Successful Repair of Graft Failure and Abdominal Aortic Aneurysm Following Thoraco-abdominal Bypass for Atypical Aortic Coarctation

A 54-year-old woman, who underwent descendo-abdominal aortic bypass grafting for atypical aortic coarctation complicated with Takayasu's arteritis 37 years previously, was referred to our hospital for treatment of a pseudoaneurysm due to rupture of the graft. Preoperative computed tomography scan also demonstrated an abdominal aortic aneurysm. First, an endovascular stent-graft repair of the pseudoaneurysm was performed, then the abdominal aortic aneurysm was repaired with the aid of cardiopulmonary bypass. Proper surgical planning was important to treat this rare development accompanied by aberrant circulation. (Jpn J Thorac Cardiovasc Surg 2004; 52: 91–94)

Key words: Takayasu's arteritis, atypical aortic coarctation, abdominal aortic aneurysm, graft failure

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Atypical aortic coarctation is a rare pathology caused by Takayasu's arteritis, and aorto-aortic bypass grafting has mainly been performed for this lesion. We report a patient who developed a graft rupture and abdominal aortic aneurysm 37 years after bypass surgery, who was successfully treated.

Case

A 54-year-old woman was transferred by ambulance to our hospital following rupture of a previously implanted vascular graft and abdominal aortic aneurysm were incidentally found at another hospital. According to her, she had sometimes experienced slight dull aching pain in her left flank for a year, but otherwise was free from any symptoms. She was diagnosed with Takayasu's arteritis in 1965 when she was 17, with severe renovascular hypertension being the symptom at onset, and underwent bypass grafting between the descending and the abdominal aorta with a 16-mm woven Teflon graft at our institution. Active inflammation had already subsided at that time. According to the old medical record, her systolic blood pressure decreased to 170 mmHg after the operation with no pressure gradient between the upper and lower extremities, though preoperatively they had been 220 and 110 mmHg respectively. The reason why hypertension did not resolve completely was unclear, as the angiography did not delineate stenosis of the renal arteries.

Computed tomography (CT) scan revealed that the graft was anastomosed to the descending aorta, then passed through the left thoracic cavity and the retroperitoneal space, and was anastomosed to the infrarenal abdominal aorta. The native descending aorta was occluded just distal to the proximal anastomosis (Fig. 1A) and had regained patency at the level of the celiac artery (Fig. 1B), thus blood flow of the abdominal branches was supplied entirely retrogradely by the bypass. The graft rupture was observed at 2 points just above the diaphragm and pseudoaneurysms had also formed. The maximum diameter of the infrarenal abdominal aortic aneurysm was 48 mm (Fig. 1C). Preoperative conditions are summarized in Figure 2A. As her vital signs were stable and she did not have any symptoms, elective surgery was planned.

First, we conducted an endovascular stent-graft repair of the pseudoaneurysm (Fig. 3A, B) in order to avoid pseudoaneurysm-related complications during the ab-

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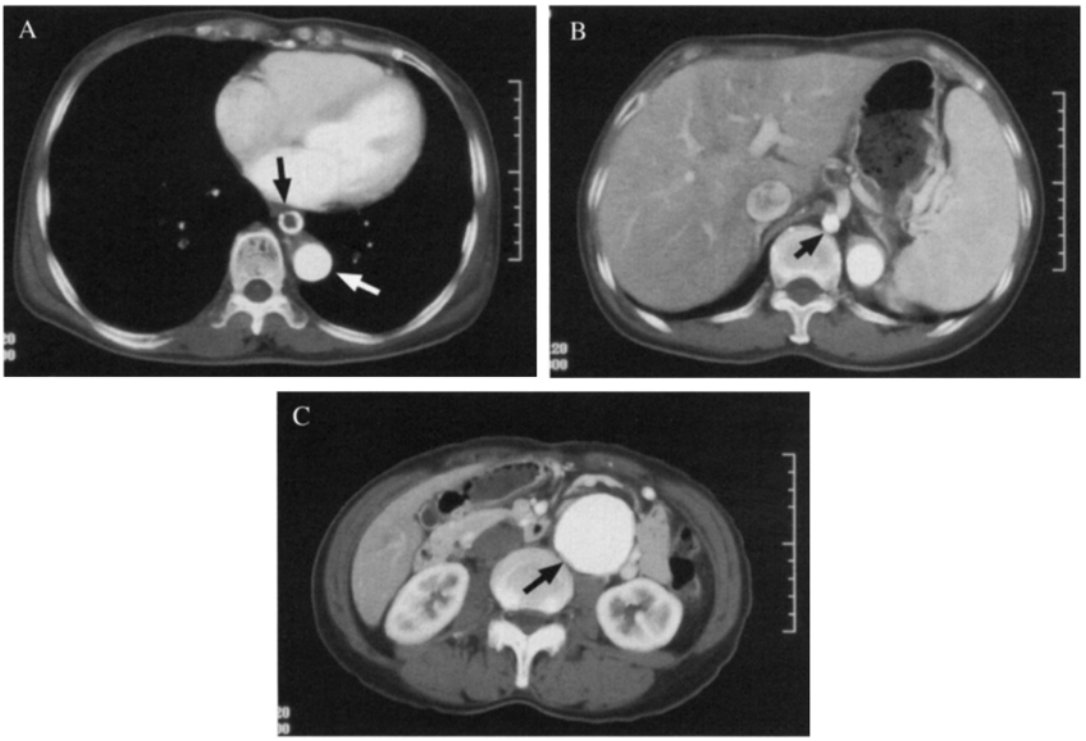


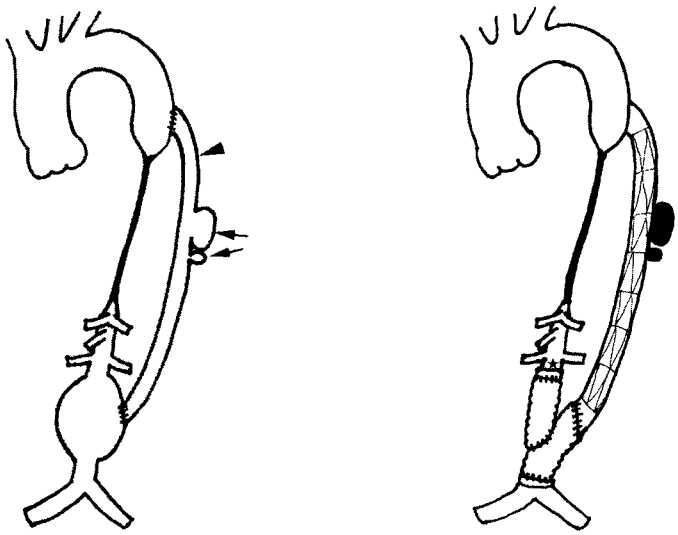
Fig. 1. Preoperative computed tomography.
A: The native descending aorta (black arrow) is severely calcified and totally occluded. The graft had passed through the left thoracic cavity as well (white arrow).
B: At the level of the celiac artery, the aorta regained patency.
C: The maximum diameter of the abdominal aortic aneurysm (arrow) was 48 mm.

dominal aortic aneurysm (AAA) operation. A 17.5 cm custom made stent-graft was inserted into the graft in such a way that the entire length of the old graft would be reinforced in order to avoid rupture at other sites. Intra- and postoperative angiography did not reveal any endoleak. Two weeks after stenting, graft replacement of the infrarenal abdominal aorta was performed. To avoid abdominal organ ischemia during aortic clamping, extracorporeal circulation was instituted between the right femoral vein and the abdominal aorta just distal to renal arteries. A 16-mm tube graft was implanted between the distal edge of the old graft and the terminal aorta, and then a 14-mm graft was interposed between the aorta just below the renal arteries and the new graft (Fig. 2B). The postoperative course was uneventful and CT scans depicted a prompt reduction of the pseudoaneurysm. The patient was discharged 16 days after the second operation and has been doing well since.

