

A Complex Wall Pseudoaneurysm Caused by a Tear on the e-PTFE Arteriovenous Fistula Graft

e-PTFE Arteriyovenöz Fistül Greftindeki Bir Yırtığın Sebep Olduğu Kompleks Duvarlı Psödoanevrizma

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ABSTRACT Expanded polytetrafluoroethylene grafts are implanted when autogenous arteriovenous fistulas fail. But they have disadvantages such as pseudoaneurysm formation. Here we represent a case of arteriovenous fistula graft pseudoaneurysm caused by a tear on the graft wall. The graft wall had a complex structure consisted of both synthetic graft material and fibrous tissue. The pseudoaneurysm was excised and the tear on the graft was repaired.

Keywords: Arteriovenous fistula; renal dialysis; renal insufficiency; polytetrafluoroethylene; vascular grafting; vascular patency

ÖZET Otojen arteriyovenöz fistüller yetersiz geldiğinde veya çalışmadığında hemodiyalizis efektif sürdürülebilmesi için arteriyovenöz fistül greftleri (AVG) implante edilir. Ancak bunların psödoanevrizma oluşumu vb dezavantajları vardır. Burada 6 yıl önce implante edilmiş bir AVG'nin üzerindeki yırtık sebebiyle oluşan bir psödoanevrizma olgusu sunuldu. Psödoanevrizma duvarı hem sentetik greft hem de fibröz dokudan oluşan kompleks bir yapıdaydı. Psödoanevrizma eksize edildi ve arteriyovenöz fistül grefti onarıldı.

Anahtar Kelimeler: Arteriyovenöz fistül; böbrek diyalizi; böbrek yetmezliği; politetrafloroetilen; damar greftleme; damar açıklıklı

Arteriovenous grafts (AVG) are implanted when the vessel calibre is poor or the previous autogenous arteriovenous fistula (AVF) failed.¹ Pseudoaneurysm (PA) formation is a complication of AVGs, which is associated with increased risk of bleeding, thrombosis, infection, pain, and failure of hemodialysis (HD) cannulation. The incidence of PA of AVG was reported between 2-10%.² The standard treatment is surgical repair.

Expanded polytetrafluoroethylene (ePTFE) prostheses were first introduced in 1972.³ There were some cases of spontaneous dilatation and rupture of the first generation of grafts.⁴

Here we report a case of PA of an AVG which occurred six years after its implantation which consisted of both fibrous tissue and graft material.

CASE REPORT

A 59-year old female chronic HD patient attended to the outpatient clinic with the complaint of bulging on the HD access site on her left arm. She had

a history of routine HD three times a week for about 10 years. In Doppler ultrasonography imaging, a synthetic AVG (GORE-TEX® Stretch Vascular Graft, standard wall, e-PTFE, 6 mm x 70 cm) was observed which was interposed between brachial artery and basilic vein, an aneurysm was observed (40x60 mm). The vascular graft was patent and no thrombus was observed in it. As told in patient's anamnesis, the AVG was implanted 6 years ago.

OPERATION TECHNIQUE

The patient was operated under local anesthesia. The aneurysm sac was explored with a longitudinal incision. Proximal and distal ends of the AVG were controlled with vascular tapes (Figure 1). After proper dose heparin administration both ends of the AVG were clamped. The aneurysm sac was incised in a longitudinal fashion. The bottom 1/3 part of the aneurysm wall was made of synthetic e-PTFE graft material and the upper 2/3 of it was made of fibrous tissue. There was a tear in longitudinal axis of the graft and this tear caused a large opening on the graft wall (Figure 2). The fibrous tissue was excised carefully and the torn part of the graft was sutured primarily with care not to narrow the graft lumen (Figure 3). The graft lumen patency was tested intraoperatively by palpating the pulses in the proximal and distal ends of the sutured segment. The patient had her routine HD session next day of the operation and was discharged in the postoperative 3rd day with oral acetylsalicylic acid medication.

