Successful treatment of endoleak Type I with uncovered EX-L stent after thoracic endovascular aneurysm repair†

Semih Buz*, Burkhart Zipfel, Guiseppe D’Ancona and Roland Hetzer

German Heart Institute Berlin, Berlin, Germany

* Corresponding author. Deutsches Herzzentrum Berlin, Augustenburger Platz 1, 13353 Berlin, Germany. Tel: +49-30-45931938; fax: +49-30-45932100; e-mail: buz@dhzb.de (S. Buz).

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Abstract

Treatment of endoleaks after thoracic endovascular repair remains challenging, particularly when the proximal landing zone is small and partly includes the origin of the neck vessels. We report a Type Ia endoleak, occurring after thoracic endovascular aneurysm repair, which was successfully treated with a novel uncovered nitinol stent. With this success, we were able to avoid a conventional surgery to treat the endoleak.

Keywords: TEVAR • Endoleak Type I • Treatment • Bare-metal stent

INTRODUCTION

Thoracic endovascular aortic aneurysm repair (TEVAR) is rapidly growing as a preferred alternative to open surgical repair for the treatment of thoracic aortic aneurysms. However, endovascular repair is associated with a higher rate of secondary interventions due to complications, than open surgical repair. Despite recent advances in endovascular technology, endoleaks remain common complications of TEVAR [1]. An endoleak is defined by persistent perfusion of the aneurysm sac and implies a failure of the endograft treatment. Patients with endoleak may be at continued risk of aneurysm rupture. Type I endoleak is the most common type of endoleak associated with TEVAR. Treatment of Type I endoleak is mandatory and conversion to open surgery represents the ultimate solution with significant mortality in most reported cases [1].

CASE REPORT

A 72-year old man was referred to our institution for the treatment of a proximal descending aortic aneurysm with extension above the diaphragm (Fig. 1A). His medical history was positive for systemic hypertension and tabagism. Coronary angiography excluded significant coronary artery disease before operation. After evaluation of the chest CT, an endovascular repair of the aortic aneurysm was planned. Kinking of the aorta at the proximal landing zone with the diameter of 33 mm was the unique finding in this case. Because of dilatation of the aneurysm neck near the origin of the left subclavian artery, over-stenting of the subclavian artery was necessary to achieve a satisfactory landing zone. Therefore, an extrathoracic left carotid-subclavian bypass was performed before endovascular treatment. An endovascular repair of the thoracic aneurysm was then accomplished transfemoral using two E-vita thoracic stent-grafts (JOTEC GmbH, Hechingen, Germany) (diameter: 40 mm proximally; length: 230 and 170 mm) with 20% oversizing of the native thoracic aorta at the proximal landing zone close behind the origin of the left common carotid artery. Although intraoperative control angiography showed a Type Ia endoleak that persisted despite balloon dilatation, it was decided to re-evaluate the endoleak in the following days. A CT scan on the seventh postoperative day revealed partial folding of the proximal endoprosthesis and persistence of the endoleak with partial perfusion of the aneurysm (Fig. 1B). We decided to implant a 36-mm uncovered nitinol stent (E-XL, JOTEC GmbH, Hechingen, Germany) to optimize endovascular sealing without compromising the neck vessel perfusion. The concept of treating endoleaks with a novel EX-L stent was a new idea, and it should be used first for this indication. The procedure was performed on the eighth postoperative day with percutaneous implantation. The postoperative course was uneventful and no neurological complications occurred. Postoperative CT on the third day showed the disappearance of the Type Ia endoleak and of the proximal graft folding (Fig. 2). The patient was discharged on the third day after the last intervention and is well after the follow-up of 33 months.

DISCUSSION

Exclusion of the aneurysm sac is the main goal of the stent-graft treatment, and clinical success is defined by ‘total exclusion’ of the aneurysm. However, endoleaks are a major cause of complications seen after the endovascular repair of aortic aneurysms [2]. An endoleak implies failure of the endograft treatment, and

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Figure 1: (A) Preoperative CT scan shows the descending aortic aneurysm with extension above the diaphragm. ‘Cave’, kinking of the aorta at the proximal landing zone. (B) Postoperative CT scan on the seventh postoperative day after stent-graft implantation; white arrow shows partial folding of the proximal stent-graft and the persistence of the endoleak Type Ia with partial perfusion of the aneurysm.

Figure 2: Design of the EX-L stent; open-cell design in the middle part for maximal flexibility and closed-cell design at the end for maximal radial force. Control CT scan with volume (A) and sagittal reconstruction (B) as well as axial scan on the third postoperative day after the implantation of E-XL stent in the proximal landing zone. No endoleak is evident. The radial force of the stent pushed the proximal stent-graft to the aortic wall, smoothing out its fold and leading to improved sealing. This result avoided a conventional surgery in the patient.
the patients may be at continued risk of aneurysm rupture. In particular, Type I endoleak remains a major risk factor for aneurysm rupture after TEVAR, and its treatment is mandatory. Conversion to open surgery represents the ultimate solution, but it carries a high perioperative mortality and morbidity, as reported in the literature [1].

The self-expandable E-XL stent is a bone-shaped nitinol bare stent, which combines flexibility with an acceptable radial force. The stent has an open-cell design in the middle for maximum flexibility and a closed-cell design with an additional 4 mm diameter at both ends to enhance radial force. This stent is especially designed for the endoluminal treatment of lesions in the descending aorta, particularly aortic coarctation and dissections, and for the treatment of the vena cava syndrome. In our case, the radial force exerted by the implanted E-XL stent pushed the proximal stent-graft to the aortic wall, smoothing out its fold and leading to improved sealing. By extending the bare-stent fixation zone more proximally into the arch, it provides additional fixation. Owing to the bone-shaped configuration of the stent, with the tips of the nitinol stent facing slightly into the lumen, the risk of aortic perforation or retrograde dissection is deemed less than with longer bare stents of stent-grafts.

Thus, the mechanical properties are different from those of the stiff balloon-expandable giant Palmaz stent, which is used liberally for the purpose of additional sealing and fixation in abdominal endovascular repair [3]. Moreover, the use of the Palmaz stent is restricted by the diameter of maximum 30 mm and considerable foreshortening when expanded to larger diameters. It has been used in the proximal thoracic aorta anecdotaly in smaller aortic arches [4]. The E-XL is the only bare metal stent available that can accommodate aortic diameters up to 40 mm. Since this first experience, we have used the device for various applications in the thoracic aorta.

To our knowledge, this is the first reported case where a Type Ia thoracic endoleak was treated successfully using the newly designed E-XL stent, thus avoiding high-risk conventional surgery. After this first positive experience, we have used this stent in other configurations including dissections and cases with angulated and tortuous necks of abdominal aortic aneurysms.

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REFERENCES