

Endovascular Completion of the Elephant Trunk in Type a Aortic Dissection: Case Report

Tip A Aort Diseksiyonunda Fil Hortumunun Endovasküler Olarak Tamamlanması

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Geliş Tarihi/Received: 07.12.2013
Kabul Tarihi/Accepted: 27.03.2014

*This case was presented in the 4th Congress
of Update in Cardiology and Cardiovascular
Surgery, November 28 - December 2, 2008,
Antalya, Turkey*

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ABSTRACT The ascending and the arch of the aorta were replaced with an elephant trunk procedure in a 55-year-old male patient who had been operated for an acute type A aortic dissection one year ago. Here, we report the endovascular completion of the elephant trunk for treatment of the chronic dissecting aneurysm in the descending aorta. Despite a generous length of overlap between the elephant trunk and the endovascular stent-graft, a secondary intervention was necessary for type 1 endoleak from both ends, just one month later. The patient has been followed-up for 60 months, and has no problems. The secondary repair of the descending thoracic aorta in patients with previous arch replacement and elephant trunk extension can be done via endovascular route. Endovascular elephant trunk completion avoids a thoracotomy, and may improve morbidity and mortality in these high-risk patients.

Key Words: Endovascular procedure; aortic dissection; aortic arch

ÖZET Bir yıl kadar önce akut tip A aort diseksiyonu nedeniyle opere edilmiş olan 55 yaşındaki bir erkek hastada, çıkan ve arkus aorta fil hortumu tekniği ile değiştirilmiş idi. Bu yazıda, aynı hastanın inen aortasında devam eden kronik dissekan aort anevrizmasının tedavisinde fil hortumunun endovasküler teknikle tamamlanması bildirilmektedir. Fil hortumu ile endovasküler stent greft arasında uzunca bir bölüm üstüste getirilmesine rağmen, birinci ay kontrolünde hastada stent-greftin her iki ucundan tip 1 içesizma tespit edilmiş, ve ikinci kez müdahale edilmiştir. Sonraki 60 ay boyunca hasta sorunsuz olarak takip edilmektedir. Daha önce fil hortumu tekniği ile arkus aortası değiştirilmiş diseksiyon hastalarında inen aortaya yönelik ikincil işlemler endovasküler yolla mümkün olabilmektedir. Fil hortumunun endovasküler olarak tamamlanması ile hastaya torakotomi yapma gereksinimi olmayabileceği gibi, bu tip yüksek riskli hastalarda mortalite ve morbiditeyi de azaltabilecektir.

Anahtar Kelimeler: Endovasküler işlemler; aort diseksiyonu; aortik ark

Damar Cer Derg 2015;24(3):187-91

The results of surgery for the treatment of type A aortic dissection continue to improve, but survival does not guarantee freedom from subsequent aortic events. The persistence of a patent false lumen postoperatively increases late morbidity and mortality.

doi: 10.9739/uvcd.2013-38316

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In a patient who had been operated for acute type A aortic dissection one year ago, the ascending and the arch of the aorta were replaced with an elephant trunk procedure. Here, we report the endovascular completion of the elephant trunk for treatment of the chronic dissecting aneurysm in the descending aorta.

CASE REPORT

A 55-year-old male patient, who had presented with an acute onset type A aortic dissection, was operated with an elephant trunk procedure in another medical center one year ago. The left subclavian artery had been occluded, and a left carotico-subclavian bypass had been done. He applied to our hospital for follow-up. The descending aorta had a diameter of 60 mm and the false lumen was patent (Figure 1). Endovascular stent-graft completion was planned using the elephant trunk as the proximal landing zone.

An endovascular stent-graft was implanted via the right femoral artery into the descending thoracic aorta. Selective cannulation of the elephant trunk was achieved through the right axillary artery. A 6 cm overlap was obtained between the 32 mm stent-graft and the 24 mm elephant trunk graft. Cerebrospinal fluid was drained perioperatively keeping the pressure below 10 mmHg, for 3 days. The patient was discharged on the fourth day without any complications.

