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A Case of Cerebrospinal Drainage for Paraplegia Complicated by Acute Aortic Dissection (Stanford B) Followed by TEVAR in the Subacute Phase

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Abstract

The patient is 50-year-old man. He was admitted to our hospital with a strong back pain and diagnosed as an acute type B aortic dissection. On the second day of hospitalization, he developed symptoms of paraplegia, and we considered TEVAR, but we were concerned that TEVAR intervention in the acute phase might worsen the dissection, so we first placed a cerebrospinal drainage (CSFD) device, which resulted in improvement of his symptoms. Thereafter, although his lower limb mobility was fine, he underwent thoracic stent graft aortic repair (TEVAR) in the subacute phase due to worsening ULP. The patient had a good postoperative course and was discharged home unassisted. The initial placement of CSFD was effective in reducing the incidence of paraplegia as a complication of TEVAR and in bringing the timing of TEVAR intervention from the acute phase to the subacute phase.

Keywords

Aortic Dissection, Paraplegia, Cerebrospinal Drainage, TEVAR

1. Background

Paraplegia is one of the most serious complications of acute aortic dissection. It is said to occur in 2% - 4% of cases, and is more common in type A dissection [1] [2]. Treatment after complications is difficult and the prognosis is poor [3].

In recent years, the frequency of thoracic endovascular aortic repair (TEVAR) for type B dissection in the subacute stage has increased due to its excellent remote outcome. In addition, it is said that it is safer to perform the intervention

in the subacute phase than in the acute phase immediately after the onset of dissection. In the present report, we describe a case of complete paraplegia associated with acute type B aortic dissection that was treated by cerebrospinal fluid drainage (CSFD), followed by TEVAR for entry closure in the subacute phase after aortic dissection worsened, without recurrence of paraplegia.

Informed consent was obtained from the patient and permission was obtained to submit this case for publication.

2. Case Presentation

Case: 50-year-old male.

Complaint: Sudden chest and back pain.

History: Hypertension (untreated).

Clinical history:

Patient called for emergency medical assistance due to sudden chest and back pain while driving.

Present condition at the time of arrival: Clear consciousness. Blood pressure 250/166 mmHg, pulse 90/min. No pain or cold sensation was noted in the lower extremities. Bilateral femoral and popliteal arteries were well pulsatile. No motor or sensory disturbance in the lower extremities.

Blood test findings on arrival: white blood cell count 10,900/μl, D-dimer 6.7 μg/ml, Lactate 3.5 mg/dl.

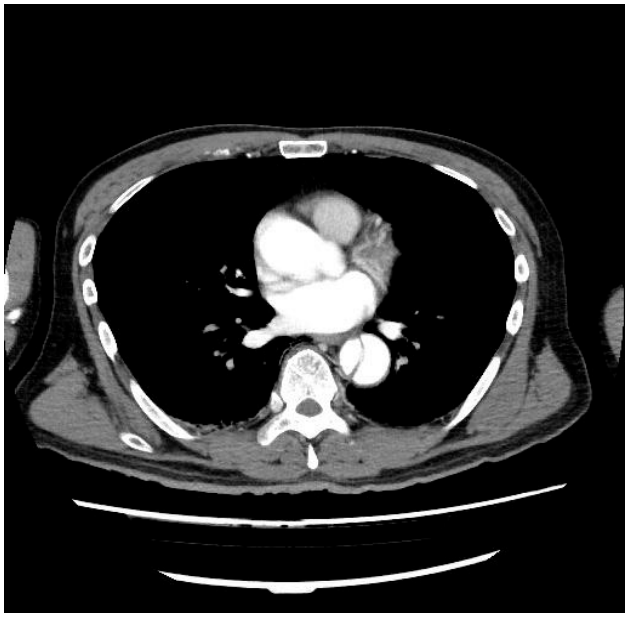
Contrast CT: Contrast CT shows communicating acute type B aortic dissection from the distal arch to the aortic branch (**Figure 1(a)**). The celiac artery and left renal artery were bifurcated from false lumen (**Figure 1(b)**).

