compared with < 1 day (IQR 0–2) for group 2 with $P < 0{\cdot}001$. This reduction was largely due to the introduction of a co-ordinated day-case assessment, which was used in 56% of group 2 compared with 0% of group 1. At a cost of £500 per bed day this equates to a saving of £1113 per patient.

Conclusion: Co-ordination of investigations by a dedicated nurse specialist led to significant reductions in patient LOS. This should reduce costs, as well as exposure to hospital- acquired infections and will contribute to meeting the 18-week target.

Litigation claims in vascular surgery in the United Kingdom

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Introduction: To establish the incidence, costs and causes of medical negligence claims in relation to vascular surgery in the UK's NHS.

Methods: All claims related to vascular surgery reported to the NHS Litigation Authority from 1995 to April 2007 were included in the study. All data were subsequently reviewed, coded accordingly and analysed.

Results: Three hundred and ninety-five claims were analysed (mean: 53/year over the last five years) of which 303 have been settled. Of the latter, compensation was given in 160 (53%) cases, with total claims' compensation ranging from £21 to £654, 819. The overall litigation costs were £169, 111, 65. Successful claims varied from intra-operative problems (50%) (of which 75% were related to varicose vein [VV] surgery and 13% to peripheral vascular disease [PVD]), to failure/delay of treatment (14%), failure/delay of diagnosis (11%), postoperative treatment (6%), inappropriate treatment (6%) and others (13%). VV surgery was the most common type of disease/procedure involved in the successful claims (48%, claim range £35–£485, 000, total claim £6·2 million), in which intra-operative problems (66%) (60% nerve damage, 27% vessel damage), postoperative complications (18%) and inappropriate treatment (7%) were implicated. Other types of disease/procedures involved PVD (21%), abdominal aortic aneurysm disease (6%), infections/ulcers (5%), medical treatment (5%) and others (15%).

Conclusion: The number of claims related to vascular surgery has remained stable over the past 5 years. In general, 50% of claims are due to intra-operative complications, while problems related to VV form almost half of all successful claims.

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Medium to long-term results of thoracic endografting

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Introduction: The long-term durability of thoracic stent grafting is still unknown, especially given the thoracic aorta can be affected by a heterogeneous group of pathologies. This study examines mid-long-term follow-up for commercially available thoracic devices and aims to determine which variables may be predictive of outcome.

Methods: Data were collected prospectively between July 1997 and July 2007 in a consecutive series of patients and analysed.

Results: Two hundred and thirteen patients (65% men) underwent thoracic stent grafting for a variety of aortic pathologies. Median age was 71 years and mean aneurysm size was 6·4 cm. Thirty-day mortality was 4·3% (6/140) for elective and 9·6% (7/73) for urgent procedures. Paraplegia occurred in 4·2% (9/213) and was permanent in four (1·9%). Stroke occurred in 5·1% (11/213). Median follow-up was 30 (range 0–119) months. Adjuvant procedures were performed to optimise landing zone in 11·3%, to improve access using conduits in 3·3% ($n = 7$), and for postoperative complications in 5·1% ($n = 11$). Endoleaks were detected in 19·7% (42/213), and are on-going in 3·3% (7/213). Secondary interventions were performed in 14·6% ($n = 31$), including six graft explantations (four in dissection patients) and repair of two Type A conversions of Type B dissection. Aneurysm-related death occurred late in 3·8% (8/213). At median 30-month follow-up, 82·6% (176/213) have had successful treatment of their thoracic aortic pathology.

Conclusion: These medium to long-term data show that thoracic endoluminal devices are durable. The heterogeneity of the aortic pathology is reflected in the fact that complex aneurysms and dissections have a worse outcome than localised pathology (penetrating ulcers and small aneurysms), and therefore ongoing surveillance is essential.

Endovascular management of traumatic thoracic aortic injury (TAI)

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Introduction: Endovascular repair for TAI, which occurs predominantly in polytrauma patients, is a minimally invasive alternative to open surgery obviating the need for thoracotomy and cardiac bypass. This study assesses the feasibility of endovascular repair following blunt TAI at a single centre.

Methods: Data from 15 consecutive patients (mean age, 44 years; range, 16–84 years; sex, 3 females, 12 males) with a blunt TAI treated by endovascular stent graft insertion between October 2001 and March 2007 were prospectively collected. Demographics, injury characteristics, technique and complications were recorded. Follow-up data included computed tomographic angiography and plain chest radiography at regular intervals.

Results: All patients underwent endovascular repair within a median of 9 hours from hospital presentation (range 4–81 hours). Two patients underwent carotico-carotid bypass immediately prior to stenting during a single anaesthetic. The type of stent graft included Talent LPS/Valiant ($n = 7$), Excluder ($n = 6$) and Relay ($n = 2$). Successful exclusion of the TAI occurred in all patients. No procedure-related mortality, paraplegia and stroke were recorded. Complications included proximal migration of initial stent graft requiring surgical explantation in one patient and iliac artery avulsion requiring iliofemoral bypass in two patients. Median hospital stay was 12 days (range 4–58 days). Mean follow-up was 28·9 months (range 4–67 months).

Conclusion: In our study, endovascular repair of blunt TAI is a safe procedure and can be employed as an alternative to open surgery.

Wholly endovascular repair of thoraco-abdominal aneurysm: experience in a single UK centre

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Introduction: To evaluate the feasibility and safety of a purely endovascular approach to the repair of thoraco-abdominal aortic aneurysm (TAAA).

Methods: Six patients (4 male, 2 female) with a median age of 71 years (range 41–76) underwent wholly endovascular repair of TAAA (diameter 56–85 mm) employing individually customised endografts incorporating branches to 23 target vessels (renal 11, superior mesenteric 6, coeliac 6). The procedures were performed under general anaesthesia with spinal drainage. Patients have been followed by serial imaging (CT and duplex) for a median of 13 months (range 5–40). All data were prospectively entered onto a dedicated database.

Results: All grafts were deployed as intended with preservation of all target vessels. There were no postoperative deaths, strokes or paraplegia. One patient suffered a silent myocardial infarction. In two patients a persistent para-ostial endoleak was successfully treated during the same admission by further balloon dilatation of the stent within the target vessel ostium. Pre-discharge imaging confirmed exclusion of the aneurysm in all cases. One patient has required late secondary intervention to abolish endoleak due to sidebranch disconnection. In another patient late occlusion of the solitary renal artery has resulted in dependence on dialysis. There have been no late deaths and all aneurysms remain excluded.

