Complete neck vessel preservation using a fenestrated stent graft for the treatment of proximal anastomotic leakage after open frozen elephant trunk graft aortic arch repair

Hikaru Nakagawa, MD,[a] Takao Ohki, MD, PhD,[b] Naoki Toya, MD, PhD,[a] Eisaku Ito, MD,[a] *and* Tadashi Akiba, MD, PhD,[c] *Tokyo, Japan*

ABSTRACT

We have reported a case of proximal anastomotic leakage excluded with the Najuta fenestrated stent graft after a surgeon-modified frozen elephant trunk aortic arch graft. The fenestrated stent graft was deployed at the zone 0 proximal site, preserving the cervical branches. Complete neck vessel preservation during endovascular repair using a Najuta fenestrated stent graft appears to be safe and effective for anastomotic leakage after aortic arch aneurysm repair. (J Vasc Surg Cases Innov Tech 2022;8:115-8.)

Keywords: Anastomotic leakage; Fenestrated stent graft; Najuta; Open stent graft

Anastomotic leakage after open surgical repair of an aortic arch aneurysm is often difficult to treat. The treatment options include redo open surgical repair, stent graft placement, and transarterial embolization. We have reported a case of proximal anastomotic leakage 15 years after a surgeon-modified frozen elephant trunk (FET) graft for repair of an aortic arch aneurysm. The patient provided written informed consent for the report of his case details and imaging studies.

CASE REPORT

A 76-year-old man had presented with an unexplained abnormality on a chest radiograph. He had undergone a surgeon-modified FET for an aortic arch aneurysm and had developed paraplegia as a postoperative complication. The FET was a 120-mm-long woven Dacron graft with a Gianturco Cook-Z stent (Cook Medical, Inc, Bloomington, Ind) attached only to the distal end. Computed tomography angiography showed an anastomotic leak at the level of the left subclavian artery (LSA), and the diameter of the aneurysmal sac was 69 mm (Fig 1). The leakage point was located at the lessor curvature of the aortic arch opposite the LSA. Considering the leakage point, we decided to attempt a complete neck preservation fenestrated stent graft repair using the Najuta stent graft (Fig 2).

With the patient under general anesthesia, transfemoral access was obtained via a surgical cutdown, and a 9F sheath was placed in the common femoral artery. A 7F twin sheath (double-lumen introducer sheath) was introduced from the right brachial artery, and a 4F pigtail catheter was advanced over a guidewire to the ascending aorta. A 6F sheath was placed in the left brachial artery for brain protection balloon occlusion of the LSA. The FET was surgeon modified and had no graft-lining stent in the middle of the graft. Therefore, it had become severely kinked into a V-shape (Fig 1). First, we had planned cTAG stent graft (W.L. Gore & Associates, Flagstaff, Ariz) insertion to straighten the FET over a Lunderquist wire (Cook Medical, Inc). Because the cTAG's trackability in a tortuous aorta is excellent, we did not perform predilatation with a balloon. The guidewire was exchanged for a 0.035-in. Radifocus wire (Terumo, Tokyo, Japan), which was then pulled through the right brachial artery to the femoral artery. The Najuta fenestrated stent graft (outer diameter, 42 mm) was delivered with a 23F J-shaped sheath maintained under continuous strain by traction at both wire ends. It was delivered and deployed at the zone 0 proximal site, with delicate positional adjustments of the fenestrations of the Najuta stent graft to align with the origins of the three neck vessels. During stent graft delivery, we performed temporary LSA balloon occlusion and manual compression of both carotid arteries for brain protection. After endoprosthesis implantation, angiography revealed that all three neck vessels were patent and the aneurysm had been successfully excluded (Fig 3). The patient's postoperative course was uneventful, and postoperative computed tomography angiography revealed no endoleak

From the Department of Vascular Surgery, The Jikei University Kashiwa[a]; Department of Vascular Surgery, The Jikei University Hospital[b]; and Department of Vascular Surgery, The Jikei University Hospital, Tokyo, Japan[c]

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Correspondence: Takao Ohki, MD, PhD, Department of Vascular Surgery, The Jikei University Kashiwa Hospital, 3-25-8 Nishi-Shinbashi, Tokyo 105-8461, Japan (e-mail: takohki@msn.com).

