

 **Case Report** 

# Parallel Placement of Excluder Legs for the Treatment of a Type IIIb Endoleak Using AFX2

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Endoleak is a major complication of endovascular aneurysm repair (EVAR). Type IIIb endoleaks, which are caused by endograft fabric disruption, are relatively rare. Although relining of the previously placed endograft with another main endograft is considered an ideal approach, it is sometimes difficult. The efficacy of parallel placement of Excluder legs has been reported in various settings. Here, we report the successful treatment of a type IIIb endoleak with parallel placement of Excluder legs during EVAR by using an AFX2 device.

**Keywords:** endovascular aneurysm repair (EVAR), complications, type IIIb endoleak

## Introduction

Endoleaks are a major complication of endovascular aneurysm repair (EVAR), making it incomparable to open repair with regard to long-term outcomes.<sup>1)</sup> Type III endoleaks are relatively rare and are classified into the following two subtypes: type IIIa endoleaks, which occur at the junction between modular endografts; and type IIIb endoleaks, which are caused by endograft fabric disruption. Although type IIIb endoleaks are rare among the two types, they can cause an aneurysm to rupture. In cases involving type IIIb endoleaks, relining of the previously placed endograft with another main endograft is considered an ideal approach to avoid an-

eurysm rupture; however, this is sometimes difficult because of the lack of an appropriate endograft or compromise of the access route due to the previously placed endografts. Parallel placement of Excluder legs has been adopted in various settings to overcome EVAR-associated problems.<sup>2,3)</sup> Since the endovascular graft system AFX Strata (Endologix Inc., Irvine, CA, USA) indicated for EVAR was withdrawn because of product failure, there has been no report on a type IIIb endoleak associated with its latest version, AFX2. Here, we report our experience of successful treatment of a type IIIb endoleak with parallel placement of Excluder legs during EVAR by using an AFX2 device. This case report was approved by our institutional review board (No. 1717).


## Case Report

A 76-year-old male patient was referred to our hospital for the treatment of a saccular abdominal aortic aneurysm and a right common iliac artery aneurysm. The maximum diameters of the abdominal aortic aneurysm and the common iliac artery aneurysm were 35 and 27 mm, respectively. Because he had several comorbidities, including a cerebral arterial aneurysm and a history of cerebral infarction, EVAR was selected as the treatment approach. After embolizing the right internal iliac artery and the inferior mesenteric artery with coils, we placed an Excluder leg (W. L. Gore & Associates, Inc., Newark, DE, USA) spanning from the right common iliac artery to the right external iliac artery as the initial step. Because of a narrow and long proximal neck (diameter, 17 mm; length, 60 mm), it was assumed that the use of a modular device could cause compression and stenosis of the ipsilateral leg at the proximal neck. Therefore, we decided to use an AFX2 device as the main endograft. On completion aortography performed after deployment of the main AFX2 endograft, an endoleak was noted in the middle of the endograft. As it was considered to be a type Ia endoleak, we added two Excluder cuffs to the proximal neck. However, the endoleak persisted, and angiography with the tip of a Berenstein catheter (Merit Medical Inc., South Jordan, UT, USA) placed at the assumed endoleak point revealed that the endoleak originated from a graft hole, indicating a type

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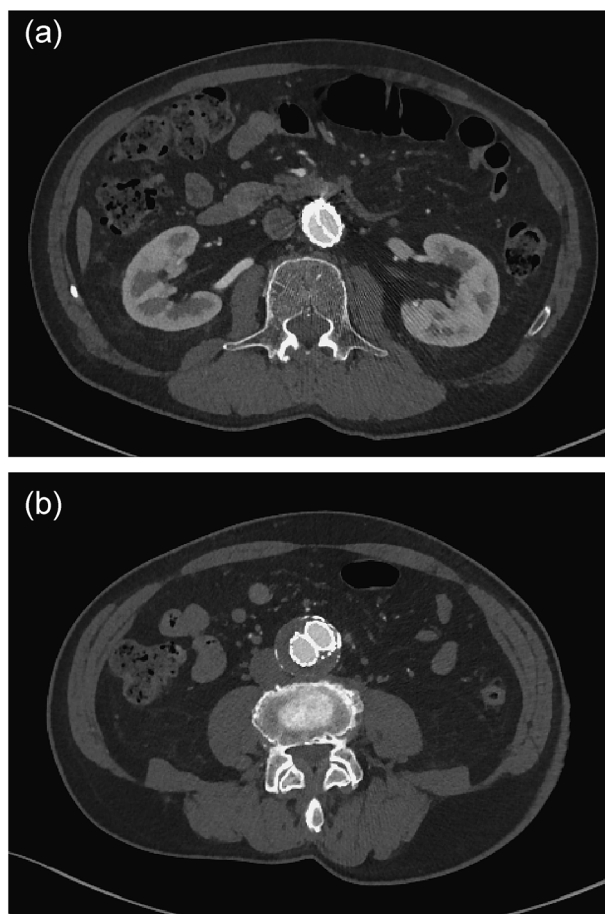


**Fig. 1** Angiography with the tip of a catheter placed at the assumed endoleak point shows an apparent type IIIb endoleak (arrow) in the middle of the main endograft.