Conclusion: Both open surgical and hybrid endovascular/surgical treatments of TAAA are associated with significant morbidity and mortality. A purely endovascular approach is feasible and relatively safe, but long-term follow-up is required to establish the durability of this technique.

Hybrid procedures for thoraco-abdominal aneurysms and secondary expanding aortic dissections - intermediate results in three European vascular centres

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Introduction: To evaluate the combined approach of visceral/renal debranching and endovascular exclusion (hybrid procedure) of thoraco-abdominal aneurysms and secondary chronic aortic dissections.

Methods: Consecutive data of three major European vascular units were collected between 2002 and 2007 including a series of 89 symptomatic and elective high risk patients. Eighty- seven patients had Types I–III degenerative thoraco-abdominal aortic aneurysms. Twenty-four of these patients had a chronic expanding dissection, three had a mycotic aneurysm and eight had Marfan's syndrome.

Results: All stent grafts involved the entire thoracic and abdominal aorta with arch vessel revascularisation in 11 and coverage of the left subclavian artery in 18. The distal landing zone was in the infrarenal aorta in 75% and in the iliac arteries in 25%. The 30-day mortality rate was 12/89 (13%). Seven (8%) of the patients were permanently paraparetic or paraplegic, three patients (3%) required long-term dialysis, and a segment of gut infarction requiring resection occurred in 2 (2%). Graft occlusion at 30 days occured in 19/297 (6%). Most patients had visceral revascularisation and stenting performed at the same time, but in 11 patients the stenting was performed at a later date. Two of these patients ruptured before the stenting procedure was undertaken.

Conclusion: Early results of visceral hybrid repair for high risk patients with complex thoraco-abdominal aneurysms indicate that this technique might be a valid alternative to open thoraco-abdominal aortic repair. Mid-term results with respect to survival, graft patency and endoleak rates will be presented.

Neurological complications of thoracic endovascular aneurysm repair (TEVAR): overstenting of the left subclavian artery (LSA) without revascularisation is unsafe

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Introduction: To determine the incidence of, and risk factors for, neurological complications associated with TEVAR.

Methods: Data from 606 patients entered onto a multicentre international registry were analysed. Thoracic aortic pathologies included: true aneurysm ($n = 291$), dissection ($n = 215$), traumatic rupture ($n = 67$), anastomotic aneurysm ($n = 24$), infections and others ($n = 9$). Three hundred and seventy-nine (62%) procedures were elective, 205 (34%) were urgent or emergencies

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and 20 (4%) were unclassified. Mean follow-up was 14·1 months (0–72). Study endpoints were peri-operative spinal cord ischaemia (SCI) or stroke. Univariate analysis and multivariate regression models were used to determine risk factors for these neurological sequelae.

Results: Fifteen patients (2·5%) developed SCI and 19 (3·1%) stroke. Two patients had both. Multivariate regression analysis showed that SCI was independently correlated with: i) left subclavian artery covering without revascularisation ($P = 0·027$, Odds Ratio [OR]= 3·9); ii) renal failure ($P = 0·02$, OR = 3·6); iii) concomitant open abdominal aorta surgery ($P = 0·037$, OR = 5·5); and iv) number of used stent grafts ≥ 3 ($P = 0·043$, OR 3·5). Stent graft diameter confounded with the number of stent grafts and correlated also with SCI ($P = 0·009$, OR = 5·2). Risk factors for peri-operative stroke were: i) duration of the intervention ($P = 0·0045$, OR = 6·4); and ii) female gender ($P = 0·023$, OR = 3·3). In patients with an overstented superior mesenteric artery, the incidence of stroke without and with revascularisation was 26% and 0, respectively (NS).

Conclusion: Revascularisation of the LSA is indicated whenever this vessel is overstented during the course of TEVAR.

Mid-term results of endovascular repair of isolated iliac artery aneurysms

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Introduction: The evidence for the natural history of isolated iliac artery aneurysms is poor, but repair is usually advised when the diameter reaches 3–4cm. Open surgery for iliac artery aneurysms is not without procedure-related morbidity and mortality. We report our experience of endovascular repair of isolated iliac artery aneurysms.

Methods: There were 50 patients, with 56 isolated iliac artery aneurysms, treated from 1997–2007. Data were prospectively collected on a computerised database with CT follow-up at three months, and annually thereafter.

Results: The median age was 74 years with a mean follow-up of 2·6 years (range 3 months–8 years). Mean aneurysm diameter was 47mm (18–102 mm). The aneurysms were localised to the common iliac artery in 49 patients and to the internal iliac artery in one patient. There were six patients with short proximal necks or bilateral aneurysms requiring a bifurcated aortic device. Technical success was achieved in 49/50 patients. One failure was due to difficulty with access and treated with open surgery. In-hospital mortality was 0/50, with five deaths during the follow-up period, none of which were aneurysm-related. One device occluded on day two postoperatively, and there were two late endoleaks which were treated endovascularly. One late device occlusion was treated with a femoro-femoral crossover graft. The overall intervention-free survival was 80% at 2·6 years.

Conclusion: Endovascular repair of isolated iliac artery aneurysms is safe and associated with good mid-term results. Long-term follow-up is essential.

The long-term impact of endovascular aneurysm repair on renal function

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Introduction: This study assesses renal function up to ten years following endovascular aneurysm repair (EVAR) with both infrarenal (IR) and suprarenal (SR) devices.

Methods: A prospectively maintained database was interrogated for consecutive EVAR patients between 1996 and 2001. Patients were grouped according to proximal fixation level. Renal function was recorded annually by serum creatinine (sCr mmol/L) and Cockroft-Gault-derived creatinine clearance (CrC ml/min). Changes in renal function were analysed using the 1-sample Wilcoxon Test within groups, and the Mann Whitney U test between groups.

Results: One hundred and eighty EVARs were performed during this period: 88 IR devices (M: F; 78: 10, median age 71 years), 92 SR devices (M: F; 83: 9, median age 75·5 years). Paired renal data were available for 130 patients (IR: 67; SR: 63) with a mean follow-up of 40·5 (range 0–120) months. Pre-operative renal function was similar between groups with median sCr and CrC values of 113 μmol/L and 57 ml/min (IR) and 108 μmol/L and 58 ml/min (SR), both $P =$ NS. Seven years post-EVAR there was no significant deterioration in renal function within either the IR or SR group, with median sCr and CrC values of 117 μmol/L and 56 ml/min, and 138 μmol/L and 41 ml/min (all $P =$ NS), respectively.

