Spinal Cord Ischaemia Following Endovascular Repair of Abdominal Aortic Aneurysm: Result of Spinal Drain Insertion in a Rare Complication

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INTRODUCTION
Spinal cord ischaemia (SCI) is a devastating complication of abdominal aortic aneurysm (AAA) surgery with an incidence of 0.2 – 0.3% for endovascular aneurysm repair (EVAR) and open repair.¹ Potential mechanisms include critical interruption of the spinal cord blood supply by coverage of feeder vessels, thromboembolus, and perioperative hypotension. Interventions for SCI are derived from experience with thoracic and thoracoabdominal aortic repairs. We report a case of acute neurological injury complicating an EVAR that was altered by spinal drain insertion and removal.

CASE REPORT
A 70-year-old woman was referred with an incidental finding of a 7.1-cm AAA (Fig. 1). Relevant past history included ischaemic heart disease, hypertension, hypercholesterolaemia, and long-term smoking. She had no prior history of spinal, thoracic, or abdominal surgery. The anatomical morphology, including proximal aortic neck and distal iliac landing zones, was appropriate for an endovascular repair.

A Cook bifurcate endograft was deployed without difficulty, and the AAA sac excluded. No endoleak was detected (Figs. 2 and 3), and the internal iliac arteries were preserved. Systolic blood pressure was maintained above 90 mmHg throughout the procedure.

Figure 1. Preoperative computed tomography angiogram showing a 7.1-cm abdominal aortic aneurysm, commencing 30 mm below renal ostia and extending to aortic bifurcation.
The patient awoke 1 hour after stent deployment, complaining of bilateral lower limb paralysis and no sensation below the knees. Her legs were well perfused, with palpable pedal pulses. An urgent L2—3 spinal drain was inserted, with an initial cerebrospinal fluid (CSF) pressure measurement of 30 mmHg. After continuous drainage, CSF pressure was maintained at less than 10 mmHg, and the patient had resolution of her sensory deficit, but no motor improvement. Computed tomography showed no aortic dissection or occlusive in-stent thrombus. Vasopressors, steroids, and cooling techniques were not utilised.

The drain was removed 30 hours after insertion; within minutes of removal the patient had loss of sensation below the knees. Owing to delayed notification of the treating team, spinal drain reinsertion was deemed futile. The patient underwent inpatient rehabilitation, but had no improvement in motor or sensory function, and was discharged to a spinal rehabilitation facility on postoperative day 19.

DISCUSSION

The spinal arteries receive important contributions from a number of variable feeder vessels, the largest of which is the arteria radicularis magna (of Adamkiewicz). This commonly arises at the T9—L1 level, but can be up to T5 and as low as L2 in origin. Pelvic blood supply, usually of minor importance for lumbosacral perfusion, can be vital when the arteria radicularis magna is compromised or of high origin.

One mechanism of SCI is critical coverage of feeder vessels following stent deployment. Preoperative imaging of these vessels to identify those at risk is challenging (as experienced in the index case), and often the arteria radicularis magna cannot be identified. Clinical use of fenestrated or branched endografts preserving feeder vessels has yet to be demonstrated.
Another mechanism of SCI is embolisation from diseased atherosclerotic vessels during device introduction or deployment. Careful patient selection and procedural technique can help reduce this risk. Perioperative hypotension, while not present in the reported case, is a relevant means of injury when cord perfusion is reliant on a collateral network of vessels such as the pelvic vasculature.

Spinal drains have been shown to be efficacious in prevention (with preoperative placement) and reversal of SCI in thoracic and thoracoabdominal repairs where there is a much greater incidence of ischaemia. Of the few mentions in the literature, drain use following EVAR has shown mixed results, from no improvement to complete resolution. This may be explained by discrepancies in the duration of ischaemia and delayed drain insertion. The evolving neurology with drain insertion and removal in this reported case is indicative of the role CSF pressure has on cord perfusion and neurological injury. With the benefit of hindsight, extended CSF drainage may have improved neurological recovery.

Intraoperative neurophysiologic monitoring is used by some institutions performing thoracic and thoracoabdominal repairs to facilitate early intervention. This is a feasible serial evaluation of anaesthetised patients; however, the potential effects of false-positives have not been properly investigated. High-dose intravenous steroids and therapeutic cooling remain novel techniques in SCI.

In conclusion, urgent drain insertion should be utilised in suspected SCI complicating EVAR. While the current reported incidence of SCI is low, it should be mentioned when gaining the consent of patients.

**FUNDING**
None.

**CONFLICT OF INTEREST**
None.

**REFERENCES**


