

Thoracic Grafts May Be an Alternative in Abdominal Aortic Aneurysm with Hostile Neck Anatomy

Mete Gursoy, MD¹ Egemen Duygu, MD² Idil Cakir, MS³ Abdulkadir Faruk Hokenek, MD¹

Departments of ¹Cardiovascular Surgery and ²Cardiology, Acibadem International Hospital; ³Acibadem University Vocational School of Health Services, Istanbul, Turkey

ABSTRACT

In cases with a proximal aneurysm neck diameter of higher than 28 mm, standard endovascular aneurysm repair is considered inappropriate. In the present study, we report a successful endovascular treatment using overlapped thoracic and abdominal grafts technique in a patient whose infrarenal aneurysm neck diameter is 38.1 mm.

INTRODUCTION

The anatomic features of the aneurysm neck are among the most influential determinants in decision making for endovascular aneurysm repair (EVAR). The length, diameter, and angulation of the aneurysm neck affect the graft, procedure, preference, and the appropriateness of patients for EVAR [Mohan 2001; Sternbergh 2002; Chaikof 2002]. In this study, we present an alternative endovascular approach in a patient having abdominal aortic aneurysm (AAA) with large proximal landing zone.

CASE REPORT

A 74-year-old man applied to our clinic due to abdominal pain and fatigue. The patient had undergone coronary artery bypass grafting and aortic valve replacement 4 months before. The patient's ejection fraction was 25%, heart rhythm was atrial fibrillation, and patient was on warfarin, ramipril, and furosemide. Physical examination revealed a mid abdominal pulsatile huge mass. Doppler ultrasonography showed infrarenal AAA. Computerized tomographic angiography (CTA) confirmed the diagnosis of infrarenal aneurysm with the largest outer diameter of 68 mm. The aneurysm neck was 24 mm in length and 45° in angulation. However, the diameter of the proximal landing zone was 38.1 mm (Figure 1). The current biggest size of commercially available abdominal aortic endovascular grafts is 36 mm (Cook Zenith XL, Bloomington, IN, USA). At first, we planned to use chimney technique; but the complexity of the procedure, relatively higher risk of endoleakage, and unavailability of long-term data resulted in

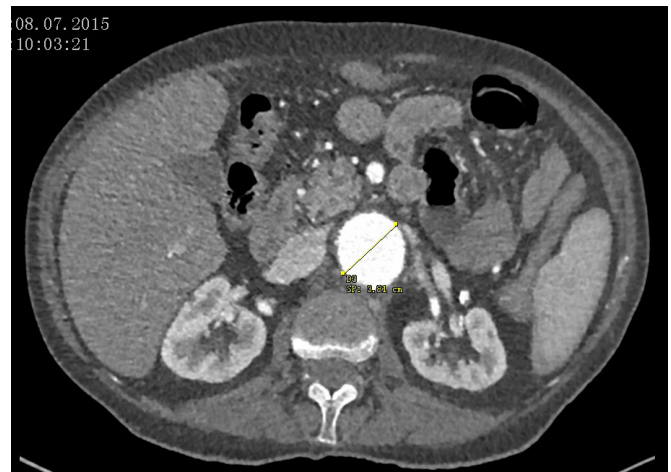


Figure 1. Computerized tomographic angiography showing proximal aneurysm neck with a diameter of 38.1 mm.



Figure 2. Computerized tomographic angiography showing post-procedure overlapped grafts covering the aneurysm completely.

considering an alternative strategy. Thus, we decided to use a thoracic endovascular graft as an extension to the main body of the abdominal aortic graft with a long overlapping zone.

Received October 19, 2015; accepted December 28, 2015.

Correspondence: Mete Gursoy, MD, Acibadem International Hospital, Department of Cardiovascular Surgery, Yesilköy, Istanbul Caddesi No: 82, 34149 Istanbul, Turkey; +90-212-468-4444 (e-mail: drmetegursoy@yahoo.com).

The patient was operated under general anesthesia. Abdominal aortic stent graft (28 mm) was inserted through the right femoral artery (Endologix, Irvine, CA, USA). Then, a 42 mm × 10 cm thoracic endovascular graft was advanced into the abdominal aortic graft. The thoracic graft was opened at the infrarenal proximal landing zone and placed into the main body of the abdominal graft. The left iliac graft was opened and control angiography revealed complete coverage of the aneurysm sac with no endoleakage (Figure 2). The patient was discharged on postoperative day 3 in good condition.

DISCUSSION

EVAR has become the first approach worldwide in the treatment of AAA in the last two decades. However, open surgery still remains superior particularly in complex cases. Appropriate proximal landing zone is *sine qua non* to perform EVAR. Approximately 20% of the patients diagnosed with AAA have an inappropriate proximal landing zone to perform standard EVAR. Patel et al reported that morphology of the proximal landing zone is also associated with the outcomes of the procedure. Mortality risk, duration of the operation, blood loss, and the length of hospitalization significantly increase as the proximal landing zone ascends [Patel 2015].

In standard EVAR, the appropriate landing zone should be at least 15 mm below the renal arteries in length, and the angulation between long axis of the aneurysm and infrarenal neck should be less than 60°. Aneurysm neck is considered to be hostile if the landing zone diameter is >28 mm [Montes Carmona 2014]. Type I endoleakage increases the risk of aneurysm rupture, conversion to open surgery, and mortality rate [Aburahma 2011]. Severe angulation of the landing zone is still a dissolved problem that causes the failure of the procedure, endoleakage, kinking and fracture of the stent grafts, which are the worst scenarios resulting in urgent conversion to open surgery or complex endovascular interventions. Inadequate length of the proximal landing zone may be compensated with the fenestrated or branched grafts, and the chimney techniques [Caniğt 2015]. Fenestrated and branched grafts are produced in accordance with the anatomy of the patients. Thus, these techniques can only be preferred in elective cases. In urgent conditions, more creative approaches must be used.

In this case, the patient's aorta was diffusely diseased. The ascending aorta and descending thoracic aorta were aneurysmatic but not within the intervention limits. The length of AAA neck was 24 mm below the renal arteries and angulation of the neck was 45°. No circumferential thrombus was found. However, the width of the proximal landing zone was

38.1 mm and this enlargement was ascending until arcus aorta. The first approach we thought was to ascend the landing zone until the thoracic descending aorta and to utilize the fenestrated graft technique. Since fenestrated grafts are custom made, this approach was not suitable. The length and angulation of the proximal landing zones were appropriate for stenting; so the only obstacle was the absence of EVAR graft to cover large aneurysm neck with a width of 38 mm. We needed a graft at least 42 mm in diameter to provide 10% oversizing. A graft in this size was not available at that time; thus we decided to place a 42 mm thoracic graft into the main body of the 28 mm abdominal aortic graft. The overlapping zone was 7 cm and post-dilation was not required. The procedure was completed successfully and postoperative angiogram revealed no endoleakage. Doppler ultrasound verified complete sealing of the aneurysm with no intraaneurysmal blood flow on postoperative 3rd day.

In conclusion, inappropriate diameter of the proximal landing zone is challenging for treatment. In selected cases, combination of thoracic and abdominal grafts with different sizes in accordance with proximal and distal landing zones may help to achieve endovascular solution.

REFERENCES

- Aburahma AF, Campbell JE, Mousa AY, et al. 2011. Clinical outcomes for hostile versus favorable aortic neck anatomy in endovascular aortic aneurysm repair using modular devices. *J Vasc Surg* 54:13-21.
- Caniğt M, Uğuz E, Hıdıroğlu M, Çener E. 2015. Endovascular aortic repair of pararenal aortic aneurysm with multibranched stent-graft: first successful experience in Turkey. 10.5606/tgkdc.dergisi.2015.11301.
- Chaikof EL, Fillinger MF, Matsumura JS, et al. 2002. Identifying and grading factors that modify the outcome of endovascular aortic aneurysm repair. *J Vasc Surg* 35:1061-6.
- Mohan IV, Laheij RJ, Harris PL. 2001. Risk factors for endoleak and the evidence for stent-graft oversizing in patients undergoing endovascular aneurysm repair. *Eur J Vasc Endovasc Surg* 21:344-9.
- Montes Carmona M, Carbajal Contreras G, Murillo Barrios IE, Sánchez Escalante LR. 2014. Single center experience of endovascular abdominal aortic aneurysm treatment in patients with hostile neck anatomy versus favorable anatomy. *Gac Med Mex* 150(Suppl 3):306-10.
- Patel SD, Constantinou J, Simring D, et al. 2015. Results of complex aortic stent grafting of abdominal aortic aneurysms stratified according to the proximal landing zone using the Society for Vascular Surgery classification. *J Vasc Surg* 62:319-25.
- Sternbergh WC 3rd, Carter G, York JW, Yoselevitz M, Money SR. 2002. Aortic neck angulation predicts adverse outcome with endovascular abdominal aortic aneurysm repair. *J Vasc Surg* 35:482-6.