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Aneurysm sac enlargement 16 years after endovascular aortic aneurysm repair due to late type IIIb endoleak: A case report

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ABSTRACT

INTRODUCTION: We report a case with delayed aneurysm sac enlargement 16 years after EVAR due to late type IIIb endoleak.

PRESENTATION OF CASE: An 84-year-old man was referred to our hospital with an aneurysm sac enlargement after endovascular aortic aneurysm repair (EVAR), which had been performed at another hospital 18 years earlier using the Zenith endograft. Computed tomography (CT), after EVAR had shown significant sac shrinkage. However, the patient presented with delayed aortic aneurysm enlargement due to an assumed endoleak. Duplex ultrasound showed a type IIIb and a type Ib endoleak. We performed a re-intervention with an AFX endograft, for relining due to persistent type IIIb endoleak.

DISCUSSION: Compared with the type IIIb endoleaks discussed in past reports, this case occurred with a much longer delay. Although CT could not identify the type of endoleak, duplex ultrasound led us to diagnose the type IIIb endoleak.

CONCLUSION: Relining using an ePTFE endograft may be considered an effective procedure for type IIIb endoleaks. Duplex ultrasound is useful for determining endoleak types.

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1. Background

Thanks to the development of endovascular aortic aneurysm repair (EVAR), treatment of an abdominal aortic aneurysm (AAA) has become less invasive [1–3]. However, in recent years, reports about secondary procedures for endoleaks after EVAR have become more numerous, and identifying the type of endoleak and determining an appropriate treatment strategy is difficult. Type IIIb endoleaks are particularly difficult to diagnose. We report a case with delayed aneurysm sac enlargement 16 years after EVAR due to late type IIIb endoleak. In this case, the type IIIb endoleak was diagnosed using duplex ultrasound and effectively treated using an expanded polytetrafluoroethylene (ePTFE) endograft relining procedure. This paper has been reported in line with SCARE criteria [4].

2. Case report

An 84-year-old man was referred to our hospital. Eighteen years earlier, this patient had undergone EVAR using a Zenith bifurcated endograft (Cook Medical, Bloomington, IN, USA) at another hospital. Follow-up computed tomography (CT) had shown aneurysm sac shrinkage and finally sac disappearance until 15 years after surgery (Fig. 1a). However, based on follow-up CT, the aneurysm sac began to enlarge 16 years after EVAR (Fig. 1b). After that it gradually enlarged and the patient was introduced to our hospital. Enhanced CT, which was performed at our hospital 18 after EVAR, revealed an enlarged AAA and an endoleak into the aneurysm sac, but the exact source of the leak could not be identified (Fig. 1c). Duplex ultrasound showed blood jet flow from the main body of the stent graft (Fig. 2A and B) and flow between the distal edge of the right leg of the endograft and the right common iliac artery (Fig. 2C). Based on these findings, the endoleak from the main body of the endograft was identified as type IIIb, and the endoleak from the right leg of the endograft was identified as type Ib.

For the type IIIb endoleak, a stent graft made of ePTFE material was used for relining, and for the type Ib endoleak, legs were added to the existing Zenith endograft in the right common iliac artery. The distance from the left renal artery to the bifurcation of the Zenith graft was 60 mm. Since the distance to the bifurcation