Conclusion: These results suggest long-term renal safety following EVAR, although longer follow-up with greater patient numbers is needed to fully assess the potential late changes following SR.

Pre-discharge duplex ultrasound scanning (DUSS) detects endoleaks not seen on completion angiography and identifies patients requiring early re-intervention

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Introduction: Duplex ultrasound scanning (DUSS) has been shown to be effective in the detection of endoleak following endovascular abdominal aortic aneurysm repair (EVAR). The aim of this study was to evaluate the role of DUSS in the immediate postoperative period prior to hospital discharge.

Methods: Patients undergoing EVAR at a single centre between July 1994 and July 2005 received pre-discharge DUSS and were then followed up. A retrospective review was performed using hospital case notes, vascular database records and imaging reports.

Results: Of the 333 patients who underwent EVAR during this period, 32 of these were found to have an endoleak on DUSS performed prior to hospital discharge (16 type 1, 12 type 2 and 4 type 3 endoleaks). Nineteen of these (59%) were not visualised on intra-operative completion angiography. Twenty-one leaks (66%) were either observed or had spontaneously sealed by the first postoperative clinic visit. Ten leaks required intervention: eight endovascular procedures and two conversions to open repair. There was one death due to rupture prior to intervention.

Conclusion: This study confirms that a significant number of early leaks are not demonstrated on intra-operative angiography and a proportion of these are likely to require secondary procedures to prevent aneurysm rupture and death. This therefore confirms the role of pre-discharge DUSS in the detection and treatment of early endograft failure.

Elective open and endovascular aortic aneurysm repair: a meta-analysis of 20,715 patients

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Introduction: A number of studies have compared outcomes following elective open and endovascular (EVAR) approaches to abdominal aortic aneurysm (AAA) surgery with varying reported benefits of EVAR.

Methods: A random-effects meta-analysis was conducted including all published studies comparing open and endovascular approaches to elective AAA repair. Study endpoints consisted of operative outcomes, postoperative complications, 30-day mortality and long-term patient survival. Endpoints were compared using the odds ratio (OR), weighted mean difference (WMD) or log hazard ratio (HR) as appropriate.

Results: Thirty-two studies (four randomized trials) comprising 20,715 patients (51·0% open; 49·0% EVAR) were included. EVAR was associated with reduced operating times (WMD-14·7 min; $P = 0·02$) and a reduction in intra-procedure blood loss (WMD −1009 ml; $P < 0·001$). The duration of intensive care stay was reduced in the EVAR group (WMD −36 hours; $P < 0·001$) and postoperative length of stay (WMD-5·4 days; $P < 0·001$). Postoperative cardiac (OR 1·76, $P = 0·002$) and respiratory (OR 4·01, $P < 0·001$) complications were more common following open surgery as was 30-day mortality (OR 2·18, $P < 0·001$). However, EVAR was associated with a trend towards an increased re-intervention rate (OR 1·96, $P = 0·08$). EVAR was associated with improved long-term aneurysm-related mortality rates (HR 0·39, $P < 0·001$) but did not affect long-term all-cause mortality (HR 0·94, $P = 0·52$).

Conclusion: EVAR offers clear benefit in the reduction in postoperative adverse events and 30-day mortality. In the longer term there is a reduction in aneurysm-related mortality, but EVAR does not reduce all-cause mortality.

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Endovenous laser ablation (EVLA): is standard above-knee great saphenous vein (AK-GSV) ablation sufficient? A randomised controlled trial

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Introduction: AK-GSV EVLA is an alternative to saphenofemoral (SF) ligation and GSV stripping for primary varicose veins due to SF/GSV reflux. Concomitant phlebectomies or delayed sclerotherapy are performed for the varicosities. This RCT assesses whether extended GSV ablation increases spontaneous resolution of varicosities and reduces adjuvant therapy requirements.

Methods: Sixty-eight limbs (65 patients) with varicosities due to combined above and below-knee GSV reflux were randomized to standard AK-EVLA (group A, $n = 23$), extended EVLA (mid-calf to groin: group B, $n = 23$) or AK-EVLA with concomitant BK-GSV foam sclerotherapy (group C, $n = 22$). Outcome measures were the presence of residual varicosities at six weeks (requiring sclerotherapy), improvement in the Aberdeen Varicose Vein Severity Score (AVVSS) at 12 weeks, patient satisfaction (visual analogue scale) and complication rates.

Results: EVLA ablated the treated GSV in all limbs. Sclerotherapy requirements were: group A 14/23 (61%); group B 4/23 (17%); group C 8/22 (36%); $\chi^2 = 9{\cdot}3$ (2 d.f.) $P = 0{\cdot}01$; pA-B = 0·006; pB-C = 0·19; pA-C = 0·14. AVVSS scores (median±IQR) improved in all groups ($P < 0{\cdot}001$): group A: 14·8 (9·3–22·6) to 6·4 (3·2–9·1), group B: 15·8 (10·2–24·5) to 2·5 (1·1–3·7), group C: 15·1 (9·0–23·1) to 4·1 (2·3–6·8). Improvements were greatest in groups B and C (pA-B = 0·011, pA-C = 0·042). Patient satisfaction was highest in group B. BK-EVLA was not associated with saphenous nerve injury.

Conclusion: Extended EVLA for patients with combined AK and BK-GSV reflux appears safe, increases spontaneous resolution of varicosities and enhances symptom improvement. Similar benefits occurred after concomitant BK-GSV foam sclerotherapy and this technique may be useful when BK-GSV tortuosity precludes extended EVLA.

Endovenous laser therapy with concomitant or sequential phlebectomy: a randomized controlled trial

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Introduction: Significant proportions of patients require secondary procedures such as sclerotherapy or phlebectomy following endovenous laser therapy (EVLT) for varicose veins. We compared EVLT plus concomitant phlebectomy (EVLTAP) with EVLT only.