One month later, the patient presented with a hemoglobin level of 8 mg/dl, and was diagnosed with a type 1 endoleak from both ends (Figure 2). He underwent a secondary intervention with two extension grafts for both ends of the stent-graft (Figure 3). He was discharged in good condition after four days, and the follow-up period has been uneventful for 60 months.

DISCUSSION

Extensive aortic aneurysms or dissections are considered to be a challenge for cardiovascular surgeons, and are still associated with significant morbidity and mortality. Two-stage repair includ-

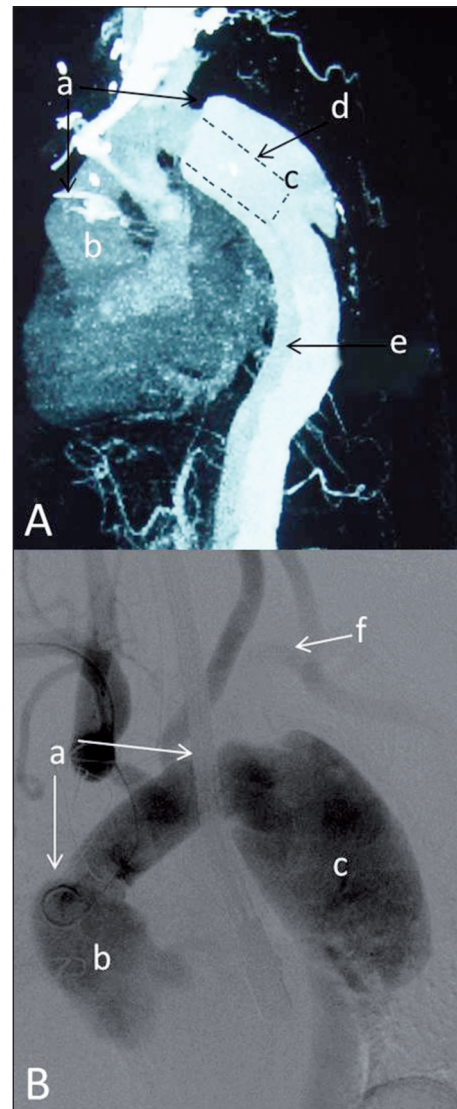


FIGURE 1: Preoperative computerized tomography aortography (A) and the digital subtraction aortography (B) of the patient. The graft replaced the ascending aorta and the arch is obviously seen (a). The aortic root is relatively dilated (b) and the segment after the ostium of the left carotid artery is aneurysmatic (c). This segment also involves the elephant trunk (d). Also note that the false lumen is patent just distal to the distal anastomosis (e). Ostium of the left subclavian artery is occluded, and a bypass from the left carotid to the left subclavian artery was performed (f).

ing placement of a proximal elephant-trunk graft followed by the repair of the descending thoracic aorta is favorable for this condition.¹ In recent years, endovascular grafting to complete the proximal surgical procedure; the so-called "hybrid approaches" have been reported.²

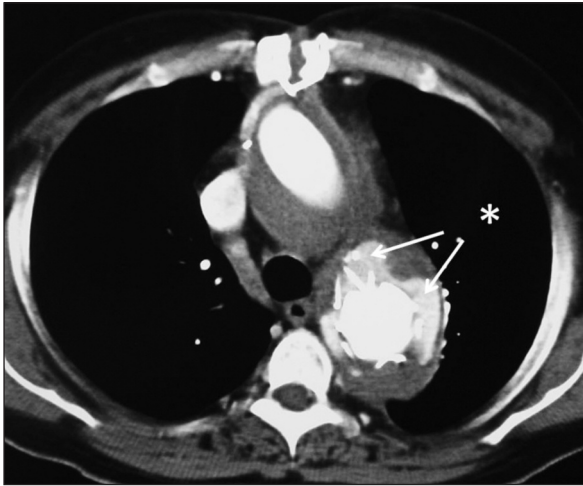


FIGURE 2: Type 1A endoleak from the proximal end of the endovascular stent graft, just one month after the procedure. Contrast leak shown with the asterisk.