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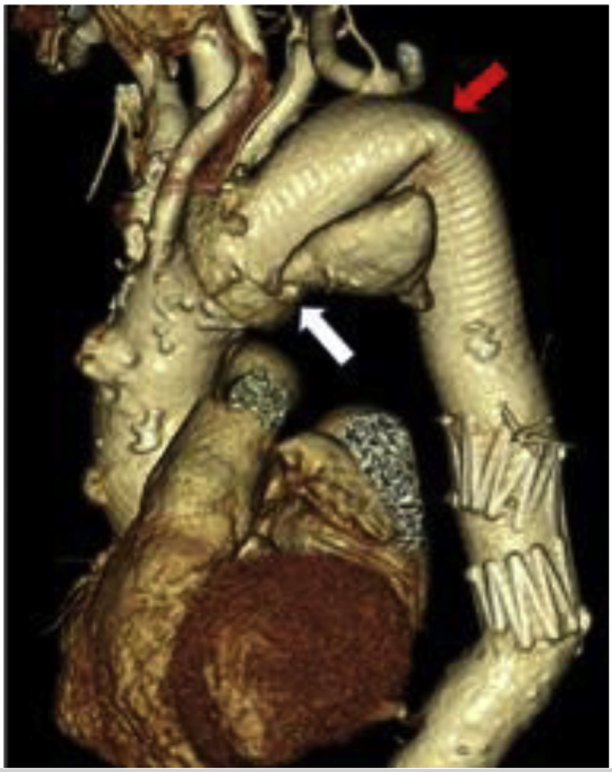

Fig 1. Preoperative computed tomography angiogram showing an anastomotic leak at the level of the left subclavian artery (*white arrow*). The diameter of the aneurysmal sac was 69 mm. The frozen elephant trunk graft was surgeon modified and was severely kinked in the middle (*red arrow*). The diameter was 11.7 mm for the innominate artery, 8.2 mm for the left carotid artery, and 10.1 mm for the left subclavian artery.

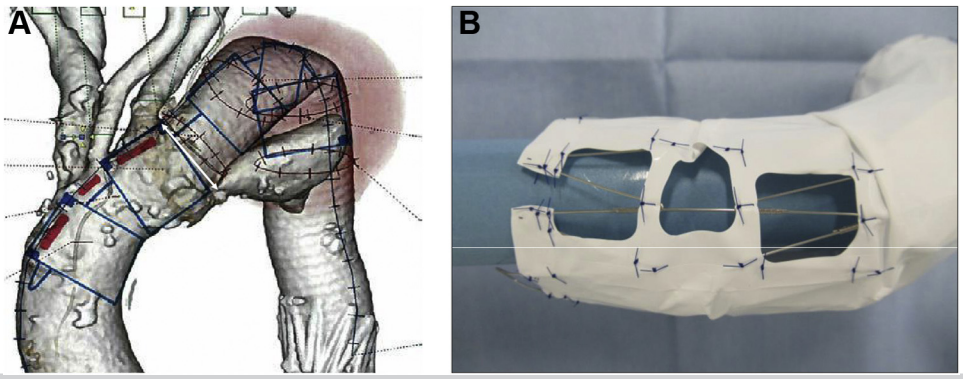

Fig 2. Implantation planning. **A,** The leakage point was located at the lesser curvature of the aortic arch. The distance between the leakage point and the origin of the left subclavian artery was 20 mm (*white arrow*). We had planned endovascular treatment with complete neck vessel preservation. **B,** The Najuta stent graft with three fenestrations.

(Fig 4). At the 1-year follow-up visit, aneurysm sac shrinkage of 10 mm was noted.

DISCUSSION

The Najuta stent graft is the only commercially available semicustom-made fenestrated device for thoracic endovascular aortic repair (TEVAR). The Najuta stent graft obtained Japanese regulatory approval in 2013 and the CE mark in 2017. A customized full-scale stent graft model was deployed to the patient-specific plaster model before TEVAR. The use of an anatomic plaster model produced using a three-dimensional printer is effective for obtaining a geometric analysis for the fenestrations.[1]