Methods: EVLT patients were randomized to undergo concomitant phlebectomy ($n = 18$), or no phlebectomy ($n = 18$), and followed up for 12 weeks. Procedure duration, pain scores, return to work/normal activities, patient satisfaction, quality of life (QoL) outcomes, venous clinical severity scores (VCSS), and need for secondary intervention were compared. Results are median (inter-quartile range); *P*- value.

Results: EVLTAP took longer than EVLT only: 67 (51–78) min vs. 46 (38–56) min; $P = 0{\cdot}003$. Pain scores, time to work/normal activities, and patient satisfaction were similar. EVLTAP patients had lower Aberdeen Varicose Vein Scores at 6 weeks (7·12 [2·00–11·56] vs. 14·74 [10·54–18·07]; $P = 0{\cdot}001$) and 12 weeks (2·06 [0·00–6·71] vs. 9·60 [7·08–13·39]; $P = 0{\cdot}009$). There were no significant differences between groups in any SF-36 domain at any time point. VCSS was significantly better in the EVLTAP group at 12 weeks. Six patients (35%) in the EVLT only group required subsequent phlebectomies, while none required secondary procedures following EVLTAP.

Conclusion: EVLTAP results in better clinical and disease-specific QoL improvement than EVLT only, in the short term. Although the procedure duration is longer, it neither increases pain nor delays return to work, and it obviates the short-term need for secondary procedures.

No advantage in performing flush saphenofemoral ligation: results of a randomised trial

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Introduction: The aim of this study was to assess the role of different techniques of saphenofemoral ligation in the reduction of neovascularisation and recurrence following surgery for primary varicose veins.

Methods: One hundred and eighty-two patients (210 legs) with primary saphenofemoral junction incompetence were randomized to standard saphenofemoral ligation (transfixion with an absorbable suture) (SSL) or flush saphenofemoral ligation (oversewing with 4/0 polypropylene) (FSL). All legs underwent great saphenous vein stripping and multiple phlebectomies. Patients underwent assessment pre-operatively, and at 6 weeks, 1 year and 2 years post-operatively with clinical examination, duplex imaging and completion of the Aberdeen Varicose Vein Symptom Severity Score (AVVSSS).

Results: A total of 168 patients (199 legs) attended for assessment at 6 weeks, 154 patients (181 legs) at one year and 148 patients (172 legs) at 2 years. At 2 years, recurrent varicose veins were visible in 30 legs (33%) in the SSL group and 26 legs (32%) in the FSL group ($P = 0{\cdot}90$). Neovascularisation was present in 20 legs (22%) in the SSL group and 15 legs (19%) in the FSL group ($P = 0{\cdot}57$). Nine cases of neovascularisation in the SSL group and five in the FSL group directly resulted in clinical recurrence ($P = 0{\cdot}37$). There was no statistically significant difference in quality of life scores between the groups at any follow-up.

Conclusion: Flush ligation of the saphenofemoral junction does not significantly decrease the rate of neovascularisation or clinical recurrence compared with standard transfixion ligation.

Duplex ultrasound appearances at one year after endovenous laser ablation

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Introduction: To evaluate the incidence, pattern and significance of venous reflux after endovenous laser ablation.

Methods: Reflux or recanalisation after endovenous laser ablation (EVLA) might indicate potential for clinical varicose vein recurrence. Whilst early reports for EVLA have been favourable, longer-term outcome remains unknown. Duplex ultrasonography was performed 12 months after EVLA. The incidence, site and clinical sequelae of reflux/recanalisation were analysed. The energy delivered was compared between the groups, as this has been reported as a significant factor.

Results: One hundred and nine duplex scans were reviewed. In 47 there was no reflux/recanalisation. In 62 reflux/recanalisation was reported. Groin tributary reflux was found in nine cases, distal reflux in 23, and recanalisation of the treated vein was reported in 35. In five cases this was reported as total recanalisation, although in two of these the vein was competent. Further treatment of the 35 cases in which recanalisation was found was as follows: sclerotherapy = 7, repeat EVLA = 2, surgical saphenofemoral disconnection = 1. Mean energy delivery was similar between the groups with or without reflux/recanalisation (62·62 J/cm; SD 12·5 vs. 59·9 J/cm; SD 13: Wilcoxon, $P = 0{\cdot}22$), or within the different reflux categories (ANOVA, $P = 0{\cdot}18$).

Conclusion: Reflux or recanalisation 12 months after EVLA were surprisingly common. However, clinically significant events were rare. Although commonly found on duplex (35/109), partial recanalisation does not appear to be of major clinical significance in the first year. Laser energy delivered was not found to be a factor in duplex evidence reflux or recurrence.

Endovenous laser ablation (EVLA) for short saphenous vein (SSV) incompetence

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Introduction: Open surgery for SSV incompetence can lead to incomplete surgery if the saphenopopliteal junction (SPJ) is not correctly identified. Other possible complications are sural nerve damage and wound infection. The objective is to present EVLA as a safe alternative to open surgery for SSV incompetence.

Methods: Data prospectively collected on patients who had EVLA for varicose veins were obtained from our dedicated vascular registry. From April 2005 to June 2007 we performed EVLA on 204 limbs for varicose veins. Patients were

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offered an outpatient appointment at 6 weeks post-op. Subsequent follow-ups were by phone consultation with further outpatient appointments as indicated.
Results: Thirty-five (17%) patients (24 female) with a mean age 47 years (range 23–80 years) had EVLA for SSV incompetence. The mean length of vein treated was 18cm (range 5–33 cm). The mean total energy given was 993J (range 45–55 J/cm). Twenty-five procedures were done as day case and ten as inpatient. Fifteen were done under general anaesthetic and 20 under local anaesthetic. Obliteration of the SPJ was confirmed by ultrasound in all patients postoperatively. There were no intra-operative complications. Two patients developed superficial thrombophlebitis that resolved with non-steroidal anti-inflammatory therapy. One patient developed a haematoma that completely resolved in 2 weeks. There was no incidence of sural nerve injury or wound infection.
Conclusion: We believe that EVLA is a safe minimally invasive alternative for the surgical treatment of SSV incompetence.

