Late-onset spinal subdural hematoma following cerebrospinal fluid drainage tube removal

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ABSTRACT
Cerebrospinal fluid drainage is recommended for high-risk patients to prevent spinal cord ischemia during aortic surgery; however, it is associated with complications. We report a case of a late-onset spinal subdural hematoma that developed after removal of the cerebrospinal fluid drainage tube from a patient who undergone thoracic endovascular aortic repair. Spinal hematomas usually develop 2 to 3 days after tube removal; however, in our patient’s case, it developed after 7 days. Therefore, a spinal subdural hematoma can occur ≤1 week after drainage tube removal, necessitating prompt magnetic resonance imaging for patients with lower limb weakness or back pain. (J Vasc Surg Cases Innov Tech 2022;8:107-10.)

Keywords: Aortic dissection; Cerebrospinal fluid drainage; Paraparesis; Spinal subdural hematoma; Thoracic endovascular aortic repair

Society for Vascular Surgery has recommended that cerebrospinal fluid drainage (CSFD) be instituted for high-risk patients undergoing thoracic endovascular aortic repair (TEVAR) to prevent spinal cord ischemia (level of recommendation, grade 1; quality of evidence, B). However, the complications associated with CSFD have limited its utility in some patients. We report a rare case of a spinal subdural hematoma that developed after CSFD tube removal in a patient who had undergone TEVAR for aortic dissection. The patient provided written informed consent for the report of his case details and imaging studies.

CASE REPORT
An 82-year-old man had presented with acute type B aortic dissection (intramural type). Nine days after treatment had been initiated, a computed tomography scan showed rapid expansion of ulcer-like projections in the distal aortic arch (enlarging from 36 to 43 mm) and descending aorta (enlarging from 42 to 47 mm; Fig 1, A). To prevent aortic rupture, we performed a debranching TEVAR procedure 3 weeks after the onset of the aortic dissection. Preoperative laboratory data showed no evidence of thrombocytopenia or abnormal blood coagulation.

We planned an aortic repair extending from zone 2 to the level of T11. Because 81% of the left common carotid artery to celiac artery would be covered by the TEVAR, we inserted a prophylactic CSFD tube, which will generally be inserted 1 day before surgery at our hospital. Therefore, 1 day before surgery, we inserted a CSFD tube into the L2-L3 subarachnoid space and advanced it 13 cm proximally without difficulty. A sample of cerebrospinal fluid collected from the tube was colorless and lacked blood contamination. The tube was clamped until the surgery had been performed.

The anesthesiologist initially confirmed that clear cerebrospinal fluid had flowed from the CSFD tube that had been placed the day before surgery. Because right to left axillary bypass is generally performed as the first treatment choice, we performed right to left axillary artery bypass grafting using an expanded polytetrafluoroethylene graft that measured 6 mm in diameter with the patient under general anesthesia. Subsequently, TEVAR and coil embolization of the left subclavian artery were performed. After TEVAR, we controlled the mean blood pressure to ≥90 mm Hg using dopamine until the patient had been transported to the hospital intensive care unit. After confirming the mobility of his lower limbs, the patient was extubated.

CSFD was initiated at a height of 10 cm from the external auditory foramen. Fluid was present in the drain tube; however, the amount was too small to be collected in the drain bag. Therefore, the CSFD tube was clamped, and the patient was discharged from the intensive care unit the day after surgery. The postoperative platelet count and coagulation profile were normal. Because the patient had had no paraplegia or paresis within 2 days after surgery, the drainage tube and urinary catheter were removed. However, the catheter was reinserted because of the possibility of urinary retention.