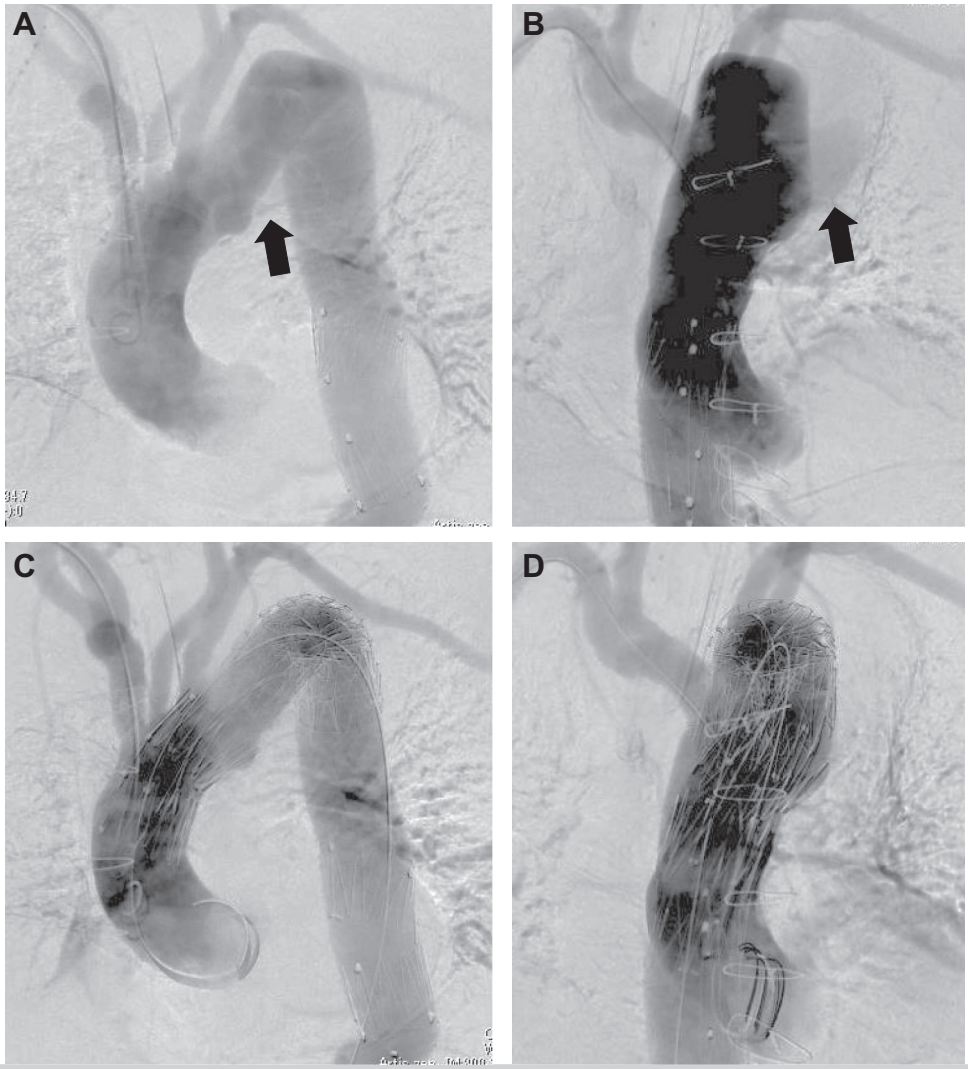

Fig 3. Pre- and postoperative angiograms. **A,** Preoperative angiogram (left anterior oblique [LAO] view) revealing a proximal anastomotic leakage (*black arrow*). **B,** Preoperative angiogram (right anterior oblique [RAO] view) revealing a proximal anastomotic leakage (*black arrow*). **C,** Postoperative angiogram (LAO view) revealed no endoleak and complete neck vessel preservation. **D,** Postoperative angiogram (RAO view) revealing no endoleak.

The frequency of anastomotic leakage after open surgical repair of an aortic arch aneurysm has been reported as 0.5%.[2] The treatment options include redo open surgical repair, stent graft, and transarterial embolization.[2-7] The standard repair for these cases is TEVAR with intentional LSA occlusion to obtain an adequate proximal sealing length. Our patient's postoperative paralytic symptoms had improved, showing it is important that the blood flow of the LSA should be maintained. Considering the patient's comorbidities, minimally invasive fenestrated TEVAR appeared to be a safe and effective treatment option.[8-10] According to the instructions for use for the Najuta stent graft, if the proximal neck length between the LSA and aneurysm is >20 mm, the LSA could also be fenestrated.[9] In the present patient, the anastomotic leakage point and the LSA were almost at the same level. However, the leakage point was located on the lesser curvature of the aortic arch, and the distance between the leakage point and the origin of the LSA was 20 mm (Fig 2, *A*). We, therefore, determined that minimally invasive endovascular treatment with complete neck vessel preservation without branch vessel bypass was possible. The Najuta stent graft can be delivered to the ascending aorta over a pulled-through Radifocus wire. Thus, it was important to be able to pass through the stenosis in the surgeon-modified FET. Because the kinking was corrected by initial placement of the cTAG stent graft, delivery of the Najuta stent graft became possible.

Fig 4. Postoperative computed tomography angiogram showing no endoleak.

CONCLUSIONS

Complete neck vessel preservation using the Najuta fenestrated stent graft after careful planning was an effective treatment of anastomotic leakage in our patient.

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