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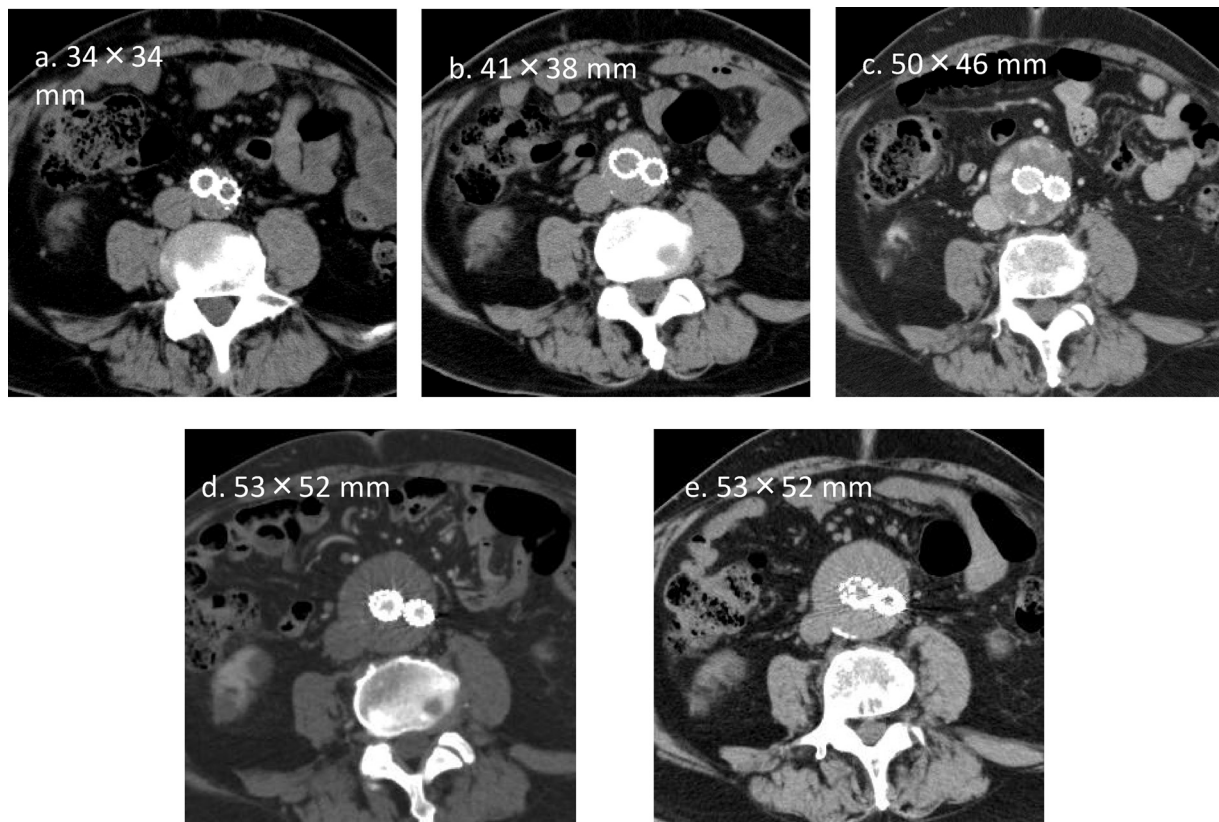


Fig. 1. a: Follow-up computed tomography (CT) have shown aneurysm sac disappearance 15 years after surgery. b: Significant enlargement of the aneurysm sac becomes evident 16 years after endovascular aortic aneurysm repair (EVAR). c: The last preoperative CT was undergone 5 months before re-intervention. Aneurysm sac enlarged still more. d, e: Follow-up CT at 1 month and 6 months after the re-intervention also showed no further aneurysm sac enlargement.

was sufficient, an AFX endograft (Endologix, Irvine, CA, USA) was selected as a lining device. A contralateral Endurant iliac extension (Medtronic, Santa Rosa, CA, USA) was placed to the edge of right leg of Zenith endograft to extend sealing. Furthermore, an Endurant aortic extension was added just below the left renal artery to extend proximal sealing (Fig. 3). The type IIIb and type Ib endoleaks were not detectable on intraoperative angiogram. The operation was completed in 149 min without any problems. Duplex ultrasound one month after re-intervention showed that the type IIIb and Ib endoleaks had disappeared (Fig. 2a–c). Follow-up CT at 6 months after the re-intervention also showed no aneurysm sac enlargement (Fig. 1e).

3. Discussion

In general, AAA sac shrinkage after EVAR is considered to be evidence of clinical success. However, re-expansion after initial shrinkage of the AAA sac occurred in some cases [5]. In this case, the aneurysm sac became enlarged 16 years after EVAR, and reoperation was performed 18 years after EVAR. Preoperative CT showed leakage of contrast into the sac, but the type of endoleak could not be identified.

Since the aneurysm had disappeared once after EVAR, it seemed unlikely that the aneurysm became enlarged due to a new type II endoleak 16 years after EVAR. To identify the endoleak mechanism, duplex ultrasound was performed, which led us to strongly suspect the presence of a type IIIb endoleak. It seemed that the endoleak had developed due to graft fatigue and damage.

The type Ib endoleak, which was observed at the distal edge of the right leg of the graft, was thought to have appeared as a result

of migration of the graft legs due to enlargement of the aneurysm sac caused by the IIIb endoleak.

