

# Surgical repair of graft aneurysm following ascending-to-abdominal aortic bypass

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## ABSTRACT

Graft aneurysm after ascending aorta to abdominal aorta bypass is a rare complication of repair of coarctation of the aorta. We present a case of an aneurysm measuring 75 mm in diameter at the midportion of the prosthetic graft in a 33-year-old man. To prevent aneurysm rupture, redo ascending-to-abdominal aortic bypass was performed through an upper ministernotomy and upper midline laparotomy. No postoperative complications occurred. The patient was successfully discharged on postoperative day 6. Although ascending-to-abdominal aortic bypass can achieve long-term patency, the prosthetic graft still has the rare risk of aneurysm formation, as highlighted in this case. Early diagnosis and timely management of this rare complication are essential in preventing aneurysm rupture. (*J Vasc Surg Cases and Innovative Techniques* 2019;5:183-6.)

**Keywords:** Aorta/abdominal; Coarctation; Surgery; Aneurysm; Blood vessel prosthesis; Extra-anatomic bypass

Ascending-to-abdominal aortic bypass is a good surgical approach for coarctation of the aorta (CoA) by avoiding the use of cardiopulmonary bypass, cross-clamping of the thoracic descending aorta, and dissection of the heavily scarred zone from previous operation, particularly in adult patients. However, graft aneurysm after ascending-to-abdominal aortic bypass is a rare and life-threatening complication of coarctation repair that has seldom been reported in the literature.<sup>1</sup> In this report, we present our experience with surgical management of a graft aneurysm 18 years after ascending-to-abdominal aortic bypass. The study protocol was approved by the Institutional Review Board of Beijing Anzhen Hospital, Capital Medical University. Informed consent was obtained from the patient.

## CASE REPORT

A 33-year-old man was admitted for aneurysm formation at the midportion of the prosthetic graft. He was asymptomatic. At the age of 15 years, the patient was diagnosed with diffuse

CoA with severe hypoplasia of the isthmus and arch and underwent an ascending-to-abdominal aortic bypass with a 16-mm Meadox tubular graft (Maquet, Rastatt, Germany). Clinical evaluation revealed that upper limb arterial pressure was 142/72 mm Hg, and lower limb blood pressure was 125/65 mm Hg. He is a nonsmoker and has been diagnosed with hypertension for 20 years. Echocardiography showed a left ventricular end-diastolic diameter of 45 mm and a left ventricular ejection fraction of 60%, with mild mitral regurgitation. Laboratory test values were within normal range.

Computed tomography angiography (CTA) revealed a markedly dilated prosthetic graft, with aneurysm formation at its midportion. The graft aneurysm started at the level of the orifice of the inferior vena cava, extending distally beyond the level of renal arteries, and terminated proximal to the inferior mesenteric artery. It was 21 cm in length, with the maximal diameter measuring 75 mm and 53 mm in coronal and sagittal reconstruction images, respectively. There was no obvious dilation in the ascending and abdominal aortic anastomoses of the dilated prosthetic graft, which were 20.6 mm and 29.7 mm in diameter, respectively. The right atrium and the right ventricular anterior wall were compressed (Fig 1).

Redo ascending-to-abdominal aortic bypass was performed to prevent rupture of the aneurysm. The patient was placed in the supine position. An upper ministernotomy and an upper midline laparotomy were made. After exposure, it was confirmed that there were no obvious graft dilation in the ascending and abdominal aorta beyond the inferior mesenteric artery. On inspection, the prosthetic graft aneurysm was found to be severely adherent to surrounding tissues. Therefore, it was decided not to excise the previously implanted prosthetic graft. After systemic heparinization (1 mg/kg), the proximal and distal ends of the graft were clamped and cut, a 24-mm × 30-cm InterGard graft (Maquet) was put into the original dilated prosthetic graft with a tunneler (Scanlan, St. Paul, Minn), the distal and proximal end-to-end anastomoses were performed, and then the graft was deaired and unclamped. The clamp time was 25 minutes. The chest and abdominal incisions were closed

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This study was supported by the National Science and Technology Support Program of China (No. 2015BAI12B03), Beijing Major Science and Technology Projects from Beijing Municipal Science and Technology Commission (Z171100001017083), and Beijing Lab for Cardiovascular Precision Medicine (PXM2017\_014226\_000037).

Author conflict of interest: none.

