Interventional (Neuro)Radiology – anesthesia in a hostile environment

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Interventional neuroradiology refers to treatments for diseases of the central nervous system by the delivery of drugs or devices by endovascular access. Uses include definitive treatments (aneurysms, stents, thrombolysis), adjuvant treatments (decreasing vascularity, functional testing), and palliative treatments (intra-arterial chemotherapy). There has been a rapid increase in the use and success of these approaches and anesthesiologists are increasingly involved in caring for the patients. In many hospitals these procedures are mainly done in the Radiology department but surgeons are now learning these techniques so that appropriate angiographic equipment is being installed in operating theatres. While cardiologist have led the way in many of these approaches, similar approaches are now being used for all parts of the vascular tree, e.g. aorta, renal & iliac arteries and the venous system. Many of the same general management issues also pertain to other interventional procedures such as the biliary tract.

Functions of the anesthesiologist include: 1) maintain physiological stability; 2) maintain patient immobility to improve the quality of images and/or treatment; 3) manage anticoagulation; 4) manipulate systemic or regional blood pressure; 5) treat unexpected complications, e.g. hemorrhage, vascular occlusion, viscous perforation; 6) patient transport to and from the Radiology suites; and 7) rapid emergence to allow early (neurological) assessment.

The safe administration of anesthetic care in a remote location requires careful preparation. If at all possible visit the venue well in advance of starting, if you have not worked there before. Also, speak with the interventionalist so as to have a clear understanding of what will be done, what position will be used, the duration of procedure, and expectations from anesthesia.

Before starting, ensure that the following are available:
1) O₂ both piped and cylinders
2) suction that reaches the patient
3) anesthetic machine and supplies equivalent to the operating room
4) Manual resuscitator bag (e.g. Ambu) and resuscitation cart
5) extension for the breathing circuit and intravenous lines
6) All routine monitors
7) sufficient electrical outlets
8) adequate lighting
9) immediate (easy) access to the patient or a mechanism to achieve that
10) good and easy two way communication with the radiology staff and a way to call for help from colleagues.

The choice of anesthetic technique varies among centers with no clear demonstrated superiority of any of them. However, there is an increasing trend towards general anesthesia as procedures are getting longer due to complexity, and easily controlled immobility reduces motion artifact and may allow more precise delivery of the treatment. Intravenous sedation can be used to relieve anxiety, pain and discomfort while keeping the patient co-operative enough to breath-hold or be immobile when requested. For intra-abdominal vascular procedures, regional technique supplemented by sedation can also be used. Care should be used with nasopharyngeal airways, as they may cause troublesome bleeding in anticoagulated patients.

The choice of general anesthetic technique should be guided by the (intracranial) pathology and no specific agents have been shown to be superior. Both endotracheal intubation and laryngeal masks are successfully used.

Anticoagulation is required to prevent thromboembolic complications. Intravenous heparin is given so as to maintain the ACT at 2-3 times normal. Sometimes antiplatelet drugs are also given but their effect is hard to monitor or reverse. Protamine should always be available and, after communication with the interventionalist, should be given if there is (intracranial) hemorrhage and also at the end of the procedure as guided by ACT.

Deliberate hypertension may be beneficial when there is acute arterial occlusion, including from emboli, and in patients with vasospasm. The aim is to try and improve collateral blood flow. Hypotension is used much less frequently but is sometimes useful to test cerebrovascular reserve during trial occlusion and to slow flow during the injection of glue in arteriovenous malformations.
Angioplasty and stents are increasingly being used to treat carotid stenosis in lieu of carotid endarterectomy. Distension of the carotid artery may cause significant bradycardia which usually responds to atropine or glycopyrrolate, but has been reported to require external pacing. Other complications include thromboembolism, dissection, transient ischemic episodes and stroke.

In conclusion, endovascular approaches to the treatment of disease is a rapidly growing field and will no doubt become a large component of our practices. The delivery of this care will take place in the OR as well as potentially multiple sites around the hospital including the radiology, cardiology and other departments. We will need to strive to consolidate these activities or achieve a uniform level of care at all the remote sites.

Further Reading:


