

Successful Surgical Treatment of Acute Type A Aortic Dissection Complicated with Distal Arch Aneurysm

Kengo Nishimura, MD, Iwao Taniguchi, MD, Azumi Kimura, MD, Shigeto Miyasaka, MD, Hiroyuki Maeta, MD, and Keisuke Morimoto, MD

We report successful surgical treatment in a case of acute type A aortic dissection complicated with distal arch aneurysm. A 74-year-old man presenting with sudden posterior headache was found by enhanced computed tomography to have an ascending aortic dissection (type A) and a distal arch aneurysm of 69 mm in maximal minor axis diameter. We performed total arch replacement, employing a four-branched graft and elephant trunk anastomosis through a median sternotomy. Because the aneurysm was not effectively thrombo-excluded, we performed descending aorta replacement using the elephant trunk through the left fifth intercostal space on the 44th postoperative day. The postoperative course was uneventful. (Ann Thorac Cardiovasc Surg 2010; 16: 370–372)

Key words: acute type A aortic dissection, distal arch aneurysm, elephant trunk, total arch replacement, two-stage repair

Introduction

Acute type A aortic dissection is a catastrophic event requiring emergent surgical repair. Despite recent favorable outcomes by leading centers,^{1,2)} the surgery is still associated with a high mortality rate of 14% to 32.5%.^{3–6)} We describe successful surgical treatment in a case of acute type A aortic dissection complicated with distal arch aneurysm.

Case

The patient was a 74-year-old man with a history of hypertension, abdominal aortic rupture in 2000, and gene therapy for severe arteriosclerosis obliterans in 2004. He was referred to our hospital because of sudden posterior headache in September 2008. Physical examination was

unremarkable except for operative scars on the abdomen. The electrocardiogram was normal, and echocardiography showed normal left ventricular wall motion and slight pericardial effusion. Enhanced chest computed tomography (CT) revealed a distal arch aneurysm of 69 mm in maximal minor axis diameter and stenosis of the right subclavian artery, as well as a type A aortic dissection and slight pericardial effusion (Fig. 1a and b). Because a proximal arch at the base of the innominate artery was involved in the dissection and the aneurysm extended beyond the bifurcation of the trachea, we decided to perform total arch replacement employing a four-branched graft and elephant trunk anastomosis through a median sternotomy as a single-stage procedure. After the sternotomy, a cardiopulmonary bypass was established with arterial cannulation into the left common femoral artery, but not the right axillary artery, and double venous cannulation into the superior and inferior vena cava.

Because the arch was extended and it was difficult to approach the left common carotid artery and the left subclavian artery, we decided to stop systemic perfusion and to convert to selective cerebral perfusion. When the patient was cooled to 23°C, systemic perfusion was stopped and selective cerebral perfusion was initiated from the

From Department of Thoracic and Cardiovascular Surgery, Tottori Central Hospital, Tottori, Japan

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Address reprint requests to Iwao Taniguchi, MD: Department of Thoracic and Cardiovascular Surgery, 730 Ezu, Tottori 680–0901, Japan.
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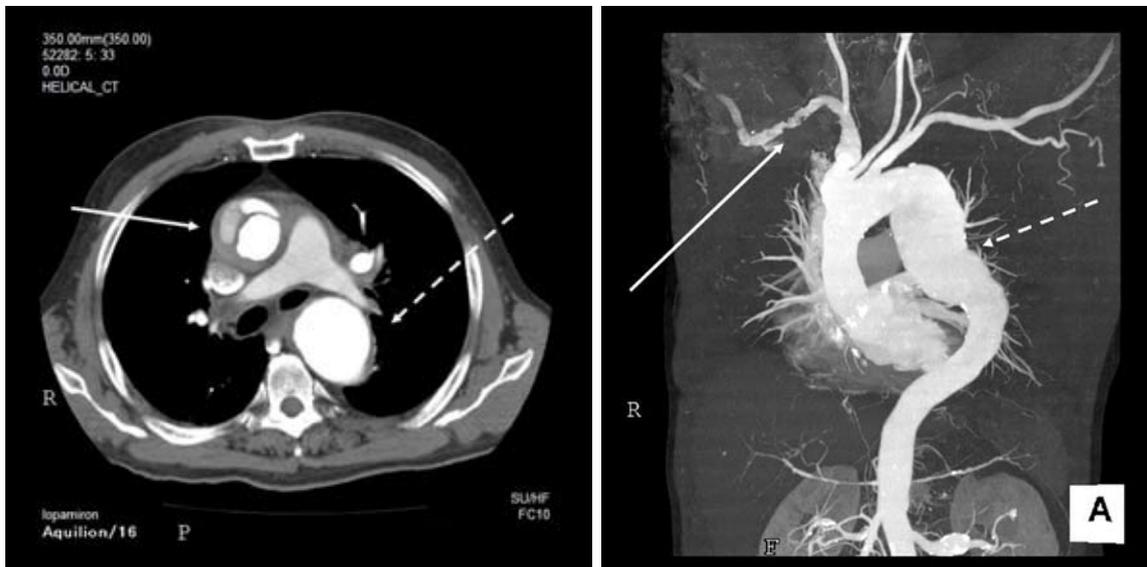


