Delayed Stent Deformity and Fracture of Djumbodis Dissection System

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In recent years, a novel approach using the Djumbodis dissection system aortic stent has been introduced as an alternative to aortic arch replacement in acute type A aortic dissection involving the arch. From 2010 to 2013, we treated 7 patients with acute type A aortic dissection using the technique of replacing the ascending aorta with interposition graft and stenting of the aortic arch with the Djumbodis dissection system. We followed up the patients with serial imaging and in 3 consecutive patients who had been followed up for more than 10 months, we noted significant deformity and fracture of the Djumbodis stent.


The established treatment for acute type A aortic dissection is to resect the entry tear along with the ascending aorta and replace it with an interposition graft. The Djumbodis dissection system (Saint Come-Chirurgie, Marseille, France) is an uncovered stainless steel aortic endovascular stent designed specifically for the treatment of aortic dissection to improve true lumen expansion. From February 2010 to February 2013, 118 patients were surgically treated for aortic dissection in our unit. We treated 7 patients with acute type A aortic dissection using the technique of replacing the ascending aorta with an interposition graft and stenting the aortic arch with the Djumbodis stent. We followed up the patients with serial imaging using roentgenology of the chest and computed tomography (CT). In 3 consecutive patients who had been followed up for more than 10 months, we noted significant deformity and fracture of the Djumbodis stent.

Case Reports

Patient 1

A 63-year-old woman with CT-confirmed type A acute aortic dissection was referred to our unit. An emergency operation was carried out to replace her ascending aorta while she was under deep hypothermic circulatory arrest at 20°C. Upon circulatory arrest, inspection of the distal dissected aorta by use of the flexible tip 5-mm EndoEYE endoscope (Olympus America, Center Valley, PA) confirmed a dissection tear at the inner curvature of the proximal arch, continuing into the descending thoracic aorta. The true lumen within the ascending aorta and the arch was compressed to a slitlike structure. Open transluminal endovascular stenting to the arch and proximal descending aorta was carried out. A 9-cm Djumbodis stent was deployed under direct vision from the arch to the proximal descending aorta. After reexamination by EndoEYE, the expansion of the distal and proximal parts of the stent was readjusted by use of the compliant balloon until full expansion was achieved. Subsequently, a distal sandwiched interposition graft anastomosis completed the operation. The patient made an unremarkable recovery and was discharged on postoperative day 12 [1]. However, serial radiograms of the chest taken at 3-month, 1-year, and 2-year intervals showed progressive transverse deformity of the stent (Fig 1). The latest CT at the 2-year interval confirmed fracture of the stent at its articulated segment, with persistent perfusion of the false lumen. Clinically, the patient is still asymptomatic with satisfactory blood pressure control, and there is no sign of end-organ malperfusion.

Patient 2

A 69-year-old man with CT-confirmed type A aortic dissection underwent an emergency operation similar to that in the first case. Intraoperatively, entry and secondary exit tears were found in the distal ascending aorta and proximal descending thoracic aorta. A 9-cm Djumbodis stent was deployed under direct vision as before. The continuation of the aorta was then restored, and operation was completed uneventfully. The patient had a prolonged postoperative course because of respiratory adverse events and was eventually discharged 1 month after the procedure. He experienced an increase in chest pain 3 years after the initial operation. Radiography of the chest showed fracture of the stent at the articulating element with a pointing strut, which was confirmed by CT of the thorax (Fig 2). There was no evidence of aortic rupture or contrast leakage over the site of the pointing strut during the time of the study.

Patient 3

A 55-year-old man with CT-confirmed type A aortic dissection underwent an emergency operation, performed as previously described. Interoperatively, the dissection tear was found to be at the origin of the brachiocephalic artery, extending to the mid-descending thoracic aorta. A 9-cm Djumbodis stent was deployed from the aortic arch into the proximal descending aorta. The operation was finished in the usual manner, and the patient was discharged on postoperative day 14. During follow-up, we noted progressive stent deformity on serial radiograms of the chest (Fig 3), and a 3-dimensional CT...
reconstruction at the 3-year interval confirmed fracture of the stent at multiple sites (Fig 4).

Comment
The Djumbodis stent system was designed to treat patients with acute aortic dissection, and it is suggested that more than 14,000 stents have been placed worldwide, although clinical case series have remained small. The device is a biocompatible 316L stainless-steel uncovered stent, premounted on a compliant balloon, which can be inflated to a 45-mm diameter. The stent is available in 4-cm, 9-cm, and 14-cm lengths, with a 120-cm introducing catheter. The design features 4-cm stent segments that are joined end to end by a 1-cm articulation segment to allow better conformity to the aortic arch. The system is a relatively simple alternative to total arch replacement in the acute setting, and it also potentially reduce the long-term morbidity if distal false lumen thrombosis is achieved. However, we could not find any robust experimental results on its durability and metal fatigability.

From the serial follow-up of our 3 consecutive patients with placement of Djumbodis stents, we could...
appreciate the following stages of evolution of the stent deformity and fracture. First, a transverse displacement of the two segments of the stent relative to each other was evident from 3 months onward. We believe that when a stent is placed at the junction of the distal arch and the proximal descending aorta, where the pulsatility of the aorta is maximal, the stent is subjected to a maximum shearing force. Second, after a time interval of...
transverse displacement, fracture of the articulating segment could occur as a result of metal fatigue. Finally, the remaining parts of the stent can become fractured depending on the forces exerted on them. Our report includes 3 patients out of a total 7 patients in whom we have deployed this stent in the manner described. For the rest of the treated patients, 1 patient died on post-operative day 1 of profound bleeding, 1 patient was lost to follow-up, and 2 patients were treated for less than 3 months and their stents remain intact. Our series is small but is given here in the absence of other long-term clinical data. It is important to note the potential of stent fracture when the stent is used in the arch and the proximal descending aorta during surgical repair of type A aortic dissection.

Conclusion
The long-term clinical outcomes of the Djumbodis dissection system in the treatment of pathologic conditions of the aorta are infrequently reported. Our current report demonstrates substantial deformity and fracture of the stent in 2 to 3 years after deployment. Whether such deformity and fracture are associated with an increased risk of aortic rupture is unclear. Additional long-term follow-up studies are required to determine the durability of the Djumbodis stent system.

Reference