

A Case of Kawasumi Najuta Thoracic Stent Graft for Distal Aortic Arch Aneurysm during Home Oxygen Therapy for which General Anesthesia is not desirable

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Author Introduction



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Introduction

Thoracotomy is considered as the first choice for nonelderly patients with distal aortic arch aneurysm. However, there are often struggles to choose a treatment method in terms of treatment invasion, as in practical situations where a patient could often be elderly with comorbidity. Herein,

we report a successful case of Thoracic Endovascular Aortic Repair (hereafter TEVAR) performed using a Kawasumi Najuta thoracic stent graft system in a patient with distal aortic arch aneurysm during home oxygen therapy for whom general anesthesia was not desirable.

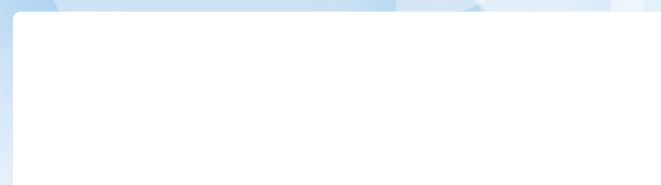
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Case Introduction

A 74-year-old man on home oxygen therapy for chronic respiratory failure caused due to emphysema was diagnosed with an aortic aneurysm at the distal arch aorta on a chest X-ray, and he was subsequently referred to our clinic. He had an old cerebral infarction accompanied by a history of chronic kidney disease (Cr 2.23, eGFR 20). Contrast-enhanced computed tomography revealed a saccular aortic aneurysm with a maximum diameter of 50 mm at the anterior side of the distal aortic arch, located 12 mm from the bifurcation of the left common carotid artery (LCCA). The left subclavian artery (LSA) branched from the position adjacent to the aortic aneurysm (Fig. 1).

Zone 2 TEVAR using a normal stent graft could not be adapted because it could hardly secure the proximal neck length on the lesser curvature proximal side. As a treatment, TEVAR in combination with thoracotomy and surgical reconstruction of the aortic arch branches, including the LCCA (the so-called debranching TEVAR), was also considered as an option. However, due to a respiratory function test result of 380 mL/s (FEV 1.0% 13.8%), requiring home oxygen therapy for extremely behavioral obstructive disorders, it was concluded that the choice of general anesthesia was at risk for long-term mechanical ventilation after surgery.

Based on the abovementioned information, the possibility of performing TEVAR under local anesthesia was examined. MRA examination demonstrated normal communication of the left and right vertebral arteries and the circle of Willis. Moreover, the risk of developing neurological complications was low even when the LSA was sacrificed (Fig. 2). To the patient we explained the risk of performing Zone 0 TEVAR under local anesthesia describing that it would be difficult to remove the patient from the ventilator due to switching to general anesthesia and changing to the necessary procedure in case complications occurred. Surgery was performed with the consent of the patient and his family.

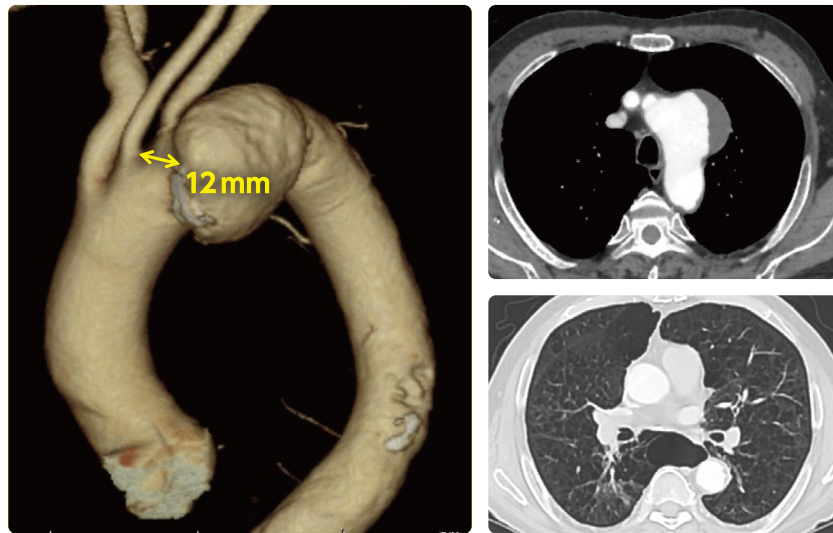


Fig. 1 Preoperative contrast CT - A distal aortic arch aneurysm can be observed 12 mm from the left common carotid artery. (Upper left arrow) Emphysema changes are observed under lung field conditions (lower right).