Foam sclerotherapy improves venous function in limbs with chronic venous ulceration

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Introduction: Superficial venous surgery has been shown to improve venous function in limbs with chronic venous ulceration. The aim of this study was to assess the haemodynamic effects of duplex-guided foam sclerotherapy in limbs with superficial venous reflux and chronic venous ulceration.
Methods: Ulcerated limbs (CEAP 5 and 6) with superficial venous reflux were treated with foam sclerotherapy and compression bandaging. Venous duplex imaging was performed before and following completion of treatment. Venous function of limbs was assessed by measuring venous refill times (VRTs) before and following completion of treatment using digital photoplethysmography.
Results: Thirty-four limbs (CEAP 5: $n = 24$, CEAP 6: $n = 10$) were treated with foam sclerotherapy between July 2006 and June 2007. Complete occlusion of the treated veins occurred in 25/34 limbs (74%) after one treatment and in 30/34 (88%) limbs after second treatment. Following foam sclerotherapy, VRT increased in 29/34 limbs. Overall median (range) VRT increased from 11·5s (3–26) to 21s (8–48) after foam sclerotherapy ($P < 0·001$, Wilcoxon signed rank test). Of the ten active ulcers at the time of sclerotherapy, seven healed (70%) at a median of 3 weeks.
Conclusion: Our early experience of foam sclerotherapy for chronic venous ulceration shows an improvement in venous function following treatment. Whilst longer-term follow-up is required to see whether this is maintained, sclerotherapy may be an acceptable alternative to surgery in this group of patients.

Transcranial Doppler-directed intravenous glycoprotein IIb/IIIa receptor antagonist therapy to control transient cerebral micro-emboli

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Introduction: Patients with transient focal neurological deficits, critical carotid stenoses and transcranial Doppler (TCD) ultrasound-detected micro-embolic signals (MES) have a significant risk of stroke. There is evidence that a high embolic load post-carotid surgery may result in strokes. We assessed the effect of tirofiban, a highly selective glycoprotein IIb/IIIa (GPIIb/IIIa) inhibitor, in suppressing MES in patients with symptomatic transient ischaemic attacks (TIAs) and postoperative carotid endarterectomy (CEA).
Methods: Thirty-three patients with ongoing MES (13 symptomatic pre-operative, 19 postoperative, 1 both) were treated with tirofiban between August 2002 and March 2007. All patients had > 70% carotid stenosis and underwent TCD monitoring during and after tirofiban therapy.
Results: With treatment, the MES rate decreased from a median (range) of 22 (4–260) pre-operatively and 81 (44–216) postoperatively to a median of 0 (0–9) ($P < 0·0001$; Mann Whitney test) in both groups. This occurred rapidly (pre-operative: median 30 min; postoperative: median 45 min) and was well tolerated in all patients. There were no serious adverse effects with one haematoma requiring evacuation.
Conclusion: Cerebral micro-emboli appear to result from platelet aggregation on unstable carotid plaques or recently endarterectomised tissue. The aggregates are well controlled by GPIIb/IIIa antagonists which appear to offer a novel effective method of controlling MES with safe, symptomatic relief in pre- and postoperative patients undergoing carotid endarterectomy. Further study would be required to compare the relative efficacy of GPIIb/IIIa inhibitors and the established drug Dextran 40.

Can SF8 replace SF36 as quality of life analysis in patients with lower limb ischaemia?

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Introduction: Generic quality of life (QoL) is a crucial outcome measure in patients with lower limb ischaemia (LLI) with the Short Form 36 (SF36) accepted as the gold standard instrument. We aimed to assess whether the new, shorter, simplified Short Form 8 (SF8) is sufficiently responsive to replace SF36 in LLI.
Methods: One hundred and ninety-three patients, 135 men, median age 66 years (range 44–84 years) with LLI completed the SF36 and SF8. Patients were graded according to ISCVS standards, i.e. 30 mild, 52 moderate, 73 severe claudicants; 16 rest pain and 21 tissue loss. Both instruments assess the same eight QoL domains. Validity: convergent-divergent and construct validity were assessed for both QoL instruments. Reliability: test-retest reliability was assessed in a subgroup of 60 patients. Responsiveness: between grades of LLI was also analysed with non-parametric statistical tests.
Results: Validity: a) convergent-divergent validity. There was greater correlation between like domains of the SF36 and SF8 (0·594–0·792, $P = 0·000$) than the non-like domains, suggesting good convergent-divergent validity; b) construct validity. The SF36 and SF8 demonstrated similar construct validity. Reliability: both QoL instruments were significantly reliable (rs > 0·7). Responsiveness: increasing LLI resulted in a statistically significant deterioration in all eight domains of both the SF8 and SF36 ($P < 0·05$, Kruskal-Wallis ANOVA).
Conclusion: The SF8 is a valid and reliable generic QoL instrument in patients with LLI. It demonstrates similar responsiveness as the SF36 in these patients and as it is simpler and quicker to complete, we suggest it to replace the SF36 as the gold standard generic QoL analysis in LLI.

Subintimal angioplasty (SIA) vs bypass surgery (BS) for critical lower limb ischaemia in patients with TASC C and D lesions: a 5-year prospective observational comparative study

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Introduction: Appropriate revascularisation results in high patency and significantly reduces amputation rates. Our primary aim is to evaluate SIA and BS in maintaining amputation- free survival. Secondary endpoints are to investigate whether SIA reduces the risk of major adverse events (MAE) and enhances quality time without symptoms of disease or toxicity of treatment (Q-TWiST) in a cost-effective manner.
Methods: From 2002–2007, 1276 patients were referred with peripheral vascular disease. We performed a prospective parallel group comparison of 334 primary procedures (SIA = 206, BS = 128) in 309 patients (nSIA = 190, nBS = 119) with CLI. Mean age (SIA 73+/−13 years vs. BS 70+/−14 years, $P = 0·127$) and comorbidity severity scores ($P > 0·05$) were similar between groups. However, 55% were females in the SIA group vs. 35% in BS, $P = 0·0005$.
Results: Five-year amputation-free survival rates were similar: SIA (72·9%) vs. BS (71·2%), $P = 0·9765$. Five-year primary patency was: SIA 72·8% vs. BS 65·3%, $P = 0·7001$. Five-year assisted primary patency was improved with SIA, 82·8% vs. BS 68·2%, $P = 0·1061$. Five-year secondary patency rates were SIA 85·9% vs. 72·1%, $P = 0·2624$. Mean number of procedures (+/− SD) for SIA was 1·19+/−0·50 and for BS was 1·10+/−0·41, $P = 0·078$. Risk of MAE ($P < 0·002$) and length of hospital stay (LOS) (LOS SIA 14+/−16 days vs. LOS BS 24+/−23 days, $P < 0·0001$) were significantly reduced with SIA. Q-TWiST was significantly improved ($P < 0·001$) and cost per Quality Adjusted Life Years (QALY) ($P < 0·05$) was reduced with SIA. Five-year survival rates were comparable.

