Paraplegia Following Elective Endovascular Repair of Abdominal Aortic Aneurysm: Reversal with Cerebrospinal Fluid Drainage

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Paraplegia secondary to spinal cord ischaemia is a rare but devastating complication of abdominal aortic aneurysm repair. We report a case of paraplegia following elective endovascular repair of an infrarenal aortic aneurysm. A cerebrospinal fluid (CSF) drain was immediately inserted and resulted in full neurological recovery. This case highlights the fact that endovascular techniques are prone to similar complications as open surgery, and the importance of prompt cerebrospinal fluid drainage in cases of spinal cord ischaemia.

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Introduction

Spinal cord ischaemia resulting in paraplegia or paraparesis following elective abdominal aortic aneurysm (AAA) repair is a rare complication with catastrophic consequences. The estimated incidence in open aneurysm repair surgery is 1 in 400 and 1 in 5000 following surgery for occlusive aortoiliac disease.1

Recent reports have highlighted complications that may be encountered with endovascular repair, including spinal cord ischaemia.2-4 The role of (CSF) drainage is established in thoracic and thoracoabdominal aortic surgery to reduce the incidence of spinal ischaemia, and may reverse neurological deficit in some cases,5 however its use infrarenal AAA surgery is less clear. We report a case of paraplegia occurring immediately after an elective EVAR which was reversed by CSF drainage.

Case Report

An 83 year old man presented with an incidental finding of a 6 cm infrarenal AAA. Contrast enhanced CT showed the aneurysm to be suitable for endovascular repair with a good proximal neck but the common iliac arteries were ectatic and calcified with tortuous calcified external iliac arteries. (See Fig. 1)

At operation the iliac vessels precluded passage of a sheath into the aorta via either the right or left iliac arteries therefore the deployment of an aortic device was abandoned. At a second procedure in anticipation of using an aortouniliac device he underwent left internal iliac artery embolisation and then an ipsilateral conduit onto the right proximal external iliac artery with a right to left femoro-femoral crossover graft and ligation of both proximal common femoral arteries. It was not possible to deploy an occluder device within the left common iliac artery because of the tortuosity of the vessels.

At a further operation a Cook Zenith aortouniliac device was deployed via the right ilio-femoral conduit under epidural anaesthesia. Completion angiogram showed no evidence of an endoleak. In recovery the patient developed paraplegia, with a sensory loss to the level of T6 on the right and T4 on the left with complete loss of motor power to T4. A CSF drain was immediately inserted in the L3-L4 space and the epidural catheter was removed. Within one hour the neurological deficit had resolved completely. The CSF drain was removed 48 hours post insertion.
Three days post EVAR balloon angioplasty of a stenosis at the origin of the right internal iliac artery was performed, in order to optimise the patient’s pelvic circulation, and reduce the risk of paraplegia on withdrawal of the CSF drain. The patient was discharged on day five with no further complications.

Discussion

This case report highlights that patients undergoing EVAR are susceptible to spinal cord ischaemia, a complication with high morbidity and mortality. Analysis of the European collaborators on stent graft techniques for abdominal aortic aneurysm repair (EUROSTAR) database of 2862 patients who had undergone EVAR found an incidence of 0.21% for spinal cord ischaemia.4

The mechanism involved in spinal cord ischaemia is not fully understood but is thought to be multifactorial, involving interruption of the artery of Adamkiewicz (great radicular artery), intraoperative hypotension, prolonged aortic occlusion, atheromatous embolisation and interruption of collateral circulation from lumbar and internal iliac arteries. In patients undergoing elective EVAR the latter two are most relevant, with the variable anatomy of the artery of Adamkiewicz also contributing.

The management of spinal cord ischaemia is based on experiences from mainly thoracic and thoracoabdominal aortic surgery. The aim of treatment is to improve spinal cord perfusion and reduce oedema; this may be achieved using several adjuncts including CSF drainage, hypothermia, steroids, bypass surgery and prevention of hypotension. Analysis of data from a number of series involving endovascular repair of descending thoracic aortic aneurysms report an incidence of spinal cord ischaemia of between 3.6% to 12%. A randomised controlled trial of patients who underwent thoracoabdominal aortic aneurysm repair showed an 80% relative risk reduction in postoperative neurological deficit with prophylactic CSF drainage.5

This case demonstrates a patient whose spinal cord perfusion was dependent on the pelvic circulation. Pelvic perfusion was dependent on the right internal iliac artery following embolisation of the left internal iliac artery. With the benefit of hindsight it would have been prudent to dilate the right internal iliac artery stenosis prior to graft deployment. The stent graft was introduced from the right and during deployment there may have been decreased pelvic circulation and emboli into the right internal iliac artery resulting in the neurological deficit. See Fig. 2. Subsequent reperfusion may have resulted in spinal cord oedema, perpetuating the problem. Insertion of the CSF drain improved spinal cord perfusion. The pelvic circulation was further improved with balloon angioplasty of the right internal iliac artery.

Fig. 1. CT image of the tortuous iliac arteries with no lumbar arteries noted.

Fig. 2. Completion angiogram following insertion of aortouniliac stent graft device, showing left internal iliac artery coil embolisation and temporary interruption of the right iliac artery by the sheath.
Failure of stent graft deployment is unusual and has only occurred in one other case in 350 EVARs carried out by our unit. This case was recognised to be difficult from the outset because of the presence of calcified tortuous iliac arteries. Tortuosity can be corrected by stiff wires but the rigidity caused by extensive calcification may result in failure.

In conclusion prompt CSF drainage is advised if spinal cord ischaemia is suspected in such patients. Delay in inserting the CSF drain in order to image the spinal cord for haematoma may reduce the efficacy in reversing the neurological deficit. Investigations, such as MRI or CT of the spine, should be only be arranged once a spinal drain is in place, especially as many of these scans are normal in the acute phase. CSF drainage without delay is the most likely intervention to have any benefit in this devastating complication of aortic endovascular therapy.

References


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