Fig. 1.
a: Enhanced computed tomography shows an ascending aortic dissection (solid arrow) and a distal arch aneurysm of 69 mm in maximal diameter (dotted arrow).
b: Three-dimensional computed tomography reveals stenosis of the right subclavian artery (solid arrow) and a distal arch aneurysm (dotted arrow).

a | b

brachiocephalic trunk through a 24-mm woven double velour four-branched graft. The heart was arrested with retrograde cold blood cardioplegia. After the arch was transected between the left common carotid and the left subclavian, the arch vessels were divided and anastomosed to the branches of the graft. Antegrade cerebral perfusion was started from the side branch of the graft, and a 12-cm length of the 22-mm woven double velour single-branched graft was then inserted into the descending aorta as an elephant trunk. After the distal anastomosis site was reinforced with an internal elephant trunk and an external Teflon felt strip, the distal site was anastomosed to the graft. While the antegrade distal aortic perfusion was started, using the branch graft, and the patient was being rewarmed, the proximal anastomosis site was reinforced with internal and external Teflon felt strips, and the proximal site was anastomosed to the graft. The selective cerebral perfusion time was 67 min, the lower-body circulatory arrest time 39 min, the cardiac arrest time 131 min, and the total extracorporeal circulation time 217 min.

Because the aneurysm was not effectively thrombo-excluded (Fig. 2), we decided to perform a second-stage procedure on the 44th postoperative day because of the respiratory and mental conditions. The descending aorta was exposed through a left fifth intercostal space. After the left thoracotomy, a cardiopulmonary bypass was established



Fig. 2. Three-dimensional chest computed tomography shows that the aneurysm was not effectively thrombo-excluded, and a 12-cm length of the 22-mm woven double-velour, single-branched graft was inside the aneurysm (solid arrow).

with arterial cannulation into the distal descending aorta and venous cannulation into the left main pulmonary artery. The descending aorta was clamped during the normothermia, and the elephant trunk was then pulled out and the distal end anastomosed to the descending aorta. The total extracorporeal circulation time was 32 min. The postoperative course was uneventful.

Discussion

A single-stage procedure with extensive incisions carries high risks of mortality and morbidity for acute type A aortic dissection,³⁻⁶⁾ and a two-stage approach with an elephant trunk (ET) anastomosed into the distal aortic arch has been widely employed since its introduction by Borst and colleagues as a less-invasive procedure.⁷⁾ Toda and colleagues demonstrated that an arch aneurysm without extension beyond the level of the carina can be treated by using an ET anastomosed at the base of the innominate artery through a median sternotomy. The complete thromboexclusion of an arch aneurysm larger than 70 mm might be less likely with total arch replacement with an ET alone, and an additional procedure is necessary to complete the aneurysmal thrombosis around the ET. Moreover, Toda et al. try to avoid placing the graft beyond the level of Th8, based on the assumption that the critical intercostal arteries exit below that level.⁸⁾ In the present case, because the aneurysm extended beyond the bifurcation of the trachea despite being a distal arch aneurysm of 69 mm in maximal minor axis diameter, a two-stage approach was required.

The inserted ET graft might be kinked or wrinkled, resulting in stenosis or hemolysis. Although we directly pushed the ET into the descending aorta, Toda et al. showed that the graft can be made to enter the descending aorta by pulling it straight into the aorta with a catching wire positioned from the femoral artery, instead of pushing it into the aorta.⁸⁾

There are several options to treat extensive aneurysms, such as one-stage surgery using a clam-shell approach or an antero-lateral thoracotomy with a partial sternotomy (ALPS) approach; another is two-stage surgery using ET or hybrid stent-grafting. The single-stage approach, via a clam-shell or an ALPS approach, might be a safe and effective procedure for patients who require treatment of extensive thoracic aortic disease and concomitant cardiac lesions, though it might be too invasive and affect postoperative respiratory function for older patients. On the other hand, a stent grafting combined with a conventional vascular prosthesis could turn a two-stage ET procedure into a single-stage repair through a sternotomy.^{9,10)} Despite stent-related complications, such as aneurysmal rupture caused by graft perforation from mechanical stress placed on the stent, it should be considered as one of the less-invasive surgical treatments. A stent grafting is recommended, especially in high-risk patients, possibly reducing the surgical risk. In the present case, because we thought that two-stage surgery might be less invasive and

might not remarkably affect postoperative respiratory function for this older patient, and also because he did not want a stent grafting, we performed two-stage surgery using ET.

Conclusions

We report successful surgical treatment in a case of acute type A aortic dissection complicated with distal arch aneurysm.

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