Type III endoleaks are classified as either type IIIa, defined as a leak from the junctional separation of the modular components, or type IIIb, defined as a leak from fractures or defects in the fabric. Type IIIb endoleaks are relatively rare and reports are scarce. Though these reports on type IIIb endoleaks in stent grafts involve multiple currently available devices [6–8], many of them are reported when using the Zenith [7,9,10].

Compared with the type IIIb endoleaks discussed in past reports, the type IIIb endoleak in the present case occurred with a much longer delay. Type IIIb endoleaks typically appear within a few years of EVAR. Even if the postoperative course is uneventful and satisfactory, there is a possibility that a new endoleak may develop due to fatigue of the stent graft, and long-term follow up is necessary. In some cases, the type of endoleak is unknown before surgery, and open surgery is performed assuming a type II endoleak, which is then identified as a type IIIb endoleak for the first time [9,10].

In recent years, intravascular therapy has been the most common secondary procedure for endoleaks after stent graft implantation [11,12]. Intravascular therapy is less invasive than open repair, and in some cases with venous anatomical anomalies, intraoperative vascular injury can be avoided [13,14]. Thus, it is very important to diagnose the type of endoleak and to understand vascular anatomy before surgery. In the present case, although it had not been identified on preoperative CT, we diagnosed the type IIIb endoleak using duplex ultrasound. Although angiography is also performed for the diagnosis of endoleaks that are difficult to identify with CT, ultrasonography, which is easier and less invasive, can be considered effective.

