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Case Report
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Hybrid Repair of Type IV Dissecting Thoracoabdominal Aneurysm Using an Aortic Cuff for Entry Tear Closure

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Abstract

The patient was a 68-year-old man. At 54 years of age, he had undergone open descending aortic repair of the ruptured chronic B dissecting aneurysm by surgical graft replacement. Subsequently, the dissection of the residual thoracoabdominal aorta enlarged. Computed Tomography (CT) revealed the upper abdominal aorta with a maximum diameter of 63 mm and intimal tear in the Left Renal Artery (LRA) and in the left common iliac artery. Furthermore, open repair by prosthetic graft replacement deemed to be high risk. Therefore, we decided to make simultaneous visceral hybrid TAAA repair with 1-vessel reconstruction. In general anesthesia open surgical LRA reconstruction was performed through transperitoneal abdominal approach using a Dacron® knitted graft of 6 mm. The endovascular aortic repair procedure was performed through the exposed left femoral artery. Aortography was performed through a pigtail catheter to determine the level of the proximal landing zone or the level of origin of the Right Renal Artery (RRA). An abdominal aortic cuff stent-graft was inserted over the super stiff guide wire. The proximal landing zone of the stent-graft was the level of the RRA orifice. The LRA was embolized at the orifice and ligated distally from the tear. The final aortogram showed exclusion of the false lumen and no endoleak. Postoperative course of the patient was without complications. At two years after endovascular procedure, CT scan showed complete thrombosis of the false lumen and aneurysm had shrunk to 57 mm.

Keywords: Hybrid repair; Endovascular repair; Thoracoabdominal aorta; Entry closure; Aortic cuff

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Introduction

The early and midterm outcomes of TEVAR for Type B aortic dissection have been described as satisfactory, in comparison with open repair, because of its less invasive nature, lower mortality and morbidity rates [1-4]. Even with this procedure, however, false lumen patency continued to be an issue suggesting a need for further techniques to achieve false lumen thrombosis and prevent aneurysmal enlargement. It has been reported that it is effective to close an entry tear endovascularly. In this report, we describe the successful closure of an entry tear in a patient with Chronic Aneurysmal Aortic Dissection (CAAD) using an abdominal aortic cuff stent-graft and a coil combined with renal debranching.

Case Report

A 68 year-old man was referred to our institution for repair of the Crawford type IV TAAA secondary to chronic dissection. The patient had undergone open descending aortic repair of the ruptured chronic B dissecting aneurysm by surgical graft replacement 14 years before in our institution. Distal an astomosis was applied for reconstruction of only the true lumen.

Computed Tomography (CT) of the aorta, performed in our institution revealed TAAA with a maximum diameter of 63 mm in the upper abdominal aorta secondary to chronic dissection (Figure 1A). CT scan also showed that all the visceral arteries were originated from the true lumen, and there were tears in the Left Renal Artery (LRA) and the left common iliac artery where chronic dissection ended. The origin of the LRA was 6mm below the origin of the Right Renal Artery (RRA) (Figure 1B). The intimomedial tear in the proximal LRA was identified as culprit in the progression of the TAAA.

We decided to make simultaneous visceral hybrid TAAA repair with 1-vessel reconstruction (LRA). In general anesthesia open surgical LRA reconstruction was performed through transperitoneal abdominal approach. For LRA bypass debranching we used a Dacron® knitted graft of 6 mm which was anastomosed to the LRA distal to the tear in end-to-side fashion. Prior to

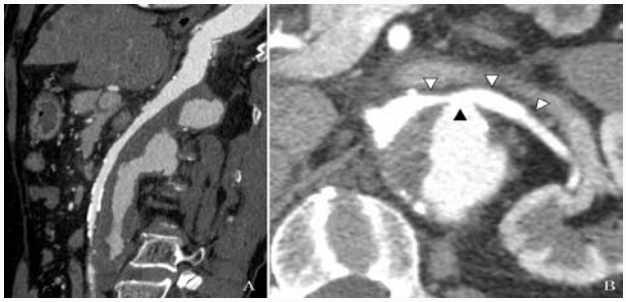

Figure 1: (A) The type IV dissecting thoracoabdominal aneurysm diameter measures 63 mm in maximal dimension and therefore meets criteria for elective repair. (B) Axial CTA reconstruction image demonstrating the location of the primary tear (▲) in the LRA (Δ) with a contrast passing from the true lumen into the large aneurysmal false lumen of the abdominal aorta.

Figure 2: (A) 2-year post-hybrid debranching follow-up 3-dimensional CT angiography. (B) CT scan demonstrating closure of the entry tears with complete thrombosis of the false lumen.

debranching the left renal vein was divided without re-anastomosis. Ischemia of the left kidney during LRA reconstruction was 46 min.

The endovascular aortic repair procedure was performed through the exposed left femoral artery. After administration of 6,000 IU of heparin sodium, a 6 French guiding catheter was introduced into the RRA preparing for stenting through the percutaneous left brachial artery approach. Aortography was performed through a pigtail catheter to determine the level of the proximal landing zone or the level of origin of the RRA. The endovascular stent-graft, the Aortic Extender 23 mm × 3.3 cm (PXA230300J; W. L. Gore, Flagstaff, AZ, USA) was inserted over the super stiff guide wire. The proximal landing zone of the stent-graft was the level of the RRA orifice where the true lumen diameter was 12 mm × 24 mm. Partial encroachment on the RRA orifice was remedied by placing a 6 mm × 15mm balloon expanded stent (PalmazGenesis, Cordis, Bridgewater, NJ, USA) over the top of the stent graft. After coil embolization of the LRA orifice through the 6 French sheath placed in the graft, proximal anastomosis of LRA bypass debranching was made on the right common iliac artery. Ligation of the LRA was performed at the proximal site of the anastomosis. Control aortography was performed to verify aneurysm exclusion and to show free perfusion of the stent-graft. Finally, all catheters were removed and arteriotomy of the left femoral artery was sutured. Postoperative course of the patient was without complications. The patient was discharged on the day 10 postoperatively with no neurological deficits. Renal function was normal. CT scan one month after the first operation showed chronic dissection type B with TAAA without increasing the maximum diameter and orderly flow through the reconstructed LRA.

On control examination 2 years after endovascular procedure, CT scan showed full exclusion of the aneurysm from the systemic circulation without endoleak and good flow through the visceral anastomosis. Also, CT scan showed complete thrombosis of the false lumen and aneurysm (Figure 2).

Discussion

The purpose of endovascular repair of type B chronic aortic dissection is to close entry tears, favor false lumen thrombosis, prevent aortic rupture [5-8]. However, in this case, entry tear coverage using conventional aortic stent grafts alone would have been associated with several technical issues. The primary tear exists in the LRA about 10 mm distal to the orifice of the LRA. There was a change of the true lumen diameter from 12 mm × 24 mm just below the RRA to 10 mm × 19 mm at 5 cm below this level. Stent graft repair would have necessitated a tapered stent graft to ensure proximal and distal sealing, but the elliptical true lumen made stent graft sizing and sealing uncertain. Methods for embolization include deployment of coils, detachable balloons, and injection of embolization material. Use of coils, vascular plugs, or a combination of both with adjunctive technical trip in several clinical series or case reports have been described with good results [9-11]. For these reasons, we elected to close entry tears using an abdominal aortic cuff and a coil. Aortic cuff has various uses other than its original purpose [12,13].

In recent years, aortic dissection has been repaired by endovascular treatment, in which an entry is closed by a stent graft, as in the acute stage. However, in the chronic stage, a stent graft alone is often insufficient; thus, various treatments have been proposed depending on the number and location of tears, and at present, there is no consensus on the optimum treatment. Endovascular treatment has the advantage that it can be repeated due to the acceptably low risks associated with multiple surgeries. However, with endovascular treatment for CAAD, unlike that with the treatment of aortic aneurysms, the lesion is extensive; therefore, when simultaneously treating extensive aneurysms, there is an increased risk of paraplegia and there is no established treatment method [5,14,15]. Previously investigated changes in the false lumen diameter and aortic diameter by following patients who had false lumen enlargement ≥ 6 months after the onset of dissection and underwent closure of the primary entry tear by TEVAR alone. They found that the percentage of patients who had shrinkage of the false lumen was small (38.9% had ≥ 5 mm shrinkage of the aortic diameter at the maximum diameter site in the thoracic aorta). Moreover, when the lesion was extended into the thoracoabdominal aorta, patients were more likely to have enlargement of the false lumen (46% had ≥ 5 mm expansion of the aortic diameter at the site immediately superior to the celiac artery). Therefore, in patients such as the present case, who had enlargement of a false lumen involving the thoracoabdominal aorta with several entries and reentries, they considered that closure of the primary entry tear alone would not lead to regression of the false lumen, and thus, closure of all entry and reentry tears should be undertaken [16].

Because of its shortness, aortic cuff may be used for various purposes. The use of a small-diameter short stent graft at the distal landing zone prior to placing the main straight device in TEVAR for aortic dissection was reported to reduce the incidence of stent graft-induced distal re-dissection by protecting the dissected aortic wall from the mechanical stress of the stent graft [13].TEVAR using

combination of abdominal aortic cuff stent-grafts and iliac leg was reported to be feasible to manage thoracic aortic injury with small diameter aorta in young patient [12].We performed a successful deployment of an aortic cuff to cover the LRA in which an entry tear existed.

In conclusion, hybrid TAAA repair with entry tear closure using an aortic cuff is feasible and allows false lumen thrombosis. We did not cover the re-entry tear in the common iliac artery, but there was little influx of contrast medium into the false lumen. It is unlikely that small tears in the periphery necessarily need to be closed, but its determination is sometimes not easy.

References

1. Trimarchi S, Nienaber CA, Rampoldi V, Myrmel T, Suzuki T, Bossone E, et al. Role and results of surgery in acute type B aortic dissection: Insights from the international registry of acute aortic dissection (IRAD). Circulation. 2006;114(1 Suppl):I357-64.
2. Nienaber CA, Rousseau H, Eggebrecht H, Kische S, Fattori R, Rehders TC, et al. Randomized comparison of strategies for type B aortic dissection: The investigation of STEnt Grafts in Aortic Dissection (INSTEAD) trial. Circulation. 2009;120(25):2519-28.
3. Ehrlich MP, Dumfarth J, Schoder M, Gottardi R, Holfeld J, Juraszek A, et al. Midterm results after endovascular treatment of acute, complicated type B aortic dissection. Ann Thorac Surg. 2010;90(5):1444-8.
4. Parsa CJ, Williams JB, Bhattacharya SD, Wolfe WG, Daneshmand MA, McCann RL, et al. Midterm results with thoracic endovascular aortic repair for chronic type B aortic dissection with associated aneurysm. J Thorac Cardiovasc Surg. 2011;141(2):322-7.
5. KanaokaY, Ohki T, Ozawa H. Repair of chronic aneurysmal aortic dissection using a stent graft and an Amplatzer® vascular plug: A case study. Ann Vasc Surg. 2017 Feb;39:288.e5-12.
6. Coscas R, Capdevila C, Colacchio G, Goëau-Brissonnière O, Coggia M. Hybrid repair of type II dissecting thoracoabdominal aneurysm using Amplatzer vascular plugs for entry tear closure. Ann Vasc Surg. 2013;27(7):972.e1-5.
7. Nienaber CA, Kische S, Akin I, Rousseau H, Eggebrecht H, Fattori R, et al. Strategies for subacute/chronic type B aortic dissection: the Investigation of stent grafts in patients with type B aortic dissection (INSTEAD) trial 1-year outcome. J ThoracCardiovasc Surg. 2010;140(6 Suppl):S101-8.
8. Kang WC, Greenberg RK, Mastracci TM, Eagleton MJ, Hernandez AV, Pujara AC, et al. Endovascular repair of complicated chronic distal aortic dissections: intermediate outcomes and complications. J Thorac Cardiovasc Surg. 2011;142(5):1074-83.
9. Hager E, Moudgill N, Lipman A, Dimuzio P, Lombardi J. Coil-assisted false lumen thrombosis in complicated chronic type B dissection. J Vasc Surg. 2008;48(2):465e8.
10. Norberto EM, Gutiérrez VM, Taylor J, Vaquero C. Coil embolization of persistent false lumen after stent graft repair of type B aortic dissection. J Vasc Surg. 2011;54(1):201-4.
11. TripodiP, Mestres G, Briceño M, Monterrosas OG, Riambau V. New indications for vascular occluders in secondary repairs of complex aortic pathologies. Ann Vasc Surg. 2017;39:285.e9-15.
12. Muradi A, Yamaguchi M, Idoguchi K, Nomura Y, Okada T, Okita Y, et al. Iliac leg and abdominal aortic cuff stent-graft for blunt thoracic aortic injury in young patient. Ann Thorac Cardiovasc Surg. 2014;20 Suppl:825-8.
13. Masada K, Shimamura K, Sakamoto T, Kudo T, Shijo T, Maeda K, et al. A novel method for prevention of stent graft-induced distal re-dissection after thoracic endovascular aortic repair for Type B aortic dissection. Interact CardiovascThorac Surg. 2018;26(1):91-7.
14. Leurs LJ, Bell R, Degrieck Y, Thomas S, Hobo R, Lundbom J. Endovascular treatment of thoracic aortic dissection: Combined experience from EUROSTAR and United Kingdom Thoracic Endograft registries. J Vasc Surg. 2004;40(4):670-9.
15. Amabile P, Grisoli D, Giorgi R, Bartoli JM, Piquet P. Incidence and determinants of spinal cord ischaemia in stent-graft repair of the thoracic aorta. Eur J VascEndovasc Surg. 2008;35(4):455-61.
16. Kato M. TEVAR for chronic type B aortic dissection. Endovasc Today Eur. 2016;4(1)(Suppl):26-9.