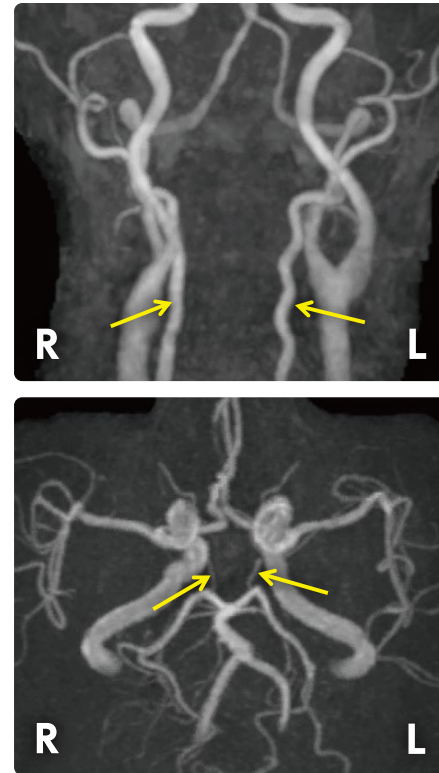


Fig. 2

Preoperative vertebral basilar artery MRA - Both vertebral arteries (upper yellow arrow) show good running to the basilar artery junction without left and right differences. The posterior communicating artery (lower yellow arrow) of the circle of Willis was narrow, but it was judged that neurological complications could be avoided if perfusion of the right vertebral artery was maintained.

Operation

Local anesthesia around the right groin and the right elbow was performed concomitant with mild sedation using continuous intravenous dexmedetomidine. The right femoral artery was exposed and a 6-Fr introducer was inserted percutaneously into the right brachial artery. Heparin was injected intravenously, and the subsequent operation was continued with the ACT around 250 s. A 0.032-inch 400-cm guide wire was advanced to the right femoral artery using a 4-Fr pigtail catheter from the right elbow introducer. The right femoral artery was clamped and cut off, and the guide wire was pulled out.

The brachial wire method was used to advance the O.D.23 Fr. (outer diameter 7.7 mm) Najuta system into the aortic arch from the right femoral artery. After pushing the guide wire into the ascending aorta, the Najuta system was also advanced into the ascending aorta. The patient's with spontaneous breathing held his breathing then, DSA was performed, and the LCCA bifurcation position was confirmed (Fig. 3). Under the blood pressure reduced around 100 mmHg, the 38-mm Najuta (skeleton AR8L, graft S38CL3, Fig. 4) was deployed from the ascending aorta to the descending aorta at the position where the distal marker on the Najuta 2nd stent positioned at the LCCA distal end.

The DSA did not reveal any endoleak into the aneurysm. Moreover, it was confirmed that the Najuta external prosthetic vascular graft dilated by the patient's blood pressure itself into the opening of the sacrificial occlusion of the LSA and that the LSA occluded at the root (Fig. 5). After closing the wounds, the operation was completed. The patient endured the 90 min of operation.

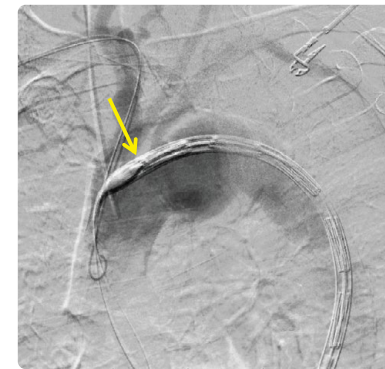


Fig. 3 Intraoperative DSA - The position of the left common carotid artery bifurcation end was confirmed.



Fig. 4 Najuta thoracic stent graft used - Deployed the distal fenestration end (yellow arrow) to the left common carotid artery end.



Fig. 5 Intraoperative DSA - Najuta 2nd stent peripheral marker is placed in line with the left common carotid artery terminal (yellow arrow), and the left subclavian artery is occluded by protruding Najuta external prosthetic vascular graft (yellow arrow head).

