Anaesthesia for endovascular surgery

Robertson S
The Canberra Hospital, Australia
Correspondence to: Dr Simon Robertson; e-mail: srobertson@grapevice.com.au

Endovascular surgery encompasses a large number of different cases, from endovascular aneurysm repair (EVAR), to carotid stenting, to coiling of intracerebral aneurysms. For the purposes of this abstract, anaesthesia for EVAR will be considered.

Preoperative preparation

Patients selected for EVAR are likely to be older and have more co-morbidity than patients selected for open repair. This is because EVAR is viewed as a “minimally invasive” option, causing less physiological insult, and has been deemed suitable for nonagenarians. Also, vascular surgeons are more likely to offer open repair to younger patients in order to avoid years of annual angiographic follow-up and reduce the need for reintervention. As a result, the patient for EVAR may be a greater anaesthetic challenge, even without trespass into the abdomen and aortic cross-clamping.

The particular risk factors for 30-day mortality with EVAR are renal failure (especially if associated with need for dialysis), age > 80 years, the presence of lower limb ischaemia and the presence of congestive cardiac failure. Mortality is also increased in units performing less than 10 EVAR procedures per year.

In terms of the ACC/AHA guidelines, EVAR is regarded as an intermediate-risk procedure. Unless the patient has at least two clinical predictors and is thought to require revascularisation as part of their general management, non-invasive testing is not required. Both beta blockers and statins are inadequately studied in this population, but both are attractive if there is the luxury of time to start both in advance and at appropriate doses.

General vs regional anaesthesia

General anaesthesia is frequently more practical than regional anaesthesia for the following reasons:

- Considerations for anti-coagulation are reduced. These patients are frequently on antiplatelet agents preoperatively and will certainly require heparin intraoperatively. This is usually asked for within 15 minutes of anaesthetic induction.
- Blood pressure control is easier and can be achieved by titration of anaesthetic agents and vasopressors in the majority of cases.
- Should aneurysm rupture occur, the patient’s airway is already secure and transport to theatre is less complicated.
- Breath-holding on the ventilator is easy, exact and can be prolonged if necessary.
- Complex fenestrated grafts may take lengthy periods of time, which may be tolerated poorly by some patients.

The possibilities for regional anaesthesia extend across the spectrum of infiltrated local anaesthetic to neuraxial blockade. The potential benefits of local/regional anaesthesia include the reduced need for haemodynamic support, reduced numbers of ICU admissions and reduced length of hospital stay.

Intraoperative monitoring

Distinct from open surgery, blood loss during EVAR may be occult. Further, bleeding may occur from numerous sites, most commonly from the aneurysm itself, but also from the stent edge at deployment and at the groin access sites.
Therefore, continuous arterial pressure monitoring is vital. Any unexplained decrease in blood pressure should prompt an inspection of the groin and a top-to-bottom angiographic run to look for a potential site of bleeding.

**Other considerations**

**Renal protection**

These patients may have significant background renal disease and are exposed to large volumes of intravenous contrast. The mainstay of renal protection is administration of intravenous fluid and maintenance of circulating volume. Consideration should also be given to bicarbonate supplementation and the use of N-acetyl cysteine.

**Blood pressure control**

Unless aortic occlusion balloons are used (usually in ruptured aneurysms), haemodynamic instability is minimal. Persistent hypertension is probably best managed with a beta blocker such as metoprolol or labetalol. Immediate control of hypertension is easily managed with nitrates and/or short-acting beta blockers.

Hypotension is common after induction of anaesthesia, as the magnitude of surgical stimulus is small. Infusion of low-dose vasopressors, such as phenylephrine, is often required.

**Emergency situations**

This may occur in two scenarios. Firstly, the patient with a ruptured aneurysm may be emergently stented in the radiology department. This is appropriate for relatively stable patients with ruptured abdominal aneurysms, and often the modality of choice in patients with thoracic aortic dissection and traumatic transection of the aorta. Secondly, haemorrhage may result from aneurysm rupture which may occur during wiring or stent deployment, or endo-leak after stent deployment. Significant haemorrhage may occur from groin vessels. In this setting, the patient needs to be moved rapidly to an operating theatre (as most of us are not blessed with hybrid operating theatres), with adequate light and a full range of vascular surgery instruments.

Logistically, plans need to be in place for such an eventuality. Several recommendations can be made:
- The vascular theatre team (surgeons, anaesthetists and nurses) is used to perform the EVAR with or without radiological assistance.
- Keep one theatre empty – possibly the theatre that would usually have been occupied by the vascular surgeons anyway. This, with the above point, ensures that the entire team can rapidly translocate to a theatre and deal with the rupture.
- The patient trolley/bed needs to remain outside the radiology suite with oxygen, a self-inflating bag, appropriate monitoring and emergency drugs.
- There must be an identified system of rapid transport to theatre.

**Conclusion**

In the majority of cases, EVAR is extremely well tolerated. Proper preparation for the few who experience complications is key to their successful management.