Recurrent spinal cord ischemia after endovascular stent grafting for chronic traumatic aneurysm of the aortic isthmus

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This report describes the development of recurrent spinal cord ischemia in a patient after insertion of a stent graft into the upper segment of the descending thoracic aorta for the treatment of a chronic traumatic aneurysm of the aortic isthmus. Intraoperatively, the stent covered the ostium of the left T7 artery, which was shown to give rise to a middle dorsal artery by postoperative spinal cord arteriography. (J Vasc Surg 2007;45:831-3.)

Spinal cord complications after endovascular stent placement in the upper part of the descending thoracic aorta are very uncommon. This report describes an unusual case of recurrent spinal cord ischemia development in a patient after endovascular stent grafting for a chronic traumatic aneurysm of the aortic isthmus.

CASE REPORT
A 42-year-old man residing in New Caledonia had a road accident in July 2002. He was hospitalized for fractures of the T7 and T8, which were treated orthopedically. In February 2003, an opacity in the upper mediastinum was identified by computed tomography angiography as a chronic traumatic aneurysm of the aortic isthmus.

In April 2004, the patient was transferred to Australia, where two Talent stent grafts (Medtronic, Minneapolis, Minn) were inserted. The stents covered not only the isthmus but also the left subclavian artery and the descending thoracic aorta down to the T8 level.

After insertion, the patient began experiencing recurrent episodes of transient flaccid paraplegia. These events recurred two to three times per month and were triggered by anteflexion of the trunk, sexual intercourse, and muscular exertion, such as dancing, involving the lower extremities. The patient recovered fully within 2 to 3 days after each episode.

The patient was transferred back to New Caledonia. Based on a diagnosis of subclavian artery steal syndrome, prosthetic bypass from the carotid to the subclavian artery was performed in August 2004. Immediately after the procedure, moderate but persistent patency of the carotid-to-subclavian bypass. A distal type 1 or type 2 endoleak was suggested by visualization of the left T7 artery (Fig 1) originating from the stented portion of the aorta. However, views taken during anteflexion of the trunk showed no evidence of kinking of the endovascular stent, which had been visualized during the last hospitalization in Australia. Because of the patient's history of paraplegia, preoperative spinal cord arteriography was not performed.

Surgical treatment was undertaken on October 25, 2005. Exposure was achieved by median sternotomy associated with anterolateral thoracotomy through the fifth intercostal space. Total cardiopulmonary bypass was established between an atrio caval canula and a canula in the ascending aorta. Body temperature was lowered to 20°C.

The stent grafts were removed through a longitudinal aortotomy of about 12 cm long. Extraction was easy because the prosthetic part of the stent graft had not incorporated into the aorta and the external structure was embedded only slightly into the wall. After removing a thin layer of old thrombus adherent to the stent but not to the aortic wall, we inspected the healthy descending thoracic aorta and found four pairs of patent intercostal arteries (T4 to T8) showing moderate reflux.

A clamp was placed between the innominate artery and left common carotid artery. Cardiopulmonary bypass was resumed and rewarming of the upper half of the body was begun after 10 minutes of circulatory arrest. After closing of the lower part of the aortotomy and unsuccessfully attempting end-to-end aortoaoctic anastomosis, we re-established continuity of the descending thoracic aorta by interposition of a 6-cm-long woven Dacron prosthesis.

Postoperative recovery was uneventful. Aortography now showed evidence of direct vascularization of the left T7 artery (Fig 2). Spinal cord arteriography demonstrated the presence of a middle dorsal artery arising from the left T7 artery (Fig 3). The Adamkiewicz artery arose from the left T10 artery. With a follow-up of 8
months, the patient has not experienced any recurrence of flaccid paraplegia even after the above-mentioned trigger factors.

**DISCUSSION**

The case history of this patient is unusual. To our knowledge there have been no previous reports of spinal cord complications after insertion of a stent-graft in the upper thoracic aorta.

The mechanism underlying recurrent spinal cord ischemia in our patient is not completely clear. We speculate that it resulted from intermittent occlusion of the ostium of the left T7 artery that gave rise to the middle dorsal artery. This mechanism assumes the presence of either a distal type 1 or a type 2 endoleak, which was strongly suggested by the preoperative work-up. Flow from this endoleak would have been sufficient to avoid spinal cord ischemia as long as the patient was in a normal posture. However, slight displacement of the stent-graft during anteflexion of the trunk would have cut off the flow from the endoleak.

**Fig 1.** Preoperative aortography shows stent grafts covering the upper segment of the descending thoracic aorta. The left T7 artery, originating from the stented portion of the aorta, is visualized (arrows), suggesting a distal type 1 or type 2 endoleak.

**Fig 2.** Postoperative aortography shows direct visualization of the left T7 artery (arrow) now originating from a noncovered portion of the aorta.

**Fig 3.** Postoperative spinal cord arteriography with selective injection of contrast material into the left T7 artery showing the presence of a middle dorsal artery (arrows) supplying the spinal cord.
Although less probable, another possible explanation for transient spinal cord ischemia is that activity involving the abdomen or legs caused steal from a spinal cord territory to which blood flow had already been reduced owing to coverage of the left T7 artery by stent graft. In this case the patient always recovered completely from spinal cord ischemia within 2 to 3 days but these episodes caused significant disability and mental anguish.

This case underlines the potential dangers of overextensive stent graft coverage of the upper segment of the descending thoracic aorta. The Adamkiewicz artery, which arises at a lower level (generally between T8 and L2), is not the only artery supplying blood flow to the spinal cord. This is particularly true in younger people, who often have several spinal cord arteries at different levels. In our patient, the middle dorsal artery arose from the left T7 artery that had been covered by a long stent graft placed in the upper segment of the descending thoracic aorta.

A more important question raised by this case involves the indication for stent graft placement. In our opinion, stent grafting is useful for the immediate treatment of acute aortic rupture in multiple trauma patients contraindicated for the heparinization that is required for cardiopulmonary bypass. We consider, however, that surgical treatment is the method of choice for chronic traumatic aneurysms in patients in good general condition.

Series published since the first surgical procedures for chronic traumatic aneurysm of the aortic isthmus in the 1950s have consistently documented excellent outcomes in terms of mortality and postoperative spinal cord complication rates that have been near 0 as well as in long-term stability, with only rare reports of secondary or late complications. The feasibility of direct end-to-end aortic anastomosis in two thirds of cases is a further argument against the use of stent grafts in good-risk patients with chronic traumatic aneurysm of the aortic isthmus.

Stent grafting should only be used in elderly patients with unstable cardiopulmonary status or in patients with limited life expectancy. This opinion is supported by the Stanford group, who published the largest series describing stent grafting for chronic traumatic aneurysm of the aortic isthmus with the longest follow-up (55 ± 29 months). Poor results at 6 years were observed in 51% ± 15% of cases. Adverse outcomes included endoleaks, device-related mechanical problems, late deaths owing to aortic-related causes, and unexplained sudden deaths.

**CONCLUSION**

The present study indicates that recurrent spinal cord ischemia must be included among the previously documented potential secondary and late complications of stent grafting of the descending thoracic aorta. The non-negligible incidence of such complications is particularly worrisome insofar as the duration of current follow-up is only a few years in a population with decades-long life expectancies.

**REFERENCES**


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