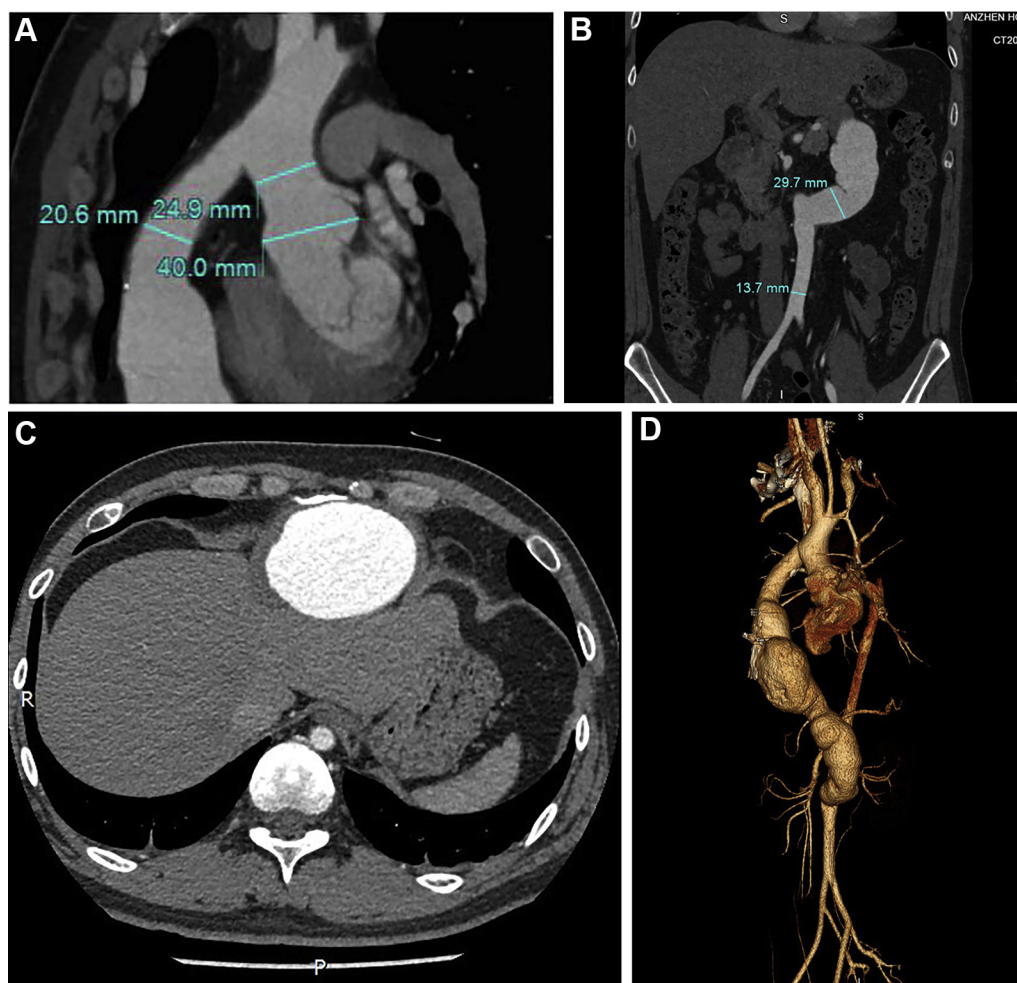
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2468-4287

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<https://doi.org/10.1016/j.jvscit.2018.12.014>



**Fig 1.** Preoperative computed tomography angiography (CTA) shows the diameters of the ascending aortic anastomosis (**A**) and abdominal aortic anastomosis (**B**) of the dilated prosthetic graft and the dilated prosthetic graft (**C** and **D**).

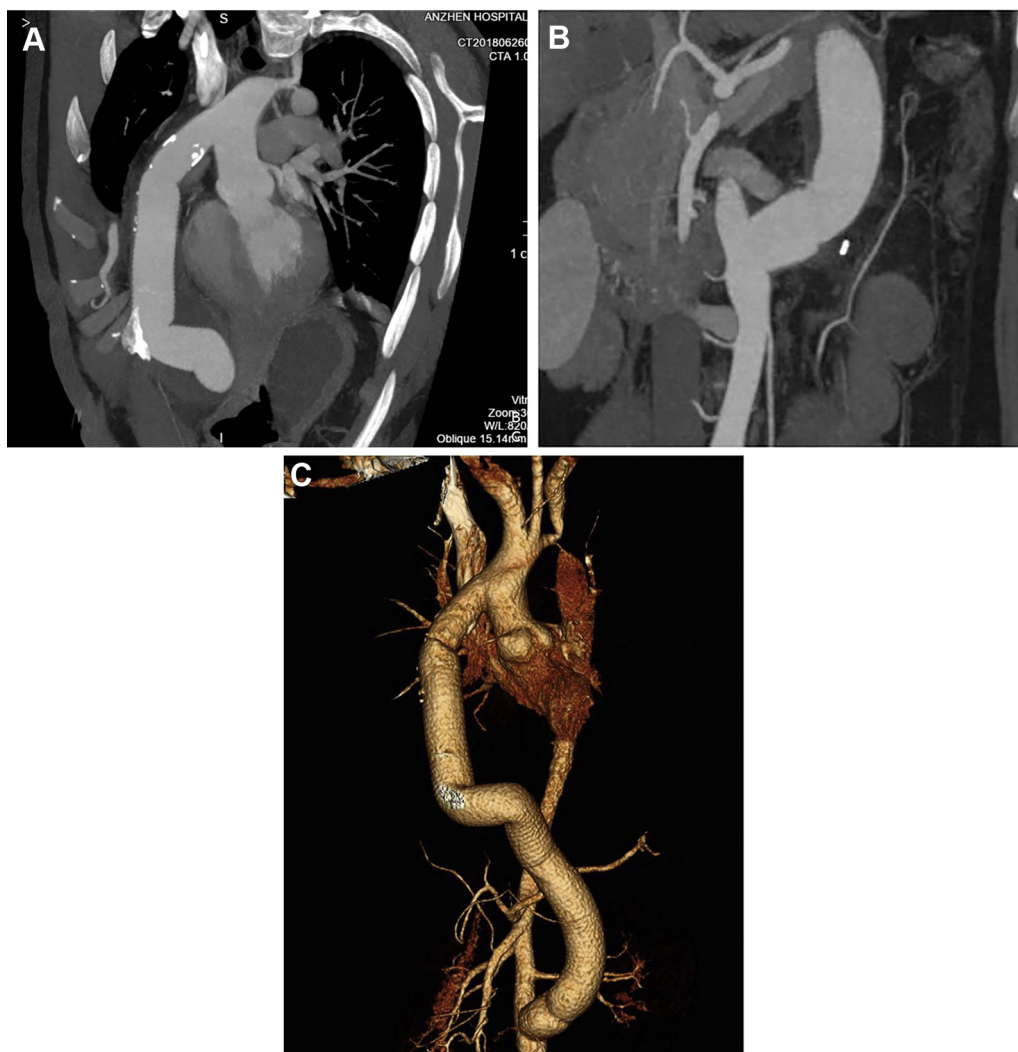
in the usual fashion. The patient was extubated 3 hours after the operation. Postoperative echocardiography and aortic CTA showed patent anastomoses of the new graft and thrombosis of the graft aneurysm with a decreased diameter (Fig 2). The patient was discharged on 6th day after the operation. No operative and late complications have occurred up to date.