IIIb endoleak (Fig. 1). Because no main endograft with an appropriate dimension was available and the reliability of the AFX2 device was unclear, we decided to perform parallel placement of Excluder legs. The required diameter of Excluder legs was calculated by the following formula<sup>8)</sup>:

$$\text{Diameter of Excluder legs} = \frac{\text{Half the circumference of AFX2} + \text{Diameter of AFX2}}{\text{Circular constant}}$$

To minimize gutter endoleaks that can occur between two Excluder legs, the diameter was increased by approximately 10%, and the final diameter was set at 23 mm. Two Excluder legs (bottom end diameter, 23 mm) were placed from immediately below the origin of the renal artery using the upside-down technique, which has been described in a previous article although it is an off-label technique.<sup>4)</sup> Briefly, an Excluder leg is removed from its delivery system, with the sleeve unopened. It is then inserted into a DrySeal sheath (W. L. Gore), which has been introduced to the top of the origin of the renal artery. After deploying the leg inside the DrySeal sheath, it is advanced to the planned position with a pusher created by cutting the edge of a dilator. It is then deployed in the landing zone by pulling the sheath while firmly holding the pusher. In our patient, two operators deployed two Excluder legs simultaneously to accomplish parallel placement.



**Fig. 2** Postoperative contrast-enhanced computed tomography (CT). (a) A CT image at the proximal neck level shows equal patency of both Excluder legs. (b) A CT image of the abdominal aortic aneurysm shows absence of an endoleak.

After deploying the Excluder legs on both sides with sufficient overlap to completely cover the previously placed endograft and expanding a balloon for touch-up, aortography and cone-beam computed tomography (CT) showed no endoleak or collapse of the Excluder legs. Contrast-enhanced CT performed 2 days after the EVAR showed no endoleak or obstruction of the Excluder legs (Fig. 2). Additionally, CT performed 6 months later revealed reduction of the abdominal aortic aneurysm to 31 mm, although the diameter of the right common iliac artery remained unchanged.

## Discussion

An endoleak with growth of aneurysm remains a major issue to be solved in EVAR. In general, type III endoleaks are relatively rare, with a frequency of 0.6%–2.1%.<sup>5–7)</sup> As type IIIa and type IIIb endoleaks transmit systemic blood pressure directly to the aneurysmal sac, they are considered life-threatening and should be repaired at the earliest. Type IIIb endoleaks are less frequent than type IIIa endoleaks,

and their frequency has been reported to be 0.3%.<sup>7)</sup> Most cases involving type IIIb endoleaks are identified 1 month to beyond 5 years postoperatively, and tears are usually found around the flow divider of polyester-based endografts.<sup>2,8)</sup> With regard to Endologix devices, as those covered with Strata material were exchanged for those covered with Duraply material (AFX2) because of durability concerns, it is claimed that there has been no report of a type IIIb endoleak with the device.<sup>9,10)</sup> Therefore, there was a possibility of type IV endoleak in this case. However, it was excluded because the modern AFX fabric is made of more than 20 layers of ePTFE (expanded polytetrafluoroethylene) films and achieves zero porosity. In our presenting case, a type IIIb endoleak developed in the middle of the AFX2 main endograft during the EVAR procedure. The cause could not be identified, but the endoleak might have developed during the deployment procedure that potentially stresses the graft material inside the delivery system because of interactions between the stent edge and the unfixed graft material, which could develop with the latest version of AFX2. Therefore, it should be acknowledged that some measures to fix a type IIIb endoleak might be required when using AFX2.

Relining of the previously placed endograft with another main endograft is considered an ideal approach for the treatment of a type IIIb endoleak. Indeed, in our patient, the use of another AFX2 endograft might have been the best solution. However, no device with an appropriate dimension was available. In addition, we might have hesitated to use another AFX2 device because of unreliability in terms of intactness. We eventually selected parallel placement of Excluder legs, which has been shown to be effective in several previous reports.<sup>2,8)</sup> This technique allows for the use of smaller delivery sheaths compared with those for a main endograft, which might be an advantage in the setting of iliac artery narrowing due to previously placed endografts. However, this technique has a few potential drawbacks. First, a gutter endoleak might develop, which is similar to the observation in patients treated with the chimney technique. Second, infolding of the device might occur when there is excessive oversizing. Although oversizing of the Excluder legs (diameter, 23 mm) was more than 20% compared to the calculated diameter (14 mm) from the aortic diameter (17 mm) of the proximal neck in our patient, which might have been too much, no infolding was observed. Deployment of the Excluder legs inside the sheath before placement in the aorta could have helped avoid infolding. Careful follow-up is mandatory to avoid serious problems related to device migration.

We experienced type IIIb endoleak of AFX2 and treated it using parallel placement of Excluder legs. As type IIIb endoleak of AFX2 may be caused by its complicated placement procedure, this parallel placement can be a use-

ful option.

## Conclusion

Here, we report successful parallel placement of Excluder legs for the treatment of a type IIIb endoleak during EVAR by using an AFX2 device when another appropriate main device was unavailable for the treatment of the endoleak.

## Disclosure Statement

The authors have no conflict of interests.

## Author Contributions

Writing: HK, NK

Critical review and revision: all authors

Final approval of the article: all authors

Accountability for all aspects of the work: all authors

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