**Extended aortic arch repair *via* simple median sternotomy using a parabronchial approach: a case report**

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**Abstract**

Surgery for extensive thoracic aortic aneurysms is challenging. We report the case of a young woman with Takayasu’s arteritis who developed aortic dissection and was successfully treated with our novel extended arch repair method, which we termed “parabronchial approach”. Surgery was performed via a simple sternotomy. The left pulmonary artery was compressed caudally by a surgical assistant arm typically used for coronary artery bypass grafting. This method simplified the creation of a distal anastomosis to the descending aorta behind the left bronchus. Postoperative computed tomography revealed a distal anastomosis at the sixth thoracic vertebra. This parabronchial approach could reduce the frequency of choosing a highly invasive approach and can be a potential minimally invasive approach in cases requiring extensive thoracic aortic aneurysm repair.

**Keywords:** aortic aneurysm, Takayasu’s arteritis,total arch replacement

**Introduction**

Surgery for extensive thoracic aortic aneurysms (ETAA), including those in the ascending aorta, arch, and descending aorta, remains challenging. Several extended arch repair techniques with thoracotomy have been reported for the treatment of such challenging diseases.1-3 However, the optimal surgical method is unclear as procedures involving thoracotomy are associated with postoperative complications like respiratory and wound problems. We present a case of aortic dissection in a patient with Takayasu’s arteritis who underwent ETAA repair via simple median sternotomy, for whom the distal anastomosis site was the sixth thoracic vertebra (Th6).

**Case**

The patient provided written informed consent for publication.

A 31-year-old woman with chronic Stanford type B aortic dissection was admitted to our hospital. The patient was treated for Takayasu’s arteritis and was under observation for an aortic arch aneurysm. Although Takayasu’s arteritis was controlled with 10 mg prednisolone, she developed acute aortic dissection six months before admission. Pre- and post-operative computed tomography (CT) images are shown in Fig 1. Preoperative CT showed a dissected ETAA (Fig 1a, 1b). The maximum diameter of the aorta was 57 mm, with entry into zone 3, and the aortic aneurysm ended at the level of the left main bronchus. The patient underwent ETAA repair six months after onset of aortic dissection.

The operative procedure is shown in Video 1. Cardiopulmonary bypass was established with ascending aortic cannulation and bicaval drainage and a left ventricular vent cannula through the right superior pulmonary vein. Temperature was cooled to a bladder temperature of 25°C. The ascending aorta was cross-clamped and cardiac arrest was achieved via antegrade cardioplegia. After the ductus arteriosus was dissected, the left pulmonary artery was compressed caudally with a surgical assistant arm (TERUMO Corporation, Japan), typically used for coronary artery bypass grafting (Fig 2). After circulatory arrest, the aorta and posterior pericardium were cut longitudinally, and the aorta was transected at the level of the left bronchus. The descending aorta was reinforced with Teflon felt, and a 20-mm branched J-graft (Japan Lifeline Co., Ltd., Tokyo, Japan) was anastomosed. Lower extremity circulation resumed, and total arch replacement was routinely completed. The durations of surgery, cardiac arrest, and circulatory arrest were 383, 94, and 73 minutes, respectively. The patient was discharged 19 days after surgery. Postoperative CT revealed distal anastomosis level was the Th6 (Fig 1c, 1d).

**Discussion**

This report describes how our “parabronchial technique” enables surgeons to perform distal anastomosis of ETAA repair at the level of Th6 using a median sternotomy. The surgical approach of the ETAA is challenging, and several procedures have been reported. Median sternotomy with left anterolateral thoracotomy is one popular approach for the ascending and descending aorta.1 However, that approach has been reported to be more likely to cause postoperative wound pain and respiratory failure.2 The L-incision approach is a less invasive approach than the median with anterolateral approach.3 The Clamshell approach, reported to have a feasible outcome by Kouchoukos et al., requires bilateral thoracotomy, leading to respiratory compromise.4 All of these procedures sacrifice unilateral or bilateral internal thoracic arteries and can lead to wound and respiratory problems. It is important to consider minimally invasive techniques based on the level of descending aortic lesions. It is also worth discussing the level of the descending aorta lesion that can be treated through median sternotomy only. Uehara et al. reported that in cases of aortic coarctation in which the distal anastomosis line was expected to be deeper than the level of the tracheal bifurcation, a left thoracotomy was added to a median sternotomy to perform total arch and descending aortic replacement.5 In our technique, the left pulmonary artery is pushed down by the surgical assistant arm, allowing the pericardium and descending aorta at the level of left pulmonary artery and bronchus to be incised. In the present case, CT scan revealed that the distal anastomosis level was Th6. We believe this parabronchial approach could reduce the frequency of choosing a highly invasive approach for ETAA and could also reduce postoperative complications to the level of the usual total arch replacement. Hybrid ETAA repair utilizing endovascular aortic repair has gained popularity.6 However, there are some cases in which endovascular surgery is not a good alternative, such as Takayasu’s arteritis and Marfan syndrome.

**Conclusion**

The parabronchial approach as described could be a minimally invasive approach in cases requiring ETAA repair. Based on our initial experience, further clinical evaluation of this technique is required.

**Author contributions:**

Study concept/design: RK and MM, Drafting article: RK and HS, Critical revision of article: all authors.

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**Figure Legends**

Figure 1. Preoperative computed tomography shows dissected aorta (57 mm) with entry into zone 3 (a, b). Postoperative computed tomography reveals the distal anastomosis site is behind the left bronchus (c, d) (Th6). Arrows show the distal anastomosis site.

Figure 2. Intraoperative findings and its schema show that the left pulmonary artery is compressed by the surgical assistant arm (arrows). The descending aorta just behind the left bronchus can be seen clearly (arrowheads).

Supplemental movie. Operative movie.