A computed tomography scan on postoperative day 7 revealed no enhancement of a false lumen, and no endoleak was observed (Fig 1, B). On postoperative day 8, the patient had presented with transient lower back pain. However, no significant changes had occurred in his vital signs. At 10 days postoperatively, the patient had developed bilateral lower extremity weakness that was attributed to inactivity and delirium.
Nonetheless, the gradual progression of his muscle weakness, even with rehabilitation, prompted further evaluation. Magnetic resonance imaging (MRI) performed 13 days after surgery revealed a spinal subdural hemorrhage (Fig 2), and the patient exhibited anal sphincter weakness with no associated constipation or incontinence. At 14 days after surgery, surgical decompression of the spinal canal was performed with laminectomy and an incision of the dura mater that extended from T12 to L3. Intraoperatively, a dark red hematoma was identified and removed from the ventral surface of the cauda equina (Fig 3). No residual bleeding was observed. After surgery, the patient’s bilateral lower extremity weakness had improved slightly. At 3 weeks after surgery, the patient was walking with a cane.

DISCUSSION

Paraplegia is a serious complication of thoracoabdominal aortic aneurysm surgery and TEVAR. Society for Vascular Surgery has recommended using CSFD for patients at risk of spinal cord ischemia during TEVAR (level of recommendation, grade 1; quality of evidence, B). However, complications of CSFD, including headache, cerebrospinal fluid leakage, meningitis, intracranial or puncture site hematoma development, and damage caused by drainage tube fracture, have been reported. Rong et al reported a 9.9% complication rate for 4714 patients who had undergone CSFD during surgery for descending thoracic and thoracoabdominal aortic aneurysms. Although headache has been the most common CSFD complication, spinal epidural or subdural hematoma formation at the puncture site (0.8%) and intracranial or subarachnoid hemorrhage (1.5%) have also been reported for patients treated with CSFD. Therefore, the indication for CSFD should be carefully weighed against the high incidence of complications before proceeding with this treatment.

To the best of our knowledge, only four cases of subdural hematoma development at the puncture site after CSFD have been reported. The patients had presented with symptoms that included lower back pain, lower extremity paresis, or paraplegia within 2 days of CSFD tube removal. Our patient had developed lower back pain and progressive lower limb weakness 7 days after drainage tube removal, suggesting that the spinal subdural vascular damage had occurred when the tube was removed. Moreover, in our patient, no CSFD was observed after the surgery, indicating that traction-related hemorrhage was unlikely. Murakami et al suggested that the subdural vascular injury that had occurred during CSFD tube removal was the cause of hematoma development. In our patient, we suspected that subdural vein or minor vessel damage had led to hematoma formation, owing to the delay in symptom onset.

Fig 1. Contrast-enhanced computed tomography (CT) findings. A, Preoperative three-dimensional CT revealing enlargement of ulcer-like projections in the distal aortic arch and descending aorta. B, Postoperative three-dimensional CT showing resolution of the previously identified endoleak in the descending aorta.
MRI is an important imaging modality for the diagnosis of spinal subdural hematomas. The late detection of our patient’s subdural hematoma affected his neurologic prognosis. For our patient, we believed that the effects of delirium were significant because we had observed lower limb muscle weakness and delirium simultaneously. Therefore, we could not intervene urgently by conducting MRI at an early stage. Hence, the findings from the present case suggest the need for mandatory and meticulous MRI to diagnose this condition quickly and accurately. Mitsuoka et al[^4] also recommended the immediate use of spinal MRI for patients with back pain, paraparesis, paraplegia, bladder disturbance, or anal sphincter weakness after CSFD tube removal. Our patient had presented with urinary retention, back pain, and lower extremity paralysis. Because elderly patients will often have delirium, urinary retention, and low activities of daily living, neurologic symptoms will be attributed to aging rather than spinal cord ischemia or hematoma. The findings from the present study highlight the importance of considering the possibility of spinal cord ischemia or hematoma in an elderly patient with neurologic symptoms after CSFD tube removal.

**CONCLUSIONS**

Although CSFD has been recommended during TEVAR, the complications that can develop warrant careful consideration of its use. Moreover, MRI should be performed promptly after TEVAR to enable the early diagnosis and treatment of spinal subdural hematoma for improved neurologic outcomes because of the potential for delayed symptom onset.

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