Zone 0 Thoracic Endovascular Aortic Repair Using Reverse Extra-Anatomical Aortic Arch Debranching Technique for an Anastomotic Pseudoaneurysm and Acute Aortic Dissection that Developed after Bentall’s Surgery Combined with Sjögren’s Syndrome

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A 66 year-old man with a previous history of Sjögren’s syndrome was admitted with anastomotic pseudoaneurysm in the ascending aorta, which developed after Bentall’s surgery, a procedure that has severe complications and high mortality. Using the reverse extra-anatomical aortic arch debranching technique, zone 0 thoracic endovascular aortic repair was performed emergently. The postoperative course was uneventful. Twenty months later, computed tomography showed remodeling of the dissection, resolution of the pseudoaneurysm, and patency of the reverse extra-anatomical aortic arch debranching graft.

Keywords: endovascular surgery, Sjögren’s syndrome, pseudoaneurysm

Introduction

Anastomotic pseudoaneurysm in the ascending aorta that develops after Bentall’s surgery is a severe complication with a high risk of mortality. The first treatment option for this severe condition is to redo an open surgery, which is also associated with a very high mortality risk. We report successful performance of zone 0 thoracic endovascular aortic repair (TEVAR) using the reverse extra-anatomical aortic arch debranching technique1) for an anastomotic pseudoaneurysm and aortic dissection in a high-risk patient with Sjögren’s syndrome.

Case

A 66 year-old man with a history of Sjögren’s syndrome, hypertension, and hyperlipidemia underwent Bentall’s surgery using a φ23 mm aortic valved graft (St. Jude Medical, St. Paul, MN, USA) for annulo-aortic ectasia, and his postoperative course was uneventful. He was referred to our department for continuous low-grade fever 9 months later. Laboratory examination revealed the following: White blood cell 15660/µL, serum C-reactive protein 7.8 mg/dL, D-dimer 31.6 µg/mL. Chest contrast-enhanced computed tomography (CT) revealed an extravasation from the distal anastomosis, a huge anterior mediastinal hematoma, and a localized aortic arch dissection, and major entry was located distal anastomosis (Fig. 1) and re-entry was located at the bifurcation of the right brachiocephalic artery (BCA). The aortic arch diameter was 35 mm. The left subclavian artery (SCA) diameter was 10 mm and the distance between the left SCA and left common carotid artery (CCA) was 20 mm. The cause of the low-grade fever was inflammation due to the hematoma and the dissection.

The diagnosis was anastomotic pseudoaneurysm; the patient developed localized aortic arch dissection following Bentall’s surgery. He had a high-risk preoperative status because of the previous open cardiac surgery history and Sjögren’s syndrome, which is more likely to be complicated by vascular trouble. Therefore, after being provided complete information, the patient and his family...
chose minimally invasive treatment.

Emergent operation was performed. A left SCA-left CCA-right SCA bypass was done using a φ8 mm ePTFE graft (FUSION vascular graft, MAQUET Cardiovascular LLC, NJ, USA). The “reverse” extra-anatomical aortic arch debranching technique meant that the inflow of the extra-anatomical graft was guided into the left SCA. The proximal side of the left CCA was ligated. A first thoracic stent graft, TAG 37*100 mm (W. L. Gore & Associates Inc., Flagstaff, AZ, USA) was introduced from the right common femoral artery and deployed into the ascending aorta under rapid pacing. The tip of the TAG was shorter than any other device, which prevented disruption of an aortic mechanical valve. With rapid pacing, the stent graft’s proximal edge was opened just above the coronary orifices. A second stent graft, TAG 40*100 mm, was deployed in such a way that its distal end was located in the left SCA. The right BCA was embolized with a φ18 mm AVPII (AGA Medical Co., MN, USA). A final digital subtraction angiographic examination showed no signs of endoleak and extravasation.

The operation time was 4 h and 46 min. The patient was extubated in the operation theater and was transferred to the intensive care unit in stable condition.

The postoperative course was uneventful, and there were no symptoms of neurological deficits. Postoperative contrast CT examination showed no extravasation from the ascending aorta and a reduction of the mediastinal hematoma. Contrast-enhanced CT performed 20 months later showed remodeling of the aortic dissection, resolution of the pseudoaneurysm and hematoma, and patency of the extra-anatomical aortic arch debranching (Fig. 2).
Reverse Extra-Anatomical Debranching TEVAR

Discussion

The reverse extra-anatomical aortic arch debranching technique is advantageous for the rescue of high-risk patients. Although this technique is relatively rare, zone 0 TEVAR using this technique has been reported to yield good short-term results. Therefore, there is a good indication that this technique is suitable for rescue in high-risk patients with a history of several chest operations and vascular-high-risk diseases, such as auto-immune diseases. In particular, Sjögren’s syndrome combined with vasculitis has been reported to be associated with an elevated risk of development of aortic aneurysm and aortic dissection. Our patient, who had Sjögren’s syndrome, developed aortic dissection and pseudoaneurysm after Bentall’s surgery. Re-operation was considered to be a high-risk option. Performing zone 0 TEVAR with the reverse extra-anatomical aortic arch debranching technique, we obtained good short-term and intermediate-term outcomes, with remodeling of the aortic dissection and no evidence of endoleak.

There are two limitations of this technique. First, blood circulation to the brain is solely dependent on graft inflow from the left SCA, which is generally smaller than the BCA; consequently, a too-small left SCA becomes a contraindication. Second, the long-term results remain unclear; therefore, longitudinal follow-up of a sufficient number of such patients is necessary.

Conclusion

We conducted zone 0 TEVAR using the reverse extra-anatomical aortic arch debranching technique as a rescue operation for a case of anatomical pseudoaneurysm and aortic dissection that developed after Bentall’s surgery and obtained good short- to intermediate-term results.

Disclosure Statement

None declared.
Author Contributions

Study conception: DA, YS, SN
Data collection: DA
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References

1) Canaud L, Albat B, Hireche K, et al. Reverse extra-anatomic
aortic arch debranching procedure allowing thoracic endo-
vascular aortic repair of a chronic ascending aortic aneu-
rysm. J Vasc Surg Cases and Innovative Techniques 2018; 4:
102-5.
2) Asano S, Hayashida N, Hirano M, et al. A case of endo-
vascular stent-grafting with periscope graft technique for the
anastomotic pseudoaneurysm in the ascending aorta. J Jpn
Coll Angiol 2013; 53: 55-8. (in Japanese)
3) Mitsuoka H, Shintani T, Saito T, et al. Preservation of aortic
arch branches using chimney and sandwich stent grafts. Ann
Vasc Dis 2012; 5: 73-7.
4) Tsai YD, Chien WC, Tsai SH, et al. Increased risk of aortic
aneurysm and dissection in patients with Sjögren’s syn-
drome: a nationwide population-based cohort study in
Taiwan. BMJ Open 2018; 8: e022326.
5) Singh AG, Singh S, Matteson EL. Rate, risk factors and
causes of mortality in patients with Sjögren’s syndrome:
a systematic review and meta-analysis of cohort studies.
Rheumatology 2016; 55: 450-60.