

Aortic banding in the treatment of type I endoleak

Tip 1 kaçak tedavisinde aortik bantlama

Emrah Oğuz,¹ Hakan Posacıoğlu,¹ Mustafa Parıldar,² Börteçin Eygi,¹ Anıl Apaydın¹

¹Department of Cardiovascular Surgery, Medical Faculty of Ege University, İzmir, Turkey

²Department of Interventional Radiology, Medical Faculty of Ege University, İzmir, Turkey

Recently, endovascular repairs for aortic aneurysms have become highly popular particularly in high-risk patients. Despite growing experience and knowledge in this field, certain problems are still to be solved. Endoleak is the most common complication after endovascular procedures. Endoleak can be defined as incomplete sealing of the aneurysm sac, resulting in continuous pressure on the aneurysm cavity and persistent rupture risk. Several methods are available for the management of proximal and the distal type 1 endoleaks. In this article, we present a 61-year-old male case who underwent aortic banding for the repair of type 1b endoleak.

Key words: Aneurysm; aortic banding; type 1 endoleak.

The conventional operation for an extensive thoracic aneurysm with chronic dissection is still a high-risk procedure. Therefore, in selected patients endovascular stent graft repair can be a good alternative. However, this has some limitations, and the outcome of the procedure mostly depends on the proximal and distal landing zones. A type 1 endoleak is the most common complication after endovascular stent graft implantations, and managing it is not easy.^[1] This kind of endoleak can be treated by using endovascular techniques such as molding balloon angioplasty, a giant Palmaz stent (Cordis Endo-vascular, Miami Lakes, FL, USA), stent graft extension, or open surgery, including open surgical conversion or external banding of the neck of the aneurysm.^[2]

Here we present the treatment of a type 1 distal endoleak after the endovascular repair of an extensive thoracic aortic aneurysm secondary to chronic type 1 dissection.

Son zamanlarda, özellikle yüksek riskli hastalarda yapılan aort anevrizmalarının endovasküler onarımı, son derece popüler hale gelmiştir. Bu alanda artan deneyim ve bilgi birikimine rağmen, halen çözüm bekleyen bazı sorunlar mevcuttur. Kaçak, endovasküler işlemler sonrasında en sık görülen komplikasyondur. Anevrizma boşluğu üzerinde devam eden baskı ve inatçı rüptür riski doğurarak, anevrizma kesesinin yetersiz olarak kapatılması kaçak olarak tanımlanabilir. Proksimal ve distal tip 1 kaçak tedavisinde uygulanabilecek birkaç yöntem vardır. Bu yazıda, tip 1b kaçak onarımı için aort bantlama yöntemi uygulanan 61 yaşında erkek bir olgu sunuldu.

Anahtar sözcükler: Anevrizma; aortik bantlama; tip 1 endoleak.

CASE REPORT

A 61-year-old male was admitted to our clinic with shortness of breath and back pain. A computed tomography (CT) scan showed an ascending arch and a proximal descending aortic aneurysm due to chronic type 1 dissection. An echocardiography showed no aortic regurgitation, so we decided to replace the entire thoracic aorta down to the diaphragm with a combination of the elephant trunk technique and a descending aortic stent graft extension. The risks and benefits were discussed with the patient as well as the possible operational approaches. Since the patient was reluctant and nearly refused a second open surgical intervention, the stent graft extension was planned as a second-stage operation.

The patient was then prepared for the first-stage operation. After a median sternotomy, the arch vessels were mobilized and encircled with silastic loops.





Figure 1. Distal type 1 endoleak with perfusion of the false lumen.

The right axillary artery and the right atrium were cannulated, and cardiopulmonary bypass (CPB) was started. During the cooling period, the ascending aorta was clamped and opened for proximal repair. The aortic valve was competent, and the proximal aorta was transected just above the sinotubular junction and tailored for anastomosis. Next, the patient was cooled down to 15 °C, and hypothermic circulatory arrest (HCA) was initiated. Antegrade cerebral perfusion was then performed via the right axillary artery. Before the construction of the descending aortic anastomosis, the long portion of the dissecting flap was resected because the Dacron graft that forms the elephant trunk should float freely in



Figure 2. Operative view of nylon tape banding.

the descending aortic lumen. Double-committed flow from the graft was then initiated, and the distal end of the graft was marked with clips to ensure a proper landing zone for the future endovascular surgery. The diameter of the graft was 34 mm. After completion of the descending aortic and brachiocephalic vessel anastomoses, the HCA was terminated, and the rewarming was started. The graft was then clamped, and the anastomosis of the graft to the proximal aorta was performed, thus successfully completing the elephant trunk procedure. The patient was weaned from CPB without any complication, and he spent one day in the intensive care unit (ICU).

