

Surgical treatment of complex coarctation of aortic arch with multiple arch aneurysms using double operative approaches



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Anatomical malformation of complex coarctation of aorta arch with multiple arch aneurysms.

CENTRAL MESSAGE

Complex coarctation of aorta arch with multiple arch aneurysms could be surgically treated using double operative approaches.

▶ Video clip is available online.

A 33-year-old male patient sought medical advice due to an aortic arch deformity detected by a health examination. He reported no symptoms and manifested a greater blood pressure of the right limb (135/82 mm Hg) and weaker left brachial and femoral artery pulses (left upper limb: 100/59 mm Hg; right lower limb: 108/77 mm Hg; left lower limb: 106/75 mm Hg). A rare anatomical malformation of aortic arch including cervical aortic arch, coarctation of aorta (CoA) arch, and multiple aortic arch aneurysms was confirmed by a preoperative aortic computed tomography angiography (CTA) scan (3-dimensional reconstruction; [Figure 1, A-F](#)). A preoperative transthoracic echocardiography scan detected no obvious abnormality in the intracardiac structure, and the aortic valve was trileaflet without dysfunction. The surgery was performed with the patient under general anesthesia, and

the patient initially lay in the right lateral position. A left posterior lateral thoracotomy through the fourth to fifth intercostal space was performed to provide the view of 2 aneurysms of aortic arch proximal to the left subclavian artery. A 16-mm MAQUET vascular graft (Getinge) was connected to the descending aorta by end-to-side anastomosis. Due to the obstruction of aneurysms, the exposure of ascending aorta and left common carotid artery proximal to the aneurysms through this incision was challenging ([Figure 2, A](#), [Video 1](#)). Thus, the thoracotomy was closed, and the patient was then repositioned to a median sternotomy, through which the clamped end of the graft was then sutured to the ascending aorta by end-to-side anastomosis. Finally, the bilateral occlusion and excision of aneurysms with the entire coarcted segment was performed ([Figure 2, B](#), [Video 2](#)). Considering that blood supply to brain was not occluded during surgery, cerebral protection (such as protective cerebral perfusion) was not performed. However, intraoperative cerebral oxygen monitoring was provided to assesses the adequacy of cerebral perfusion. The patient experienced