Postoperative process

There was no neurological complication, and the pulsation of the left radial artery had disappeared immediately after the operation due to the effect of the LSA sacrificial occlusion, but no subjective symptoms were reported. (Currently, 2 years after the operation, the weak pulsation of the LSA can be confirmed, and the blood pressure of the left upper arm can be measured at 70 mmHg level.)

The patient started eating and walking the day after the operation and was discharged from the hospital 10 days after the operation with good progress. A contrast-enhanced CT scan taken 7 days after the surgery confirmed thrombus occlusion of the distal aortic arch aneurysm (Fig. 6).

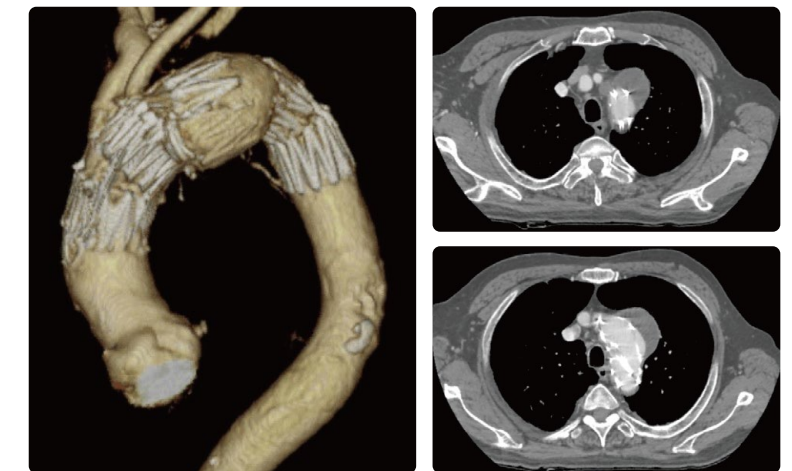


Fig. 6 Contrast CT images 7 days after surgery. Volume rendering image (left) Axial image (right) confirmed thrombosed occlusion of aortic aneurysm.

In postoperative CT, only a simple CT scan was performed considering the chronic renal insufficiency, but no abnormality has been detected in the 2 years after the operation. Chronic respiratory failure was gradually progressing, but the patient is living in a condition where regular outpatient visits to the respiratory clinic are possible.

Consideration

It is generally difficult to implement therapeutic intervention for distal aortic arch aneurysms associated with heart and respiratory failure cases with limited application for general anesthesia. For patients requiring home oxygen therapy, as in the present case, simple TEVAR using fenestration-type Najuta, which does not require additional work, is the best solution in terms of the less invasive treatment without ADL reduction after surgery. In this case, the greatest concern was whether accurate deployment in millimeters in accordance with the carotid artery, an important branch vessel of the aortic arch, could be performed safely under local anesthesia. Continuous infusion of dexmedetomidine was effective for approaching a sedation state without respiratory depression. However, the experience under local anesthesia is limited, and safety examination, including more reports from other facilities, is necessary.

Furthermore, using the Najuta system, it is possible to deploy accurately a stent graft with a relatively large diameter of 38 mm in Zone 0 TEVAR without circulatory support. We believe that this was a factor for the success of this minimally invasive treatment. If the aneurysm has a saccular form as in this case, good results can be expected with Najuta (used in this case), whose clinical application was started in 2013. However, if the fenestration on the distal side is large, for a fusiform distal aortic arch, there could be concerns for type 1 endoleaks from the fenestration into the aneurysm. Since 2016, it has become possible to use an improved device with a smaller distal fenestration of Najuta, whose performance is expected to improve in the future (Fig. 7).

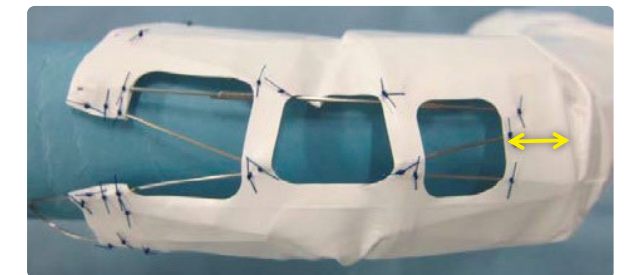


Fig. 7 Najuta half fenestration type began to be used since 2016 (Japan) - distal fenestration has been improved to be smaller, and the clamping effect to the proximal neck equivalent part (yellow arrow) from the second stent fenestration is expected.