Discussion

In general, the principal remote complications seen after vascular surgery that call for utilization of prostheses are anastomotic aneurysm and graft occlusion. Failure of arterial prostheses now seems improbable and in fact, we could not find any reports of a failed graft implanted after the mid-1980s. However, Berger et al. reported in 1981 that the incidence of late defects in Dacron grafts was 3% in patients followed for a period of 3 to 15.3 years.[1] In the present case, the graft was more primitive than those in Berger's series, thus failure of the prosthesis may well be attributed entirely to the nature of the graft. However, it is also possible that long-term excessive stress accelerated deterioration of the graft, which was used as a substitute for the thoracic aorta in this patient, whose renovascular hypertension did not completely resolve following bypass surgery.

Indeed, radical operations such as replacement of the graft with a new one could have eliminated risk of rerupture at another site. However, we considered that the patient had a good indication for stent-graft implantation, as there were good landing zones available, there was no concern regarding paraplegia accompany-



A B

Fig. 2.
A: Preoperative anatomy. Due to rupture of a Teflon graft (arrowhead), 2 pseudoaneurysms (arrows) had formed just above the diaphragm.
B: Surgical procedure. The asterisk shows aortic cannulation site.

A B

Fig. 3. Digital subtraction angiography.
A: Preoperative angiogram revealing two pseudoaneurysms.
B: After insertion of the stent-graft, the aneurysms were entirely excluded. Stent-graft lined almost whole length of the old graft. The arrowheads show edges of the stent-graft.

ing the use of a stent-graft, and it seemed very difficult to approach the aneurysm and to clamp the graft safely under re-thoracotomy because of adhesion and fragility of the graft. There have been several reports of late graft failure, and most of them were treated with re-grafting.[2,3] To the best of our knowledge, this is the first reported case of a stent-graft being used to repair a pseudoaneurysm caused by graft rupture.

Atypical aortic coarctation is a rare condition causing correctable hypertension and claudication. There is controversy regarding its etiology, though Lande concluded that most of these lesions could be ascribed to Takayasu's arteritis in Asian and also in Western populations,[4] which seems to be the accepted theory. Aorto-aortic bypass grafting, coarctectomy with interposed grafting,[5] and stenting[6] have each been performed as surgical treatments for the condition. At our institution, 29 patients have undergone bypass surgery in the past four decades. Among those, 6 patients developed an anastomotic aneurysm and 2 had an AAA in the remote phase, some of whom required complicated surgical treatment. In this case, a cardiopulmonary bypass was useful and indispensable for successful AAA repair, as collaterals usually formed between the upper and lower half of the body due to aortic coarctation had already become involuted.

The etiology of the present abdominal aortic aneurysm, that is, whether the AAA was atherosclerosis or

Takayasu's arteritis in origin, could not be ascertained by pathological examination. Therefore, long-term follow-up of patients with Takayasu's arteritis seems necessary to assess not only the developement of anastomotic aneurysm, but also any new lesions due to relapse of inflammation or atherosclerosis caused by hypertension.

Conclusion

We successfully treated coexisting AAA and pseudoaneurysm due to graft failure in a patient. The appropriate selection of surgical techniques was helpful in obtaining a good outcome.

REFERENCES

1. Berger K, Sauvage LR. Late fiber deterioration in Dacron arterial grafts. Ann Surg 1981; 193: 477–91.
2. Trippestad A. Late rupture of knitted Dacron double velour arterial prostheses: Report of four cases. Acta Chir Scand 1985; 151: 391–5.
3. Hariya A, Yamaguchi A, Adachi H, Murata S, Okada M, Ino T. A case of non-anastomotic false aneurysm of late fiber deterioration in Dacron graft. Jpn J Cardiovasc Surg 2001; 30: 95–8.
4. Lande A. Takayasu's arteritis and congenital coarctation of the descending thoracic and abdominal aorta: A clinical review. Am J Roentgenol 1976; 127: 227–33.
5. Tada Y, Sato O, Ohshima A, Miyata T, Shindo S. Surgical treatment of Takayasu arteritis. Heart Vessels Suppl 1992; 7: 159–67.
6. Keith DS, Markey B, Shiedler M. Successful long-term stenting of an atypical descending aortic coarctation. J Vasc Surg 2002; 35: 166–7.