## DISCUSSION

CoA is the fifth most common cardiovascular anomaly requiring surgical intervention in infants and children.<sup>2</sup> Since surgical repair of CoA became available in 1944,<sup>3</sup> great progress has been made in the diagnosis and treatment of CoA. Surgical repair can be performed through resection and end-to-end anastomosis, extended end-to-end anastomosis, subclavian flap aortoplasty, graft conduit interposition, bypass graft, and prosthetic patch aortoplasty.<sup>4</sup> However, recurrence of coarctation after surgical repair may vary from 3% to 35% according to the age at primary intervention and surgical technique employed.<sup>5,6</sup> Ascending-to-abdominal aortic

bypass through a median sternotomy and upper midline laparotomy is a good surgical approach because it avoids the use of cardiopulmonary bypass, cross-clamping of the thoracic descending aorta, and dissection of the heavily scarred zone from the previous surgery, particularly in adult patients. Levy Prashker et al<sup>7</sup> reported that ascending-abdominal aortic bypass with prosthetic grafts is a safe and effective repair of recurrent coarctation in adults with good long-term outcome.

Both immediate and long-term types of pseudoaneurysms have been reported.<sup>8</sup> Various treatment options of pseudoaneurysm are reported in the literature. However, graft aneurysms after ascending-to-abdominal aortic bypass are rare. The precise cause is unknown and may be related to prosthetic graft injury, late degeneration of prosthetic graft material, or hypertension. Prosthetic graft infection after surgical repair of CoA may be another possible cause of graft aneurysm formation. Our patient did not have prolonged fever after the initial coarctation repair, which ruled out the possibility of graft infection.



**Fig 2.** Postoperative computed tomography angiography (CTA) shows the ascending aortic anastomosis (A) and abdominal aortic anastomosis (B) of the prosthetic graft and the prosthetic graft after redo ascending-to-abdominal aortic bypass (C).

To date, there is no well-defined treatment of this rare complication. Yada et al<sup>1</sup> reported a case of graft pseudoaneurysm after ascending-to-abdominal aortic bypass for atypical coarctation due to aortitis syndrome, and endovascular aortic repair was performed to prevent rupture of the pseudoaneurysm. Endovascular aortic repair may have been a treatment option for our patient, but the dilated prosthetic graft was too long (21 cm in length), and there was sharp angulation of the graft, which makes endovascular repair difficult and dangerous. In addition, the patient was very young. Therefore, we did not choose endovascular aortic repair for this patient. Given such circumstances, we consider surgical repair to be the best treatment.

The main challenge for surgical repair is to plan an approach to the lesion without compromising hemodynamics that can protect the graft from injury. In our

patient, an upper ministernotomy and upper middle laparotomy were chosen, and the old prosthetic graft was not removed because the prosthetic graft aneurysm was severely adherent to surrounding tissues. Injury to the prosthetic graft during sternotomy, massive fatal bleeding, and impaired hemodynamics represent major risks during surgical repair. Fortunately, precise information about the location of the prosthetic graft aneurysm was obtained with preoperative CTA, which permitted the choice of a safe and minimally invasive access for this patient.

## CONCLUSIONS

Although ascending-to-abdominal aortic bypass can achieve long-term patency, the prosthetic graft still has the rare risk of aneurysm formation, as highlighted in this case. Early diagnosis and timely management of

such a rare complication are essential in preventing aneurysm rupture. Close imaging surveillance is warranted in such patients to ensure safe and durable repair in the long term.

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Submitted Sep 24, 2018; accepted Dec 19, 2018.