

An asymptomatic case of type B dissection developing type A dissection during transfer

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October 29, 2024

Title page

An asymptomatic case of type B dissection developing type A dissection during transfer

Running title: Asymptomatic retrograde type A aortic dissection

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Data availability statement

Not applicable.

Funding statement

None declared.

Conflict of interest disclosure

None declared.

Ethics approval statement

The Ethics Committee of Aichi Medical University Hospital approved this case report on XXXXXXXX

Patient consent statement

Written informed consent was obtained from the patient to publish this report in accordance with the journal's patient consent policy.

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None declared.

Clinical trial registration

None declared.

Key Clinical Message

Aortic dissection can worsen even when a patient has no symptoms or hemodynamic changes. Total arch replacement using a frozen elephant trunk for retrograde aortic dissection is effective in resecting intimal tears.

AUTHOR CONTRIBUTIONS

KS involved in analysis, data interpretation, and drafting and revising manuscript. KS also involved in analysis and data interpretation. KM involved in analysis, drafting and revising manuscript. All authors involved in final approval of the paper, agreement to be accountable for the integrity of the case reports.

Keywords: Retrograde type A aortic dissection, asymptomatic aortic dissection, total arch replacement with frozen elephant trunk

Introduction

Retrograde type A aortic dissection (RTAAD) can be spontaneous or iatrogenic and is caused by open and endovascular aortic surgeries, especially when the proximal aorta is already dilated by > 40 mm.¹ Moreover, patients with RTAAD do not report the typical symptoms related to aortic dissection.² Therefore, establishing the diagnosis of RTAAD can be difficult.

The 30-day mortality rate of patients with RTAAD is 11%, which is significantly lower than that of patients with antegrade aortic dissection (34%),³ whereas the incidence rate of iatrogenic RTAAD occurring during thoracic endovascular aortic repair (TEVAR) is low (1.33%), with high mortality rate (42%).⁴

The management of spontaneous RTAAD is currently not standardized, with reports of successful treatment with optimized medical therapy, open surgery, and/or endovascular repair available in the literature.¹ To exclude the primary tear during the index procedure, extensive aortic replacement is required (i.e., total arch replacement with elephant trunk [TARFET] techniques). Although TARFET is effective for repair of RTAAD, these techniques still carry higher mortality and morbidity, especially those related to spinal cord injury.^{5,6}

We encountered a case of asymptomatic RTAAD, with no symptoms, that was successfully treated with emergent TARFET.

Case report

The patient was a 50-year-old man with a history of hypertension and smoking history. He was referred to our hospital due to chest and back pain. Electrocardiography revealed a normal sinus rhythm without ischemic changes. Chest radiography revealed no cardiomegaly or pulmonary congestion but mediastinal enlargement. The patient's preoperative laboratory data were as follows: hemoglobin, 11.5 mg/dL; platelet count, $2.1 \times 10^5/\mu\text{L}$; D-dimer, 0.26 $\mu\text{g/mL}$; prothrombin time-international normalized ratio, 2.0; activated partial thromboplastin time, 68 s; N-terminal pro-brain natriuretic peptide, 32 pg/mL; and C-reactive protein, 0.06 mg/dL. On arrival at the previous hospital, the patient had high blood pressure (180/110 mmHg), with a heart rate of 86/min and a respiratory rate of 18/min.

The patient underwent computed tomography (CT), which revealed dissection of the descending aorta (Fig. 1a). No dissection was found in the ascending aorta, and organ malperfusion was not detected; however, the true lumen was relatively small (Fig. 1b). The patient was transferred to our hospital for preemptive TEVAR of complicated type B aortic dissection. During the transfer, his blood pressure remained low at 90–100 mmHg because of vasodilator medication, and there was no worsening of symptoms. On arrival at our hospital, the patient's vital signs were normal (blood pressure, 128/44 mmHg; heart rate, 80/min; temperature, 36.4°C; and oxygen saturation, 96% on room air). However, after arrival at our hospital, a CT scan was performed to measure TEVAR, which showed progression of the dissection to Stanford A (Fig. 1c, 1d). Although there was no cardiac tamponade, severe aortic valve regurgitation, or major

organ malperfusion, the true lumen of the ascending aorta was relatively small; therefore, we decided to perform emergency open surgical repair. A primary tear in the aortic dissection was observed in the proximal descending aorta. Through median sternotomy, after the establishment of a cardiopulmonary bypass via the right femoral artery and vein, TARFET was performed. After opening the pericardium, no cardiac effusion was observed and direct echocardiography showed no intimal tears in the ascending aorta (Fig. 2a). After opening the aorta, entry was detected in the proximal descending aorta, leading to the decision to perform TARFET for entry closure (Fig. 2b). Postoperatively, the patient recovered without major complications and was discharged after 2 weeks. Postoperative CT revealed no major complications, and the intimal tear was resected using a frozen elephant trunk (Fig. 3a). In 6 months, because of the continued small true lumen due to the remaining re-entry in the distal site of the aorta (Fig. 3b, 3c), TEVAR was performed (Fig. 3d). He is currently doing well without any symptoms at 5 years of follow-up.