Post-hospitalization course:

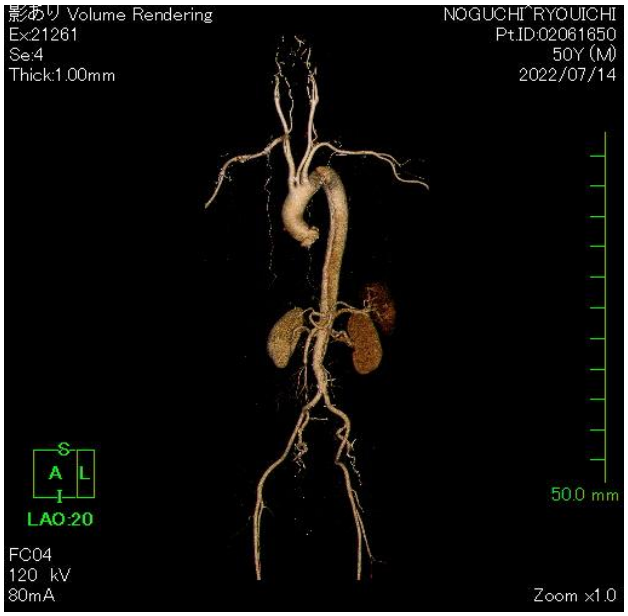
After admission, the patient was treated in the ICU with antihypertensive and sedation therapy according to acute type B dissection. There was no difference in blood pressure in both upper extremities, and systolic blood pressure was generally controlled between 110 - 120 mmHg. Both femoral arteries were well palpable, and blood pressure in both lower extremities did not differ between right and left, and systolic blood pressure was generally 120 - 130 mmHg. There were no complaints of chest and back pain.

On the evening of the third day after the onset of the dissection, manual muscle testing (MMT) levels decreased by 5 to 4, and symptoms of paraplegia appeared in both lower extremities. CT imaging showed no obvious worsening of the aortic dissection.

Steroids were first administered, and the patient improved to MMT 5. However, the next morning, although there was no change in blood pressure or worsening of the dissection on CT, he still had incomplete paraplegia in both lower extremities up to MMT3. Emergency TEVAR was considered, but TEVAR intervention in the acute phase of aortic dissection was feared to worsen the dissection itself and paraplegia, so a CSFD was placed on day 4 of the onset of dissection. The paraplegia improved 2 hours after CSFD implantation.



(a)



(b)

Figure 1. (a) and (b) preoperative computed tomography.

Thereafter, although his lower limb mobility was fine, worsening of ULP was detected. Since the patient was entering a subacute phase in which TEVAR could be performed relatively safely, we decided to perform TEVAR intervention in this case.

Operative findings:

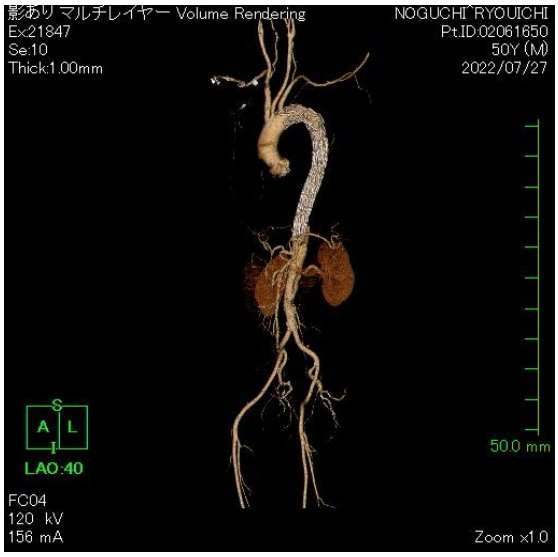
Percutaneous thoracic endovascular aortic repair (P-TEVAR) was performed from just below the left subclavian artery to just above the celiac artery on day 14 of acute aortic dissection and day 12 after paraplegia occurred. To prevent vascular injury, the stent graft diameter was selected to be about 90% - 95% of the

aortic diameter. No problematic endoleak was observed on final contrast. There were no surgical complications such as retrograde type A dissection (RTAD) orstent-induced new entry (SINE). The operative time was 44 minutes.