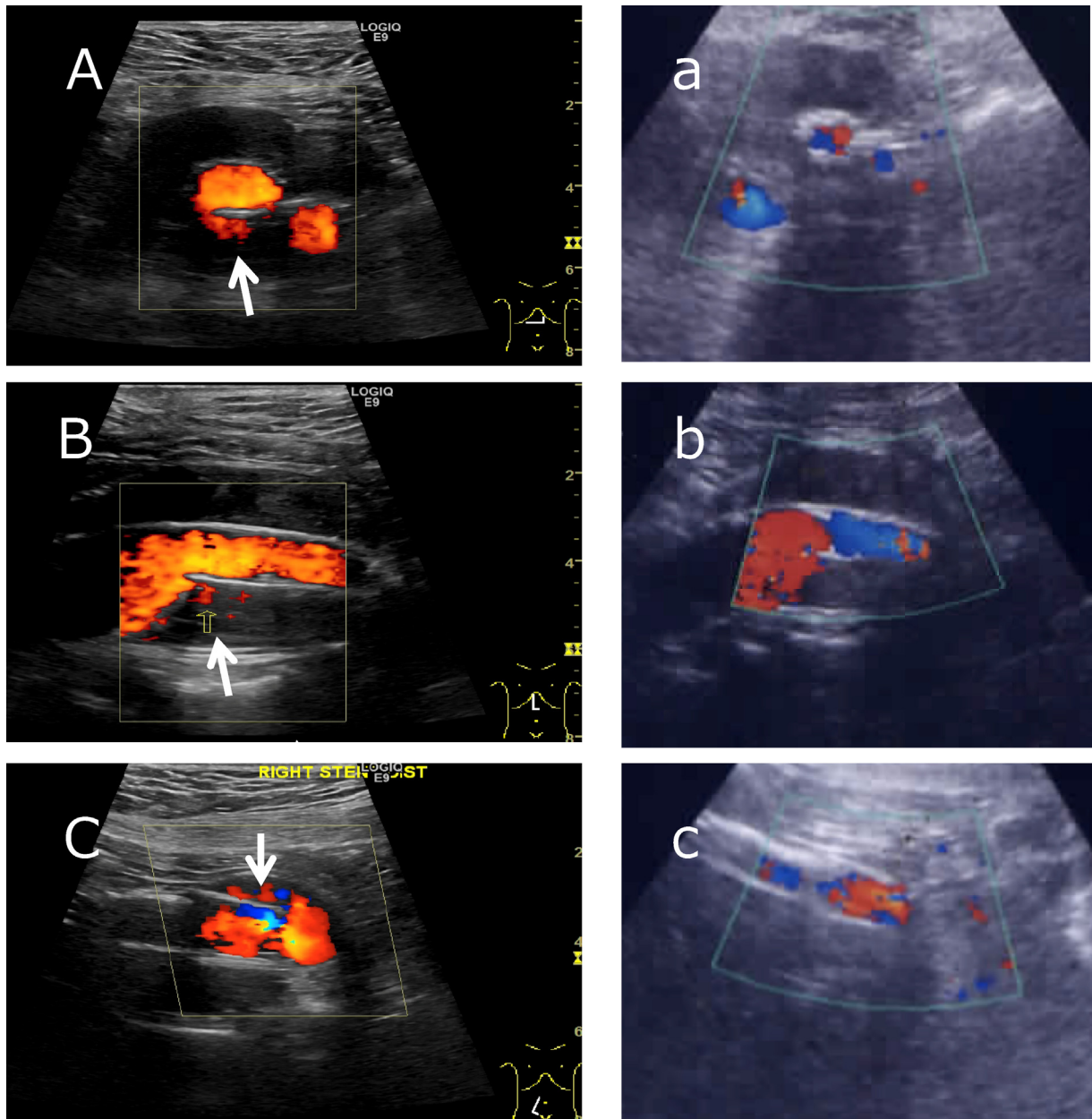


Fig. 2. Preoperative abdominal ultrasound (a–c). Blood flow is detectable from the main body of the stent graft (A, B; white arrow) and from the distal edge of the right leg of the stent graft (C; white arrow). Postoperative abdominal ultrasound (a–c). Type IIIb and Ib endoleaks are no longer detectable.

We chose the AFX endograft as an additional stent graft because the fabric of the AFX is made of low-permeability ePTFE material, and the DuraPly active seal mechanism conforms to irregular surfaces and achieves endovascular sealing of the tear. Moreover, the AFX is a unibody device, and there is no danger of junction leaks (type IIIa). In the present case, there was a distance from the renal artery to the bifurcation of the Zenith stent, so the AFX stent seemed to be a suitable device.

4. Conclusion

This report describes a case of delayed aneurysm sac enlargement 16 years after EVAR. Our findings confirm the notion that, even if the postoperative course is uneventful for many years, it is possible that new endoleaks may develop, so long-term follow-up is necessary. Duplex ultrasound is useful for determining endoleak

types. Relining using an ePTFE endograft may be considered an effective procedure for type IIIb endoleaks.

Conflicts of interest

No conflict of interest.

Sources of funding

None.

Ethical approval

The ethical approval has been exempted by our institution, because this is a case report.

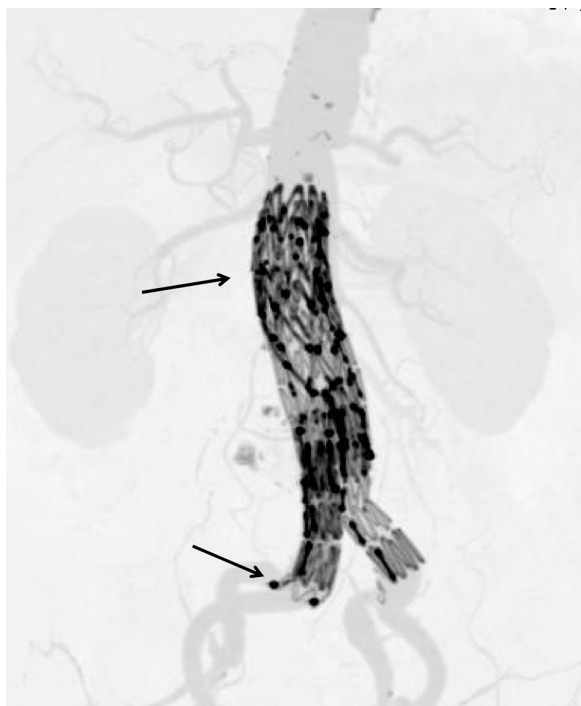


Fig. 3. Postoperative 3D-CT. An AFx endograft was placed into the Zenith main body (upper arrow), and an Endurant contralateral leg was placed into the right common iliac artery (lower arrow).

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images.

Author contribution

The idea of the project was conceived by Naoki Toya. Tadashi Akiba supervised the project. Yuri Murakami performed the literature review. The paper was written by Yuri Murakami. Soichiro Fukushima participated in the operation. Eisaku Ito coordinated and helped to draft the manuscript. All authors contributed to the refinement of the case report and approved the final manuscript. Takao Ohki provided final approval of the version to be published.

Registration of research studies

This is not ‘first-in-man study’.

Guarantor

Yuri Murakami and Naoki Toya.

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