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Conclusion: SIA enhances symptom-free survival rates without MAE and further Q-TWiST. It is cost effective, allowing for a high patient turnover without compromising QALY and is technically successful in most patients. SIA is the gold paradigm in the management of CLI.

Fast-track open aortic surgery: reduced postoperative stay with a goal-directed pathway

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Introduction: Open aortic aneurysm repair is traditionally associated with an extended hospital stay. The aim of this study was to examine the feasibility of reducing postoperative stay through the implementation of a fast-track, goal-directed, clinical pathway for elective open aortic surgery.
Methods: A fast-track clinical pathway for aortic surgery was introduced in a regional vascular unit in September 2005. The pathway has daily goals and discharge is targeted for all patients on the third postoperative day. This study compares 30 consecutive discharges of unselected patients undergoing elective infrarenal aortic surgery following introduction of the pathway to the 30 consecutive cases preceding its introduction. Reasons for prolonged hospital stay were recorded.
Results: Six of 30 patients achieved discharge by day three. The median hospital stay reduced from 9 (range 4–17 days) to 5 days (range 2–12 days) following introduction of the pathway. There was one readmission within 30 days and no complications attributable to the pathway implementation. Cardiac complications and home planning were the most common causes of delayed discharge.
Conclusion: Postoperative stay in patients undergoing standard elective open infrarenal aortic surgery can be safely reduced with the introduction of a goal-directed pathway.

Does aneurysm rupture risk decrease in patients who are anatomically suitable for endovascular repair?

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Introduction: To investigate factors associated with large abdominal aortic aneurysm (AAA) rupture in patients anatomically suitable for endovascular repair but considered unfit for open surgery.
Methods: Patients randomised in the EVAR 2 trial ($n = 404$ by August 2004) were followed up until December 2005 for AAA rupture. Patients without rupture were censored as non-emergency AAA repair, death, loss to follow-up or known emigration, or end of follow-up period. Cox regression, adjusted for baseline covariates, was used for analysis of pre-specified factors (gender, diabetes, initial AAA diameter, aneurysm neck and sac lengths) associated with rupture.
Results: The overall rupture rate in EVAR 2 was 15·6 (95% c.i. 11·6–20·6) per 100 patient years and for those with 6+ cm aneurysms, 17·4 (95% c.i. 12·9–23·4) per 100 person-years, appeared to be significantly lower than that from meta-analysis of other studies, 27·0 (95% c.i. 21·1–34·7) per 100 person-years, $P = 0·026$. Patients with shorter neck lengths appeared to have a higher rupture rate than those with longer necks, but this was of borderline significance ($P = 0·10$). Patients with diabetes also showed a trend towards lower rupture rates. The covariate baseline statin usage appeared to reduce the rupture rate. Post-hoc analysis showed that patients taking statins at baseline had half the rupture rate of non-statin patients, HR 0·52 (95% c.i. 0·27–0·98), $P = 0·044$, which was similar after adjustment for other baseline covariates.
Conclusion: This study supports the hypothesis that patients anatomically suitable for endovascular repair have lower AAA rupture rates than patients who are not anatomically suitable for endovascular repair. The possibility that statins reduce rupture rates should be tested prospectively.

Recurrence and neovascularisation two years after varicose vein treatment: a comparison of surgery and endovenous laser ablation (EVLA)

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Introduction: Recurrent varicosities following previous treatment are common with neovascularisation being a major cause after conventional surgery. This study compares recurrence rates and the incidence of neovascularisation following surgery (saphenofemoral [SF] ligation, stripping above-knee great saphenous vein [GSV]) and above-knee GSV EVLA.
Methods: One hundred and twenty-nine consecutive limbs (118 patients: 72 females, 46 males, median age 48 [32–68]) underwent treatment (group A: surgery, $n = 60$ limbs; group B: EVLA $n = 69$ limbs) for primary SF/GSV reflux over 17 months and were reviewed at a mean of 24 months (range 18–30). Clinical varicose vein recurrence, duplex ultrasound- detected groin neovascularisation and patient satisfaction (visual analogue scale) were recorded. Statistical analysis used the Fisher exact test to compare recurrence and neovascularisation rates, and unpaired student *t*-tests to compare patient satisfaction.
Results: Recurrence rates at 2 years were: group A 4/60 (6·6%); group B 5/69 (7%), ($P = 0·631$). The causes of recurrence were: group A: mid-thigh perforator $n = 2$, residual GSV with neovascularisation $n = 2$; group B: GSV recanalisation $n = 3$ (all received < 50 J/cm laser energy), mid-thigh perforator $n = 1$, new anterior saphenous vein reflux $n = 1$. Neovascularisation was detected in 11/60 (18%) of group A and 1/69 (1%) of group B, $P = 0·001$. Patient satisfaction was 90% and 88%, respectively ($P = 0·37$).
Conclusion: Although there was no difference in the frequency of recurrent varicose veins following conventional surgery or EVLA at 2 years, the incidence of neovascularisation, a predictor of future recurrence, was significantly lower following laser therapy. Further, current recommendations to deliver ≥ 70 J/cm laser energy should reduce the risk of recanalisation and recurrence in EVLA patients.