Postoperative course:

The patient woke up well after the surgery. Fortunately, no recurrence of paraplegia was observed. The blood pressure was maintained at a mean pressure of 80 mmHg. The highest postoperative CPK value was 158 IU/l, which was within the normal range, suggesting that there was no muscle damage due to lower extremity ischemia. Postoperative CT showed good stent graft expansion and enlargement of the true lumen (**Figure 2(a)** and **Figure 2(b)**). He was discharged home 14 days after surgery.

(a)



(b)

Figure 2. (a) and (b) postoperative computed tomography. Stent graft and the true lumen were well expanded.

3. Discussion

It has been reported that the frequency of spinal cord disorders complicating acute aortic dissection is 2% - 4%, and is relatively common in type A dissection [1] [2]. Although this is a relatively rare complication, it is a serious complication considering the fact that once it develops and the symptoms are fixed, ADL is greatly reduced.

Therefore, early treatment is desirable. Untreated hypertension is a risk factor for the development of aortic dissection. However, the association between untreated hypertension and the development of paraplegia is unknown. There are various mechanisms of spinal cord injury associated with aortic dissection, but the main ones are withdrawal and compression of the intercostal and lumbar arteries due to dissection, and decreased direct perfusion due to decreased true-lumen blood flow caused by dynamic occlusion in the high aorta [4] [5]. Primary entry closure with stent grafting may be an effective treatment from the viewpoint of increasing true lumen perfusion and decreasing false lumen pressure. In fact, when type A dissection is complicated by paraplegia, entry closure by open chest surgery is performed to save the patient's life, and this alone often improves paraplegia, and if not, CSFD implantation is often considered afterward [6]. However, when acute type B dissection is complicated by paraplegia, stent grafting is often preferred over open chest surgery, but TEVAR intervention in the acute phase is generally not recommended due to the risk of more serious complications such as RTAD. Another treatment for paraplegia is to maintain a high mean blood pressure to increase dorsal luminal blood flow, but this is difficult in acute dissection.

CSFD is also effective for paraplegia associated with aortic dissection. There have been reports of cases of spinal cord injury associated with early thrombo-occlusive type A dissection that resolved with CSFD alone, and spinal cord drainage may be an option depending on the patient's condition.

In a report by Nagano *et al*., an emergency descending entry closure was performed for spinal cord injury associated with type B dissection with good results, and aggressive treatment is recommended. Open thoracotomy is also a method, but it may be more invasive than TEVAR.

In this case, the patient had acute type B dissection complicated by complete paraplegia, and we considered performing TEVAR as a compliant type B dissection as soon as possible, but we were hesitant to perform TEVAR in the acute phase because of complications. The initial placement of the CSFD, in this case, resulted in improvement of paraplegia. Therefore, we were able to wait until the subacute phase, when the vessels were stabilized, to perform TEVAR. Since TEVAR was performed in the subacute phase, it was possible to manage the patient's circulation with an average blood pressure of about 85 after the procedure. This may have contributed to the prevention of recurrence of paraplegia.

When paraplegia develops after acute type B dissection, as in this case, TEVAR intervention in the acute phase may be considered for entry closure and main-

tenance of blood pressure control, but if the CSFD is placed first and paraplegia is improved, it may be better to wait until the subacute phase to perform TEVAR to prevent TEVAR-related complications. It was thought that effective use of CSFD can delay TEVAR intervention to the subacute phase when the intima is stabilized, thereby reducing the complication rate of TEVAR.

4. Conclusion

The initial placement of CSFD was effective in reducing the incidence of paraplegia as a complication of TEVAR and in bringing the timing of TEVAR intervention from the acute phase to the subacute phase.

Conflicts of Interest

There is no stipulated COI for all authors of this paper.

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