

## UPDATES AND FUTURE DIRECTIONS IN VASCULAR SURGERY AND ANAESTHESIA

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Endovascular procedures such as local arterial angioplasty and stenting, endoluminal aortic stents and in some cases, carotid stents, are becoming increasingly used in place of open procedures – reducing the need for open surgical operations. These interventions were originally reserved for high-risk cases, but are now often 'standard of care' for most patients. These advances are not without controversy, however. As surgeons undertake more complex endo-vascular reconstruction such as iliac bifurcation or aortic arch stenting, the duration of the procedures increases as do the risks to the patient and proceduralist. The relative merits of carotid stenting in particular are still being evaluated in comparison with the now excellent results from open procedures.

An entire new paradigm is emerging in endo-vascular interventions and anaesthesia. Four previously discrete disciplines now overlap in their ambition to manage complex vasculopathy. *Vascular surgeons* have their traditional open procedures being replaced by percutaneous interventions that can be performed by *interventional radiologists*. Similarly, *cardiac surgeons* have thoracic aortic surgery, aortic valve replacement and more recently mitral repair and procedures being 'usurped' by *interventional cardiologists* who are also extending their practice into reno-vascular stenting and endovascular sympathectomy. Although we as anaesthetists can see strengths that each specialty can bring to patient care, in reality cross-communication is compromised by competition for patient 'ownership' and territorial behaviour. Collaboration does at times occur, but this needs to be strengthened if patient outcomes are to be improved.

Our relationships with these specialists and the physical sites where these procedures occur also present new challenges. The angiography-suite rarely is an anaesthesia-friendly location and the cardiac catheter lab even less so. The development of hybrid operating/imaging rooms has introduced the potential for a greatly improved environment for surgeons and anaesthetists, but is less comfortable for other specialists such as cardiologists. The endovascular suite is a hostile environment for the anaesthetist. The physical layout often compromises patient access and anaesthesia equipment ergonomics. Access is often difficult for simple but important things such as suction, communication / telephones and slave monitors for the imaging equipment, etc. It is important that anaesthetists are involved with the design phase of these areas so that our ability to care effectively and safely for our patients is not compromised.

The anaesthesia for many smaller endovascular procedures has become much less challenging. Minor endovascular procedures can usually be done under sedation in angiography suites or in the operating room using image intensifiers with DSA capacity. More intensive anaesthesia support is still required for major stenting interventions such as endoluminal abdominal or thoracic aortic stent insertion. Endovascular Aortic Reconstruction (EVAR) is now being done on acute aortic aneurysm cases as well as elective patients and may take two hours or longer to complete and require bilateral femoral artery exposure for cannulation. Data from a large European study suggests that a regional-based anaesthetic technique is associated with better outcomes than a purely GA based technique for EVAR.<sup>1</sup> Stenting of acute thoracic aortic dissection has been a supplemental procedure to the open repair of a Type-A dissection, but more recently is being undertaken as the primary procedure for Type-B dissections.<sup>2</sup> Anaesthesia management is very important in these patients and the risk of stroke or paraplegia is still high. The use of TOE to aid stent positioning and the placement of CSF drains to decrease the risk of spinal cord ischaemia are areas in which our expertise is needed.

The indications for open carotid surgery have decreased following large studies demonstrating the equivalence of medical to surgical intervention for asymptomatic moderate-degree carotid stenosis. The best form of neurological assessment during open surgery (where the risk of stroke is still 1-2%) has long been debated, although it would appear now that outcomes are more related to institutional expertise (no surprise). Cardiac benefits have not been shown for regional anaesthesia for carotid surgery, and although non-randomised trials show some neurological benefit,<sup>3</sup> the GALA trial in the UK (randomising a policy of GA versus a policy of regional) failed to demonstrate a difference in outcomes.<sup>4</sup> The procedure of carotid stenting is not uncomfortable for the patient apart from the need



to keep their head very still during most of the procedure. It requires careful haemodynamic monitoring and neurological assessment in an awake and hopefully relaxed and co-operative patient. With the use of downstream filters to catch any embolic debris during stent deployment, outcomes are becoming comparable with open carotid surgery.<sup>5</sup> Haemodynamic management of patients during these procedures is important because bradycardia and hypotension are common<sup>6</sup> and the underlying hypertensive vasculopathy in these patients means there may be an increased risk of severe systolic hypertension on cerebral reperfusion which may potentiate a haemorrhagic stroke. Other monitoring such as trans-cranial Doppler may be useful but probe positioning can be difficult and may interfere with the intracranial imaging.

The role of anaesthetists in transcatheter aortic valve insertion (TAVI) is still being defined, however a clear role definitely exists. Cardiologists are not usually familiar with the collaborative relationship needed between specialists and so we must be prepared to assert our needs and advocate for the patient whenever necessary. The engagement of anaesthetists in the cardiac catheter lab is likely to become increasingly common – especially for patients presenting for percutaneous devices and valve repair because of their significant co-morbidities. Procedural outcomes may well be better with the improved operative conditions provided by anaesthesia.

Radiation exposure is a serious issue that is under-appreciated by many anaesthetists. The cumulative exposure to radiation can be very high – especially with multiple contrast angiography DSA runs that are typical of many endovascular techniques. In normal use, exposure rates (for surgeons) to ionizing radiation are acceptable,<sup>7</sup> but long and complex cases or a need to be close to the patient and x-ray source significantly increase the risk to the anaesthetist. Strategies to minimise risk include wearing appropriate lead protection, including thyroid guards; keeping as far from the beam as possible; minimising the duration and intensity of imaging; and an awareness that 'scatter' radiation may come tangential to the beam, usually directly where the anaesthetist is standing.

Renal impairment or failure is also a risk due to exposure to x-ray contrast media. Renal status should be known. Prevention centres around minimising dose of contrast and maximising hydration – although other strategies such as N-acetylcysteine may be of value.<sup>8</sup>

Patients presenting for valvular or vascular surgery have significant medical co-morbidities and the availability of less invasive surgical procedures has meant that patients considered otherwise unfit are now being accepted for surgery. In addition to their primary vascular disease, up to 80% of these patients will have ischaemic heart disease. Diabetes is also common, as is hypertension and respiratory disease. Many of these conditions relate to a history of years of cigarette smoking and / or obesity. Preparation for anaesthesia and surgery should be thorough because if an endovascular procedure fails there may be a need to convert to an open procedure at short notice. The American Heart Association Guidelines are helpful in evaluating perioperative risk.<sup>9</sup>

A predictable consequence of the more widespread uptake of endovascular procedures is that clinical expertise for open procedures is declining. Open surgical repair of an Abdominal Aortic Aneurysm or infected endograft remains a challenging and high-risk procedure, especially in the setting of an acute rupture. Good outcomes for these cases remain dependent on effective anaesthesia and perioperative care. The use of regional anaesthesia for lower limb procedures should still be considered, as should neuraxial blocks for open abdominal surgery. Monitoring modalities such as transoesophageal echocardiography enhance optimisation of cardiac status and are particularly useful in acute situations provided expertise exists.

Vascular surgery and related procedures has undergone radical changes over the last 15 years, and this has had a significant impact on the challenges faced by vascular anaesthetists. Overall vascular anaesthesia remains an area where optimal patient outcomes are significantly contributed to by the quality of anaesthesia.

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