Two cases of ascending aortic aneurysm following recurrent repair of aortic coarctation with extra-anatomic bypass

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Postoperative computed tomography angiography (CTA).

CENTRAL MESSAGE

Lifelong follow-up examinations are required in patients who present with complicated/recurrent coarctation to prevent life-threatening complications.

Coarctation of the aorta accounts for 5% to 10% of all congenital heart defects.[1] Since surgical repair became available, the survival of patients has continuously improved, but recurrent coarctation remains a common problem.[2] We present 2 cases of ascending aortic aneurysm following repeated surgical repair using extra-anatomic bypass because of recoarctation.

CASE PRESENTATION

All procedures performed in these cases were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. Informed consent was obtained from the 2 patients included in this work.

Case 1

A 64-year-old asymptomatic patient was referred with a progressive aneurysm of the ascending aorta found at routine echocardiography. He had received coarctation repair with end-to-end anastomosis at the age of 7 years and a 20-mm interposition graft because of recurrent coarctation 12 years later. Because of a restenosis at the level of this graft, an extra-anatomical bypass with an 18-mm graft was performed at the age of 44 years to improve lower-body perfusion. Follow-up echocardiography showed an aneurysm of the ascending aorta that was confirmed by computed tomography angiography as having a diameter of 56 mm (Figure 1, *A*).

Case 2

The second patient was a 54-year-old man who received coarctation repair with end-to-end anastomosis in the first year of life. At the age of 22 years, he presented with a combined aortic valve dysfunction, a subaortic membranous stenosis, and a recurrent coarctation. Redo surgery through sternotomy included resection of the membranous subaortic stenosis, the implantation of a mechanical valve, and the implantation of an extra-anatomic ascending to supraceliac bypass 22 mm. He complained of chest pains, and imaging showed a large ascending aortic aneurysm (65 mm) and a pseudoaneurysm at the level of the proximal anastomosis of the conduit with the ascending aorta (Figure 2, *A* and *B*).

Operative Technique

Operation was performed through a median resternotomy using moderate hypothermic (28 °C) cardiopulmonary bypass. In case 1, central cannulation, in case 2, peripheral cannulation, was performed. In both cases, the extra-anatomic bypass was cannulated in order to achieve optimal perfusion of the lower body part. At the target temperature, the ascending aorta and the extra-anatomical bypass graft was clamped (once with clamp, once with balloon) (Figure 2, *C*). A 100-mL single shot of Cardioplexol (Swiss Cardio Technologies) cardioplegic solution followed by antegrade blood cardioplegia into the coronary ostia was