The second-stage intervention was scheduled for 15 days after the first operation and was to be performed in the angiography suite. In this procedure, the right femoral artery was explored surgically, and the left femoral artery was catheterized percutaneously under local anesthesia. The first Valiant® thoracic stent graft (Medtronic Inc., Minneapolis, MN, USA), which

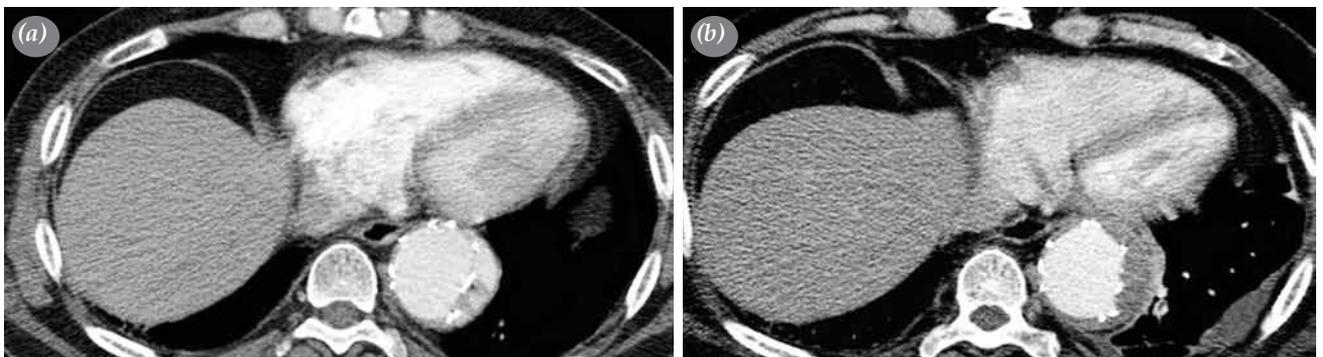


Figure 3. (a) Endoleak before banding and (b) after banding. The computed tomography did not show any distal endoleak and achievement of complete false lumen thrombosis.

was 40 mm in diameter and 10 cm long, was deployed successfully. The diameter of the second graft was 46 mm and it was 20 cm long. Its distal end was placed just above the celiac trunk to facilitate the false lumen thrombosis. Control angiography showed no type 2 or type 1 endoleak.

However, a follow-up CT scan performed at one month postoperatively demonstrated a type 1 distal endoleak. We decided to wait for eight weeks, and the CT scan in the following visit revealed a distal type 1 endoleak with persistent perfusion of the false lumen (Figure 1). Therefore, an aortic banding procedure was deemed appropriate to close the leak.

The procedure was performed in the operating room of the cardiovascular surgery unit. A left lower thoracotomy was performed through the eighth intercostal space under general anesthesia, and the descending aorta just above the diaphragm was dissected and freed from the adjacent structures for banding. Transesophageal echocardiography (TEE) was used to determine the true and false lumens, and spectral analysis showed a flow in the false lumen. The descending aorta was then banded with nylon tape above the diaphragm, and the tape was tightened until the endoleak was no longer visible on the real-time TEE exam. After this, a Dacron graft was divided and wrapped around the nylon tape to secure the former endoleak zone (Figure 2), and intraoperative TEE showed no flow through the aneurysm sac. Postoperatively, a CT scan showed no distal endoleak and revealed the complete thrombosis of the false lumen (Figures 3a and b).

Currently, the patient is in good condition 30 months after the banding procedure. No secondary intervention has been required, and no aortic enlargement has been observed in the distal segments of the native aorta.

DISCUSSION

Extensive aortic aneurysms involving the ascending aorta, aortic arch, and descending aorta are still considered to be a challenge for many cardiovascular surgeons. For extensive thoracic aneurysms, three different surgical approaches (the elephant trunk technique, frozen elephant trunk, and hybrid treatment) can be used for treatment.

The goal in the endovascular treatment of chronic dissections with an aneurysm is to achieve complete false lumen thrombosis. However, the rate of incomplete thrombosis is high because the stiff septum cannot be compressed by the expanding force of the stent graft.^[3]

There have been reports that compared the rate of false lumen thrombosis in the acute and chronic phases of the dissection, and this can be more easily achieved in acute cases.^[4] In addition, the false lumen thrombosis rate (70-80%) is higher at the segments covered with a stent graft than at the stent-free zones in chronic cases (40-50%).^[5]

The endovascular treatment of chronic dissections with an aneurysm is not well documented in all of the endovascular procedures in the thoracic aorta, and it also lacks a good level of evidence. Therefore, managing a persistently perfused false lumen or type 1 distal endoleak at the distal end of the endograft can be a real challenge. The treatment options are either “watchful waiting” (until disease progression or expansion of the false lumen) or endovascular or open intervention. The first option needs constant surveillance, and the reintervention rate is approximately 35% after two years. When considering endovascular or open surgical intervention, there are five treatment options: debranching and stenting, a fenestrated or branch stent graft, coiling, Palmaz stent deployment, or banding. If multiple re-entry points exist, like in our case, the endovascular option is more difficult because it would necessitate the debranching of the visceral and renal arteries along with total thoracoabdominal stenting or it would exclude the thoracoabdominal aorta by the use of a fenestrated or branched graft. These are very extensive and morbid operations with an inherited risk of paraplegia.

Aortic banding has also been reportedly used for the surgical treatment of a refractory type 1 endoleak and also for the preparation of the landing zone prior to thoracic endovascular aortic repair (TEVAR) or endovascular aortic repair (EVAR) according to a study by Chen et al.^[6] Transesophageal echocardiography or angiographic real-time correlation is crucial for successful banding. Epiaortic ultrasonography is another tool that could be used to detect an endoleak under the band.^[3]

In conclusion, aortic banding is an easy and less morbid operation for the management of a distal type 1 endoleak or persistent perfusion of the false lumen. In addition, this surgical procedure can be done with the guidance of TEE without angiographic imaging in the cardiac surgery operating room, but the timing of the intervention is dependent on the surgeon’s discretion and experience. Furthermore, future studies are warranted in order to delineate the proper indications and timing of the banding procedure.

Declaration of conflicting interests

The authors declared no conflicts of interest with respect to the authorship and/or publication of this article.

Funding

The authors received no financial support for the research and/or authorship of this article.

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