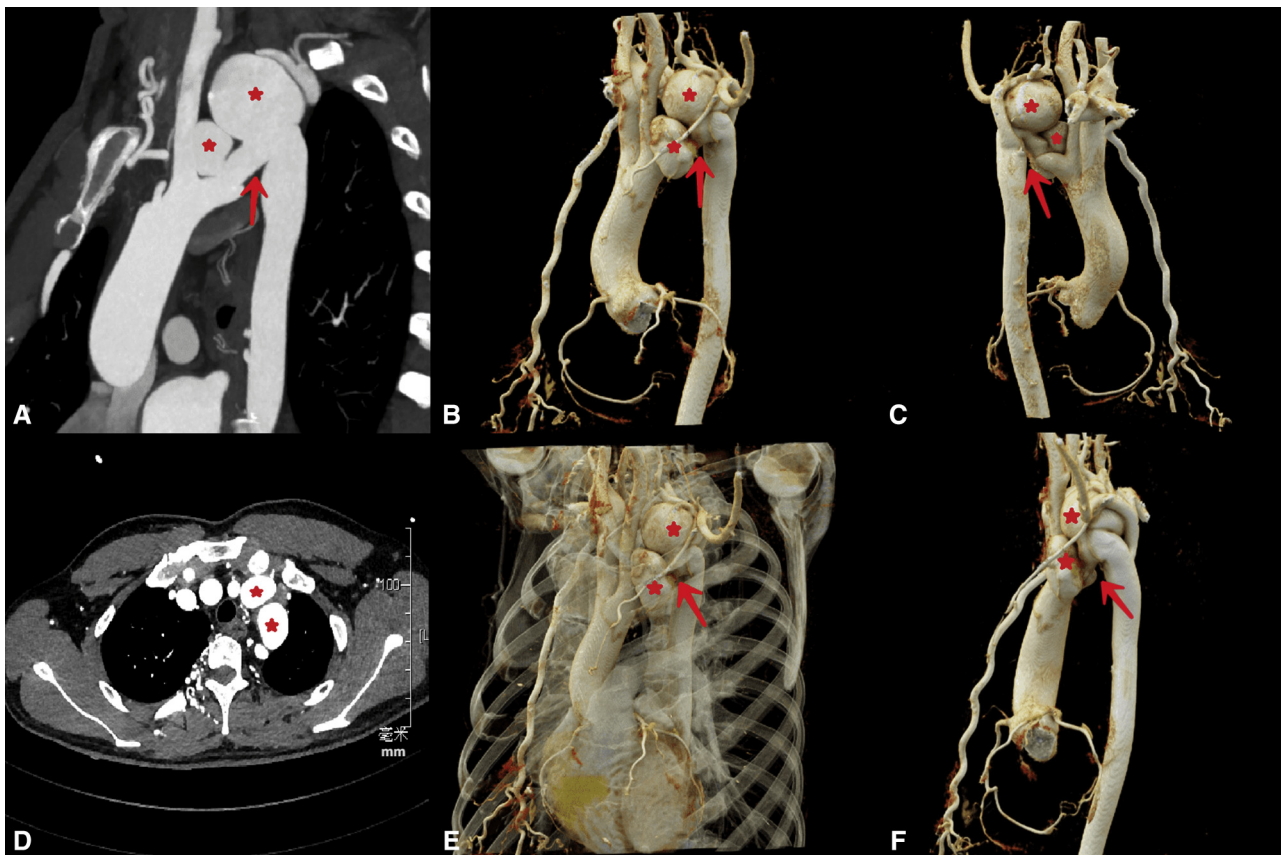


FIGURE 1. The preoperative aortic CTA and transthoracic echocardiography. The preoperative aortic CTA (A-F) showed the anatomical malformation of aortic arch including cervical aortic arch, coarctation of aortic arch (red arrows) and 2 aortic arch aneurysms (red asterisks). CTA, Computed tomography angiography.

an uneventful recovery before discharge, and a postoperative aortic CTA reexamination showed the patency of the vascular graft (Figure 2, C-F). The ethics committee of Shandong Provincial Hospital approved the study (number: NSFCN 2018-002; date: March 1, 2018). The patient provided the informed written consent for the publication of the study data.

DISCUSSION

CoA accounts for approximately 8% of congenital cardiovascular malformations and is characteristic of the narrowing of the distal transverse and proximal descending aorta with poststenotic dilation. In more complex cases with CoA, bicuspid aortic valve, aortic arch aneurysm, ventricular septal defects, and mitral valve anomalies are frequently present.^{1,2} Adolescent and adult patients usually manifest with upper-extremity hypertension or murmur, and without treatment, the survival rate by age 50 years is no more than 10% due to aortic dissection, endocarditis, congestive heart failure, and intracranial hemorrhage.³ In 1944, Clarence Crafoord reported the first surgical correction of coarctation.⁴

Although the treatment of aortic coarctation has improved during the last 70 years, no consensus has been reached about the optimal treatment for patients with complex coarctation or coarctation with accompanying cardiovascular problems. Transthoracic echocardiography is the initial screening tool for CoA, and aortic CTA is the further noninvasive diagnostic and follow-up imaging modality. Surgical repair of coarctation, bypass of the coarctation segment, and percutaneous techniques including angioplasty and stent implantation are viable options and have improved reported prognosis over time.^{5,6} Here, we present an uncommon case of surgical bypass and resection of coarctation of the aortic arch with multiple arch aneurysms using double operative approaches. Endovascular treatment would be infeasible due to the complexity of arch deformity, and a single approach would be technically challenging. The double operative approaches simplified surgical procedures and avoided the use of cardiopulmonary bypass and hypothermic circulatory arrest, and the risk of aneurysm rupture and life-threatening bleeding during operation was greatly reduced.