FIGURE 3: Computerized tomography aortography 2 months after the second intervention.

An alternate hybrid method combining the concepts of elephant trunk and endovascular

stenting of descending aortic aneurysms is the “frozen elephant trunk technique”. Although this approach is being more widely used nowadays, postoperative paraplegia has been reported as high as 21% in different series.³ However, no permanent paraplegia has been reported in surgical series of previous conventional elephant trunk technique with endovascular completion.⁴

The behavior of the residual aorta after surgical repair has not been completely understood. Younger age, female gender, dissection of the supraaortic branches, preoperative malperfusion and patent false lumen are all risk factors for late aortic dilation.⁵ Median diameters of the arch and the descending aorta are all mildly enlarged after type A dissection repair.⁶ Since the initial operation does not remove the entire diseased aorta, some patients may need an aortic reoperation for aneurysmal dilatation of the distal aorta, especially when there is a residual patent false lumen.⁷ The growth rate of the residual aorta, however seems generally slow, and it takes relatively a long time for a large aneurysm to develop. An intervention is necessary when the aortic diameter reaches 55 mm in an otherwise healthy young patient with a patent false lumen. Careful follow-up is mandatory to prevent rupture of the descending aorta, and without a second-stage completion, mortality is known to increase markedly after 4 years.⁸

The aortic diameter had enlarged to 60 mm and the false lumen was patent one year after the first operation in our patient. Historically, conventional open surgery would be the mainstay of therapy. Despite all improvements in surgical standards, the operative mortality risk is 6.2% for the second stage of surgery, even in the centers of excellence.⁹ The hybrid method, the completion of the elephant trunk with an endovascular stent-graft, thus is expected to have a lower risk of mortality and morbidity. However, the technique still bears the risks of paraplegia, stroke, endoleak and stent migration.

The endoleak was repaired successfully with two additional extension grafts. It is important that endovascular treatment itself provides a useful method for endovascular complications. Meticulous imaging follow-up is required to detect persistent false lumen and aneurysm enlargement.

Proximal landing of an endovascular stent-graft within the graft of the elephant trunk may seem quite advantageous at first sight. However, as is the case in this patient, despite a 6 cm overlap, we still had the problem of a proximal type I endoleak. Deficiency of tapered grafts in the market at the time of the intervention may have limited the use of a perfect-sized graft in this specific patient. The behavior of the stent-graft, concerning the radial forces, within the dissected aorta, and the graft material of the elephant trunk is not expected to be similar. Thus, the difficulty in this specific case was the estimation of the size and length of the endovascular stent-graft. Since there is no exact recommendation for the choice of the stent-graft in such cases, the approach has to be specifically tailored. The requirement of another extension graft at the proximal landing zone urged us to think even a 6 cm overlap within the elephant trunk was not enough, and

it might be necessary to try to have the maximum length of overlap within the elephant trunk in the first attempt.

It is still debatable whether the hybrid technique is comparable to total open repair, since the hybrid strategy is reserved for high-risk patients unfit for open repair. The recent literature attempting to elucidate this issue interestingly showed no significant advantage of the hybrid technique concerning early operative mortality. Still both of these studies had the limitations of being a meta-analysis of non-randomized observational studies including patients of a wide variety of pathologies.^{10,11}

CONCLUSION

The secondary repair of the descending thoracic aorta in patients with previous arch replacement and elephant trunk extension can be done via the endovascular route. Endovascular elephant trunk completion avoids a thoracotomy, and may improve morbidity and mortality in these high-risk patients.

Conflict of Interest

Authors declared no conflict of interest or financial support.

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