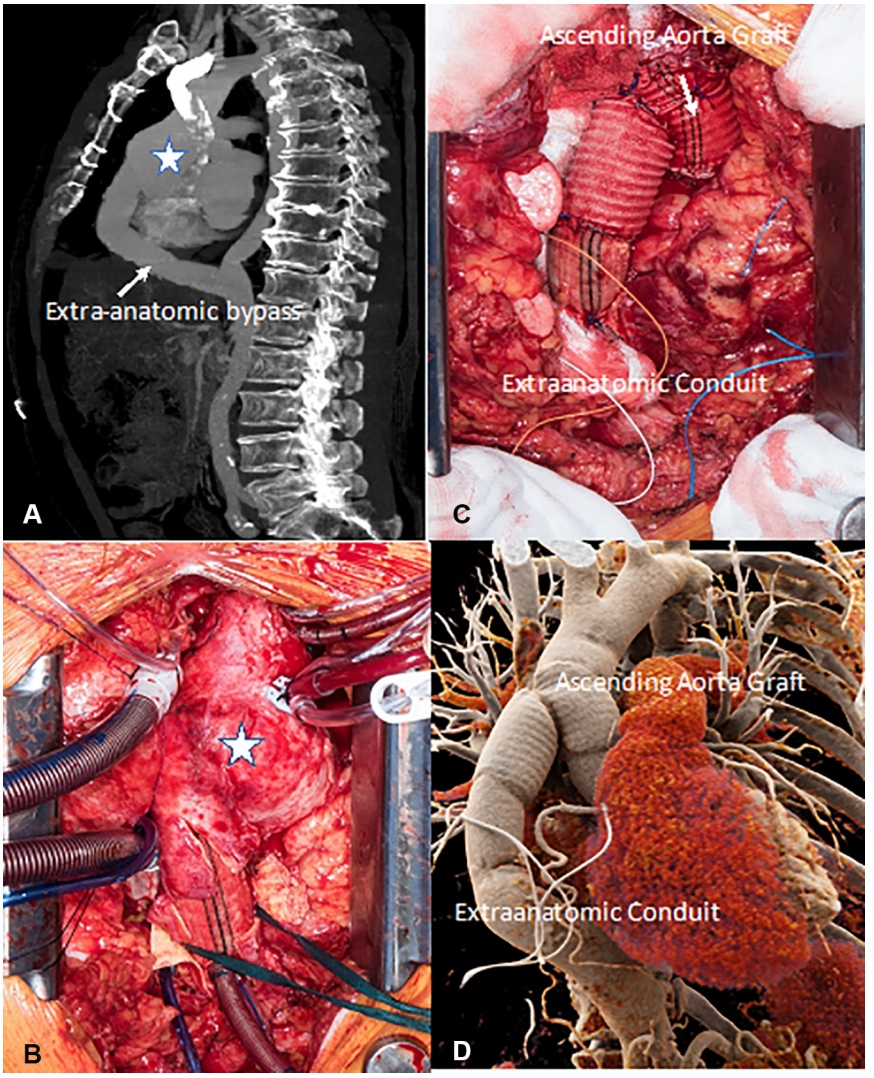

FIGURE 1. Preoperative computed tomography angiography (CTA) showing aneurysmatic formation of the ascending aorta (A, *star*) and anatomy of the extra-anatomic bypass (A, *arrow*). B, Intraoperative picture showing the aortic aneurysm (*star*) and cannulation for the heart–lung machine. C, Photo of the final result showing the newly implanted ascending aorta graft (*arrow*) connected side-to-end with the extra-anatomic bypass graft. D, Postoperative CTA reconstruction.

administered. The aneurysm was excised and the aorta replaced using a 26-mm Dacron tube graft in the first case and a 32-mm tubular graft in the second case, respectively. The extra-anatomic bypass was reinserted end-to-side directly (case 1, Figure 1, *B* and *C*; and Figure 2, *D*) or following extension to avoid tension into the ascending graft using 4-0 PROLENE. Postoperative course was uneventful, and both patients were discharged at day 8 and 11 after surgery. Follow-up computed tomography angiography demonstrated regular perfusion through the new graft of the ascending aorta as well as the extra-anatomic bypass (case 1, Figure 1, *D*). Institutional review board approval was not required, per institute, but informed consent was obtained.

DISCUSSION

Aortic coarctation is a common congenital cardiovascular defect that may be associated with other congenital defects, including patent ductus arteriosus, bicuspid aortic valve, ventricular septal defect, and mitral valve abnormalities.[3] Although the majority of these patients reach adulthood, life expectancy is not as normal as in unaffected peers. Recoarctation leading to hypertension is the most common indication for aortic reintervention.[4] Mechanisms