A randomized placebo-controlled double-blind trial to evaluate ezetimibe combination therapy on abdominal aortic aneurysm wall proteolysis and inflammation

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Introduction: HMG-CoA reductase inhibitors (statins) have the potential to retard abdominal aortic aneurysm (AAA) growth. Statins have been associated with suppression of aneurysm formation in a murine model, and reduced concentrations of aneurysm wall MMP-9 and IL-6 in humans. These effects may be consequent upon a reduction in serum LDL-C. Ezetimibe is a novel cholesterol absorption inhibitor used in combination with statins to lower LDL-C. This study aimed to compare the biological effects of combining ezetimibe and simvastatin with the actions of simvastatin alone on parameters relevant to aneurysm expansion.
Methods: In a double-blinded randomized controlled trial, nine patients scheduled for elective open AAA repair were randomized to simvastatin 40 mg + ezetimibe 10 mg daily and nine to simvastatin 40 mg + placebo. Total concentrations of TNF-a, IL-1b, IL-6, IL-8, IL-10, MMPs-1,-2,-3,-8,-9,-12,-13, TIMP-1 and TIMP-2 were measured in plasma, aortic wall homogenates and tissue culture explants. Median trial duration was 30 days.
Results: Two patients in the placebo arm underwent EVAR precluding aortic samples. There were no significant differences in plasma levels between groups. There were significant reductions in aortic wall MMP-9 ($P = 0·016$) and IL-10 ($P = 0·03$) concentrations associated with ezetimibe use. Tissue culture revealed a significant reduction in MMP-1 ($P = 0·02$), MMP-2 ($P = 0·02$) and IL-6 ($P = 0·02$) in the ezetimibe group.
Conclusion: These results suggest that ezetimibe combination therapy reduces aortic wall proteolysis and inflammation, key processes that drive AAA expansion. A larger RCT is justified focusing on aneurysm growth rates in small AAA.

Surgical *versus* endovascular reconstruction for chronic mesenteric ischaemia

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Introduction: To compare the immediate and long-term outcomes of surgical (SR) and endovascular (ER) reconstruction for chronic mesenteric ischaemia (CMI).
Methods: Retrospective review of consecutive patients who underwent SR or ER for CMI in three vascular surgery units in the UK between 1996 and 2006. Early (< 30 days) outcome (technical success, major morbidity, mortality, length of hospital stay) and late (> 30 days) outcome (symptom recurrence, vessel/graft patency, re-intervention, mortality) were assessed.
Results: Twenty-six patients underwent 32 mesenteric arterial reconstructions: SR ($n = 18$), ER ($n = 14$). Comorbidity and anatomical distribution of mesenteric disease did not differ between the two groups. Forty-three of 58 (74%) diseased arteries were revascularised. Twenty-six vessels underwent SR (bypass [$n = 25$], endarterectomy [$n = 1$]) for stenosis in 14 (54%) and occlusion in 12. Seventeen vessels underwent ER for stenosis in 15 (88%) and occlusion in two. Peri-operative mortality for SR and ER was 6% and 0%, respectively ($P = 0{\cdot}56$). Hospital stay was significantly shorter following ER compared to SR (mean, 4·5 vs. 14·8 days; $P = 0{\cdot}0003$). ITU admission was significantly more likely following SR compared to ER ($P < 0{\cdot}0001$). Mean (range) follow-up for SR and ER was 30 (1–94) months and 33 (0–135) months, respectively. At two years, there was no significant difference between SR and ER for primary patency (83% vs. 50%), secondary patency (87·5% vs. 62%), clinical patency (90% vs. 79%) and re-intervention-free survival (65% vs. 57%).
Conclusion: ER is associated with significantly shorter hospital stay and comparable long-term outcome as SR and represents an acceptable first-line treatment option in appropriately selected patients with CMI.

Driving advice given by vascular surgeons: a survey of Vascular Society Members

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Introduction: It is a legal requirement of doctors to assess all patients' fitness to drive based on DVLA guidelines. Our aim was to assess the current advice given to patients by vascular surgeons and compare this to national guidelines.
Methods: A postal survey was performed of 438 members of The Vascular Society. Six questions covered a spectrum of scenarios commonly seen in vascular surgical practice. Options were provided in line with DVLA guidelines for domestic driving.
Results: The response rate was 52·5% ($n = 230$). Thirty-three (14·3%) gave no driving advice for any scenario, whereas no respondents gave answers in keeping with guidelines for all scenarios. Two hundred and twenty-six (98·3%) gave correct advice for claudicants. Patients with a single TIA were stopped from driving inappropriately in 40·3% of cases, whilst those with multiple TIAs were allowed to drive inappropriately in 27·0%. By contrast patients with a 5·5cm AAA were prevented from driving inappropriately in 6·6% of cases, whilst those with a 6·5cm AAA were incorrectly allowed to drive in 74·6%. Advice given to patients with a peri-operative MI was highly variable (appropriate in 32 [19·9%]).
Conclusion: Current driving advice given by members of The Vascular Society is highly variable. Patients with TIA are likely to be given correct or over-cautious advice, whereas those with aneurysmal disease are more likely to be allowed to drive against DVLA guidelines. Further education of vascular surgeons regarding driving advice and, perhaps, re-appraisal of guidelines, are required.

The value of graft surveillance in infra-inguinal bypasses performed with small diameter veins

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Introduction: Within the context of a surveillance programme, we sought to assess the impact of pre-operative diameter of the venous conduit on re-intervention rate and its relationship to outcome following infra-inguinal vein graft bypass.
Methods: Consecutive infra-inguinal vein bypasses between January 2001 and December 2006 were reviewed. All patients underwent pre-operative vein mapping and measurement of vein graft diameter (VGD). Grafts were classified into those with VGD < 3·5mm or grafts with VGD ≥ 3·5mm. All patients were enrolled in a duplex surveillance programme. The association between VGD and re-intervention rate was assessed. Graft patency and amputation rates were compared.
Results: Three hundred and seventy-seven bypasses were followed up for a median of 21 months (range: 2–67). Forty-month primary, primary assisted, and secondary patency were 73%, 79% and 83%. VGD was < 3·5 mm in 139 grafts (36·9%) and ≥ 3·5mm in 238 (63·1%). A higher proportion of smaller vein grafts (32·3%) required re-intervention to maintain graft patency compared with larger conduits (20·2%), ($\chi^2 = 7{\cdot}7$, $P < 0{\cdot}001$). VGD (odds ratio: 2·87 [95% c.i.: 1·63–3·81], [$P < 0{\cdot}001$]), smoking (odds ratio: 1·83 [95% c.i.: 1·39–3·20], [$P = 0{\cdot}02$]) and the type of bypass (odds ratio: 1·86 [95% c.i.: 1·49–2·47], [$P = 0{\cdot}02$]) were variables associated with a higher re-intervention rate. There was no difference in graft patency ($P = 0{\cdot}13$) or amputation rates ($P = 0{\cdot}35$) between the two groups, stratified on the basis of VGD.
Conclusion: Use of smaller vein grafts is associated with a higher re-intervention rate. Provided that these grafts are surveyed and where necessary repaired, the use of smaller vein grafts is successful and expands the availability of autogenous conduit for infra-inguinal arterial reconstruction.