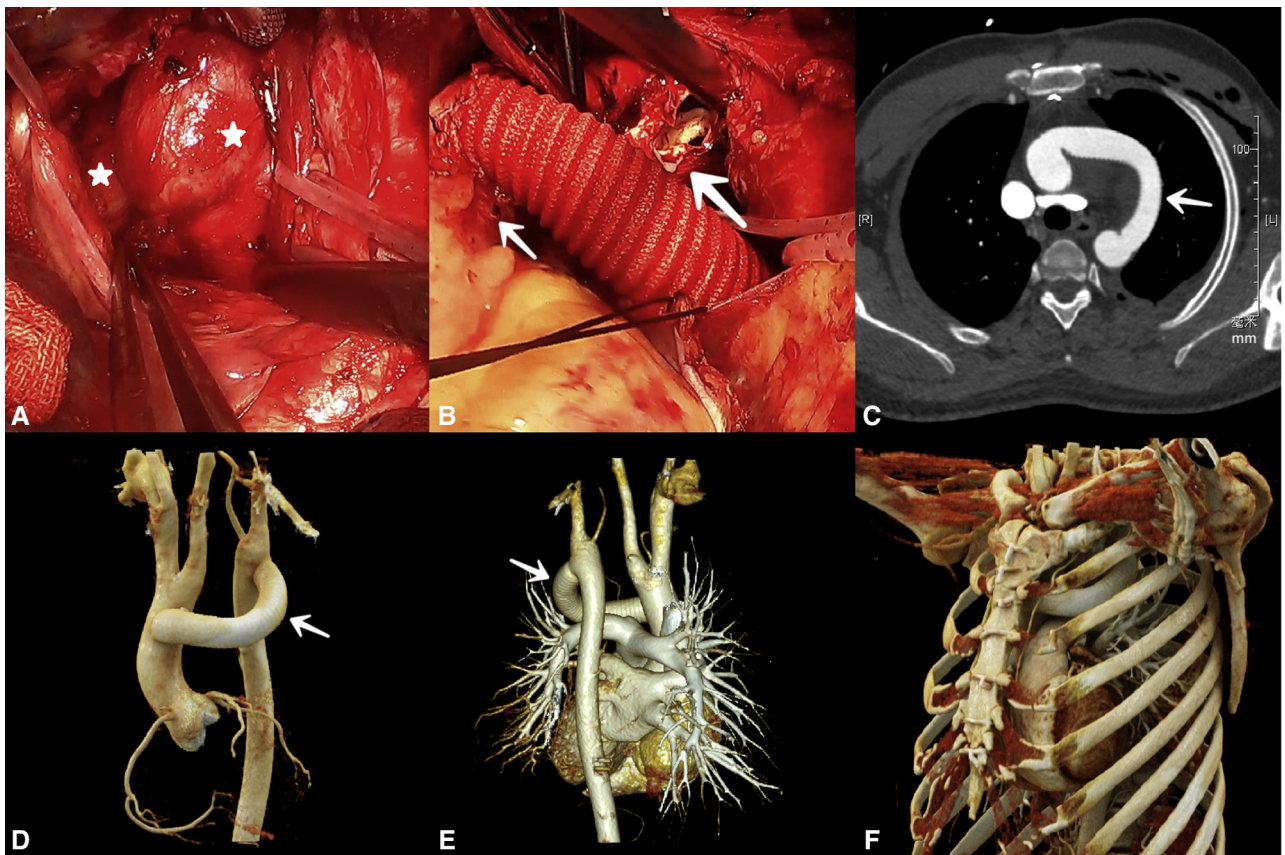
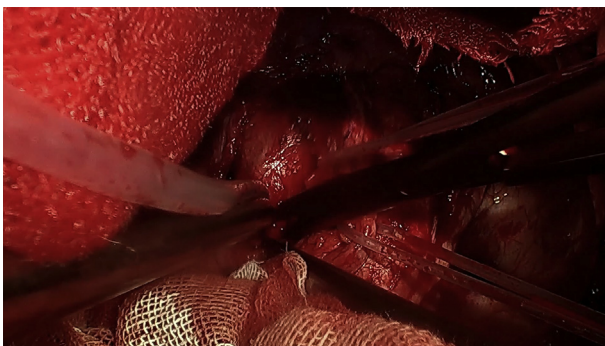
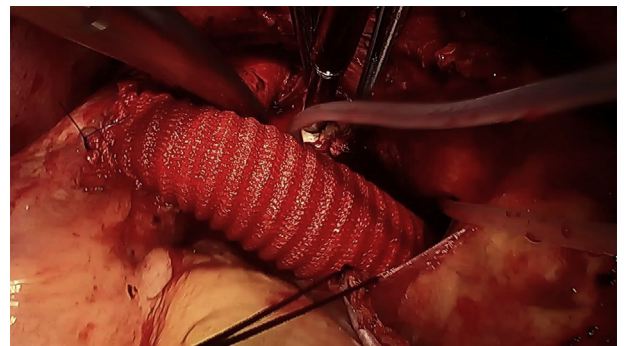


FIGURE 2. Intraoperative images and postoperative aortic CTA. The exposure of 2 aortic arch aneurysms (*white asterisks*) and ascending aorta was challenging through the left posterior lateral approach (A). Through a median thoracotomy, the proximal end of the graft was sutured to the ascending aorta by end-to-side anastomosis (*small arrow*), and the aneurysms were occluded and excised (*large arrow*) (B). Postoperative aortic CTA scan showed the patency of vascular graft (*white arrows*) through the double operative approaches (C, D, E, and F). CTA, Computed tomography angiography.



VIDEO 1. Left posterior lateral thoracotomy. Through the fourth to fifth intercostal space, the aneurysms were shown, but the dissociation of ascending aorta and left common carotid artery proximal to the aneurysms was challenging. Video available at: [https://www.jtcvs.org/article/S2666-2507\(22\)00139-0/fulltext](https://www.jtcvs.org/article/S2666-2507(22)00139-0/fulltext).



VIDEO 2. Median sternotomy. The bilateral occlusion and excision of aneurysms was performed after the bypass of the coarctation segment. The wall of the aneurysms was thin without collateral circulation. Video available at: [https://www.jtcvs.org/article/S2666-2507\(22\)00139-0/fulltext](https://www.jtcvs.org/article/S2666-2507(22)00139-0/fulltext).

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