Introduction

Angiography of the spine has a small but often critical place in the evaluation of some spinal lesions. Clinical angiography of the axial spine can be divided into two different types: arteriography of the spinal cord and venography of the epidural venous plexus. Arteriography is generally used to evaluate the small, select group of patients with known or suspected arteriovenous malformations of the spine, spinal cord or supporting tissues, and is occasionally used to investigate a highly vascular spinal tumour. Epidural venography has been used predominantly as a secondary, or less commonly as a primary, examination for lumbar disc protrusion, although lately it has been replaced in this role by the less invasive techniques of computed tomography and magnetic resonance imaging. Because the clinical problems and clinical roles of angiography and venography are quite different, these examinations will be discussed separately. The clinical indications, vascular anatomy and pathophysiology, as well as the technique, need to be fully understood for proper utilization of these examinations in clinical practice.

Arteriography

Clinical Indications

The main indications for spinal arteriography are to establish the presence of an arteriovenous malformation (AVM) in the cord (suggested by myelography) or in the paraspinal tissues (indicated by computed tomographic scanning) and to define in detail the arteriovenous anatomy of such a lesion or occasionally of a known highly vascular tumour.

Arteriography is not used to evaluate ischaemic or vascular occlusion in the spinal cord because of the limits of resolution of small vessels, nor as a screen for vascular lesions because of the complexity of the examination. However, once an AVM or highly vascular lesion has been detected or strongly suggested by myelography, selective spinal arteriography is essential as the only means of defining with accuracy the vascular anatomy of the lesion and surrounding territory. Other non-invasive tests, such as plain films, computed tomography and, more recently, magnetic resonance imaging, can
Spinal cord Angiography of the Axial Skeleton

Fig. 7.1a,b. Spinal cord arterial supply. a Segments of spinal cord are supplied by different groups of arteries, including the artery of Adamkiewicz (open arrow), thoracic intercostal arteries (straight black arrow) and anterior spinal and cervical medullary arteries (curved black arrow). See text. b In the cervical region, vertebral arteries and thyrocervical cervical trunk vessels both supply spinal cord extending from the medulla to a watershed zone in the upper thoracic level. (By permission of the Mayo Foundation.)

demonstrate spinal AVMs, but myelography, properly carried out, remains the most reliable screening method.

Patients with vascular lesions of the spine requiring arteriography may have progressive locomotor disability and loss of bowel or bladder control; in acute presentations there will probably be associated haemorrhage, pain and sudden neurological deficit. In a series of 60 patients (Aminoff and Logue 1974) the presenting symptoms were of acute onset in 20%. In patients with a progressive history, the mean interval between the first symptom and the greatest persistent gait disorder was 5.7 years. In another series (Houdart et al. 1966) 11 of 15 adult patients had their first symptoms before age 12. The differences between acute and chronic presentations are likely to depend on the type of vascular malformation. Some authors believe that the symptoms of parenchymal angiomata are more frequent of sudden onset whilst dural lesions may have a more chronic and progressive course (Symon et al. 1984).

If a myelogram demonstrates serpiginous defects suspicious of an AVM, then arteriography is indicated. Rarely, other causes of serpiginous defects, such as the enlarged spinal nerves of Dejerine-Sottas syndrome or dilated veins beneath total blockage of the spinal canal, mimic an AVM. These disorders can usually be differentiated from a true AVM. A complete myelographic block in the thoracic region usually indicates tumour, but such a block occasionally occurs with an AVM following previous haemorrhage (Symon et al. 1984).

The extensive vascular supply to the spine may result in the failure of the first attempt at demonstrating a suspected AVM. The question then arises as to how aggressive one should be in continuing the search. It is usually accepted that an end-point has been reached when satisfactory negative examinations of all standard arterial supplies to the spinal cord have been accomplished. These include all thoraco-lumbar intercostal, both subclavian and vertebral, and both iliac arteries.