Abdominal aortic aneurysm screening - why wait?

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Introduction: The introduction of an abdominal aortic aneurysm screening programme, without additional funding, has been explored. The Trust serves a population of 270,000. The aim of this study was to review feasibility, costs, results and patient satisfaction two years after introduction.
Methods: Trust and LHB approval were obtained. 'Second offer surgery' funded two ultrasound machines. The vascular consultant and nurse specialist performed the scans and the vascular secretary undertook all administration. A patient satisfaction questionnaire was sent to a random selection of 150 patients with screened normal aortas and all patients who had screen-detected aneurysms. The non-pay costs for running the programme were calculated.
Results: In the two-year period, 2946 patients were invited for an abdominal ultrasound (2620 attended). Sixty-five aneurysms were discovered; seven underwent surgery. There was a 71% return of questionnaires: 100% thought the programme a good idea; 99% were happy with the organisation and would encourage others to attend. Of those with screen-detected aneurysms, 100% were happy that they had attended, but 20% felt their lifestyle was subsequently affected. Non-pay costs totalled £1115·46 per year.
Conclusion: We have demonstrated that it is possible to introduce a screening programme with no additional resources. The programme has been accepted by patients. Patients with screen-detected aneurysms were happy to have had them discovered but one in five felt their lifestyle was affected as a result of the diagnosis. Annual non-pay costs of running the programme are minimal.

The role of pre-operative angiography in the morphological assessment of ruptured abdominal aortic aneurysm

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Introduction: Angiographic aortic aneurysm neck visualisation is an alternative to computerised tomography (CT) for endovascular aneurysm repair (EVAR), with time-saving potential in the emergency setting. We evaluated angiography in the assessment of aortic neck morphology as a complementary or replacement investigation.
Methods: Patients admitted for elective or emergency EVAR were assessed by pre-operative CT and intra-operative angiography. The proximal and distal aortic neck diameters, and neck length were measured. Measurements were expressed as mean (± standard deviation) and compared by Student's *t*-test. The correlation between measurements was assessed by Pearson's correlation coefficent.
Results: Thirty-five patients (20 male) were assessed from August 2003 to January 2005 for elective (26) and emergency (9) EVAR. The mean proximal neck diameter was 22·33 mm (±3·21) on CT, or 21·22 mm (±4·25) on angiography ($P = 0{\cdot}01$). The mean distal neck diameter was 23·03 mm (±3·15) on CT, or 22·75 mm (±4·67) on angiography ($P = 0{\cdot}29$), while the mean neck length was only slightly greater on angiography relative to CT (24·78 mm ±10·21 vs. 23·45 mm ±8·51; $P = 0{\cdot}76$). There was a close relationship of

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results for the proximal neck diameter ($r = 0{\cdot}67$, $P > 0{\cdot}0001$), distal neck diameter ($r = 0{\cdot}74$, $P > 0{\cdot}0001$) and neck length ($r = 0{\cdot}44$, $P = 0{\cdot}02$). The stent grafts deployed were oversized by 26·76% (±14·84) relative to the CT measurements, and 33·66% (±15·64) relative to angiographic measurements.
Conclusion: The use of on-table angiography appears to be an acceptable alternative to determine the neck diameter and thus the stent graft size. Further research is needed to ascertain the ultimate success of this investigative modality in the emergency setting.

Endovascular vs. open repair of acute abdominal aortic aneurysms - a meta-analysis

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Introduction: To compare the results of emergency open repair of acute AAA with that of endovascular repair.
Methods: A systematic literature search was performed to identify series that reported comparative outcomes. PUBMED, Embase, the RCT register and all relevant major journals were searched independently by two researchers. Twenty-three studies were identified, out of which 22 studies were eligible. The outcome measures were 30-day mortality, ITU stay, hospital stay, blood loss and operative duration.
Results: The total number of patients in the pooled data was 7040, of which 730 belonged to the e-EVAR group. e-EVAR was associated with a significant reduction in mortality (pooled odds ratio 0·624; 95% c.i. 0·518–0·752; $P < 0{\cdot}0001$). The EVAR group had a significantly shorter ITU stay (pooled effect size estimate −0·70 days; 95% c.i. −1·05 to −0·35 days; $P < 0{\cdot}0001$) and significantly reduced hospital stay (pooled effect size estimate −0·33 days; 95% c.i. −0·50 to −0·16 days; $P = 0{\cdot}0001$). EVAR was also associated with a significant reduction in blood loss (pooled effect size estimate −1·88 litres; 95% c.i. −2·49 to −1·27; $P < 0{\cdot}0001$) and reduced procedure time (pooled effect size estimate −0·65 hours; 95% c.i. −0·95 to −0·36 hours; $P < 0{\cdot}0001$).
Conclusion: There has been debate about the benefit of EVAR in ruptured AAA. This meta-analysis indicates clear benefits to the selected group of patients undergoing this minimally invasive procedure. There is a reduction in high mortality, prolonged intensive care requirement, total hospital stay, large blood loss and operative duration which are historically associated with open repair.

EVAR for emergency AAA: not an easier option!

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Introduction: In 2004 the National Vascular Database mortality for ruptured AAA was 41%. We wished to assess the results of EVAR for the management of emergency AAA.
Methods: One hundred and forty-two patients underwent emergency EVAR. Patient age, size of AAA and mode of presentation were compared. Mortality at 24 hours, 30 days and 12 months were compared. Causes of mortality were also compared in particular cases where EVAR led to death.
Results: There were 51 acute ruptured AAA and 91 acute symptomatic AAA. Women (26) were older than men (116) (average age 77 vs. 73 years, $P = 0{\cdot}009$). There was no difference in average AAA size (median 7·2 cm) between men and women or mode of presentation. Mortality figures at 24 hours, 30 days and 12 months were: 16%, 29%, 49% for ruptured AAA and 12%, 24%, 37% for symptomatic AAA. Mortality from ruptured AAA was greater at 12 months, $P = 0{\cdot}046$. Overall causes of death by 30 days were as expected (bleeding 8, cardiac 5, organ failure 12, other 3); a further six deaths occurred due to EVAR failure (persistent endoleak, renal artery occlusion, graft thrombosis). A further four patients later died (3–7 years) following graft failure.
Conclusion: EVAR for emergency AAA is associated with increased complications related to graft deployment. If these problems are overcome then mortality may be lower.

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