Discussion

Painless aortic dissection is associated with increased mortality.⁷ The present patient developed RTAAD although his vital signs were stable and there were no symptoms during transfer. Ruan et al. reported that RTAAD might be misdiagnosed because of its atypical symptoms, which could lead to catastrophic outcomes.² However, typical symptoms associated with RTAAD remain unclear. Furthermore, Eggebrecht et al. reported that abrupt death after discharge due to RTAAD could occur in patients with RTAAD.⁴ In conservative treatment for type B aortic dissection, RTAAD should be considered consistently; however, it remains controversial whether routine CT evaluation for suspected worsening of the lesion after transfer should be performed.

Spontaneous RTAAD has been reported in 7–25% of TAAD.⁸ According to Kaji et al., RTAAD seems to have a better prognosis than the antegrade form.^{3,8} This may be explained by the less frequent involvement of the aortic valve, coronary arteries, and supra-aortic trunks.⁸ However, Lopez et al. reported that RTAAD was often associated with more extensive distal involvement and higher presentation with malperfusion.⁸ In the present case, CT upon arrival revealed a small true lumen in the descending aorta, although there was no organ malperfusion.

Optimal treatment is not standardized with a small series of different approaches available in the literature.^{3,5,6,9,10,11} In select patients with RTAAD, excellent outcomes can be achieved with initial medical management combined with timely intervention.¹⁰ Conservative medical therapy has been successful for cases with completely thrombosed false lumen in the ascending aorta, providing the aorta that it is not dilated beyond 55 mm.^{10,11} Kato et al. reported the successful use of an endovascular technique with stent grafts to treat RTAAD in 10 patients with complete thrombosis of the false lumen of the ascending and descending aortas 3 months after stent grafting.¹² There are some reports of RTAAD successfully treated with endovascular coverage of the primary tear in the descending aorta or with coils to induce thrombosis of the proximal false lumen as a bridge to definitive endovascular treatment.^{13,14} TEVAR may be a useful alternative surgical option in patients with entry into the descending aorta.¹³ These approaches require optimal anatomy, and serious late complications, such as redissection at the ascending aorta, are a major concern.¹⁵ Omura et al. also recommended total arch replacement using the fresh or frozen elephant trunk technique for RTAAD in patients without extremely high surgical risks.¹⁵

Erbel et al. suggested that poor surgical results in patients with RTAAD occurred because the current surgical techniques could not eliminate intimal tears in the distal aorta.¹⁶ Kamohara et al. reported a trend toward complete thrombosis in the TAR group.⁶ Tamura et al. reported that TARFET for RTAAD yielded acceptable outcomes, despite the high preoperative morbidity.⁵ TARFET theoretically addresses this limitation more effectively but significantly increases the risk of adverse outcomes related to greater technical challenges and the more demanding nature of the surgery.¹⁰ Moreover, the hybrid total arch and frozen elephant trunk procedure has been consistently reported to increase the risk of spinal cord ischemia.¹⁷ The AMDS Hybrid Prosthesis is a novel device for the treatment of acute TAAD in patients without intimal tears of the arch.¹⁸ However, the indication for AMDS implantation is TAAD with a primary entry tear in the root or ascending aorta.¹⁹ Therefore, this treatment was not recommended in this case. Therefore,

appropriate devices are warranted in the future.

Conclusion

RTAAD may occur in patients with type B aortic dissection, even if the patient has no symptoms or hemodynamic changes during transfer. TARFET may be effective in treating retrograde aortic dissection by resecting intimal tears in the distal arch or proximal descending aorta.

Acknowledgments

We thank the staff at the Honyaku Center for reviewing and editing this manuscript.

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Figure Legends

Figure 1a Preoperative computed tomography before admission showing type B aortic dissection

b Preoperative computed tomography before admission showing type B aortic dissection with narrow true lumen

c Preoperative computed tomography after admission showing type A aortic dissection

d Preoperative computed tomography after admission not showing intimal tear in the ascending aorta

Figure 2a Intraoperative direct echo showing no intimal tear in that position

b Intraoperative view showing the insertion of a frozen elephant trunk for entry resection into the proximal descending aorta

Figure 3a Postoperative computed tomography showing resection of intimal tear, but with narrow true lumen remaining

b Postoperative computed tomography showing remained narrow true lumen

c Postoperative computed tomography showing reentry in the abdominal aorta

d Post thoracic endovascular aortic repair computed tomography showing improvement of the narrow true lumen in the descending aorta