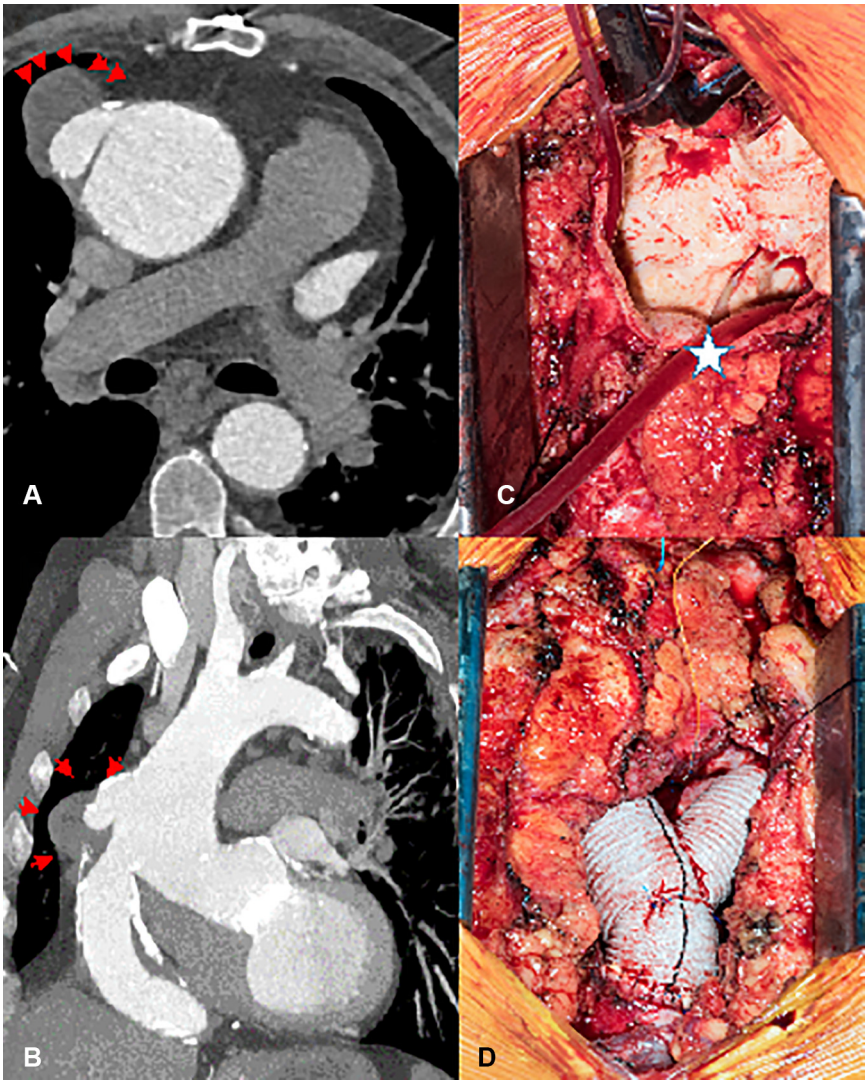

FIGURE 2. A and B, Preoperative computed tomography angiography (CTA) showing a large ascending aortic aneurysm (65 mm) and a pseudoaneurysm at the level of the proximal anastomosis of the conduit with the ascending aorta (*arrows*). C, Intraoperative picture showing balloon occlusion of the extra-anatomic graft (*star*). D, Final result showing the newly implanted ascending aorta graft connected side-to-end with the extra-anatomic bypass graft.

of recoarctation include inadequate growth, residual ductal tissue close to the anastomosis as well as narrowing of the anasatomotic site, and shrinkage of enlargement patches. Extra-anatomic bypass between the ascending and descending aorta has been described as useful alternative to in situ multiple repair and allows to avoid re-exploration in a previously operated location. The present cases illustrate a typical complication after extra-anatomic repair of aortic coarctation and emphasizes the importance of cardiovascular follow-up. Multimodality imaging plays an essential role in the diagnosis and optimal operative planning in these complex patients. Redo surgery may be challenging with regard to adhesions, optimal perfusion, as well as brain and myocardial protection.

CONCLUSIONS

Lifelong follow-up examinations are required in patients who present with complicated/recurrent coarctation to prevent life-threatening aortic complications. Multimodality imaging is essential for diagnosis and proper surgical planning. Intraoperatively, optimal perfusion of the upper and lower body parts is essential, and special attention must be paid to intraoperative neuro- and myocardial protection.

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