DISCUSSION

Expanded polytetrafluoroethylene (e-PTFE) grafts had been utilized for vascular interventions since 1970s and they are also used for creating HD access sites in patients with failed autogenous AVFs. Pseudoaneurysm formation is one of the disadvantages of AVGs which is also related to thrombosis, infection, failure of HD access, etc. Here we represent a case of a PA of an AVG which was implanted 6 years ago. We think that it is an exceptional case because the lower 1/3 part of the PA wall was made of e-PTFE graft material and upper 2/3 part was made of fibrous tissue.

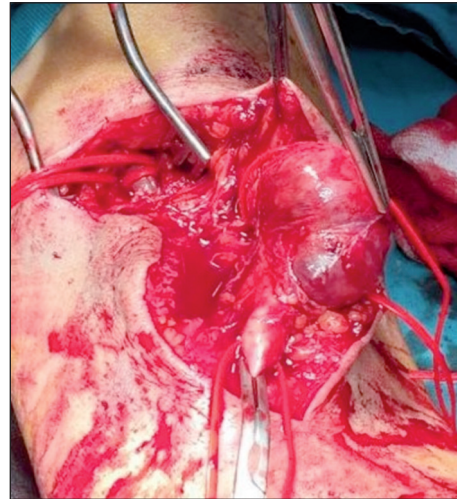


FIGURE 1: The pseudoaneurysm.

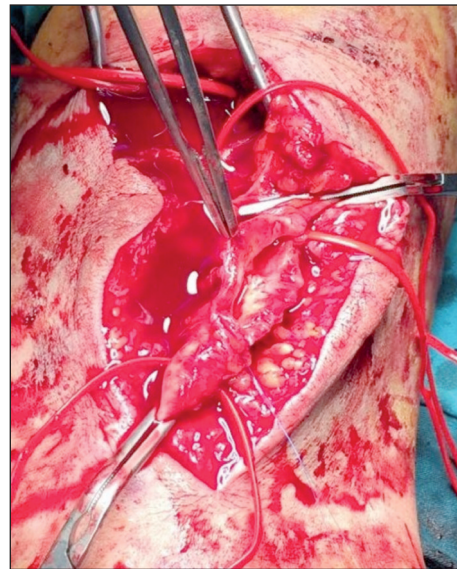


FIGURE 2: Longitudinal tear of the graft wall.

There were some cases of dilatation and aneurysm of the first generation synthetic grafts. Campbell et al. reported a case of an e-PTFE graft aneurysm in 1976 and Roberts et al. reported another similar case in 1978. Mohr et al. reported five cases of e-PTFE graft aneurysms in 1980. A more recent paper about a case of an e-PTFE graft aneurysm was published by Chakfé et al in 2003.⁵ In all of these cases, the e-PTFE grafts were used for arterial revascularizations. In our case, the graft was used for arteriovenous fistula construction for HD access so it had sustained many puncturing and needle damage in HD sessions in its lifespan.

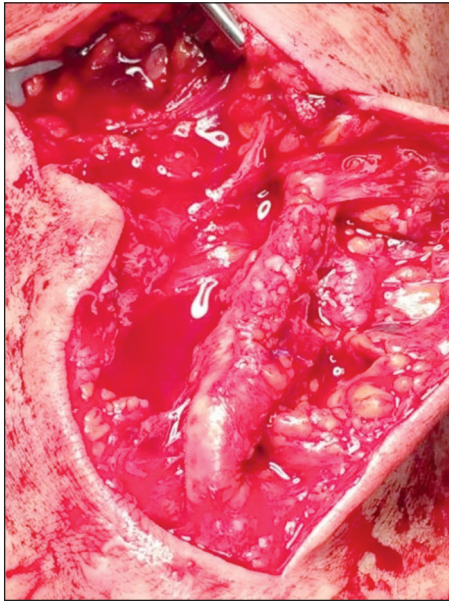


FIGURE 3: Primary repair.

The group of factors that may lead to PA formation include leaking of blood outside the lumen perioperatively as a result of surgical technique, infection, repeated localized puncturing of AVG with large-bore needles. It was reported that the incidence of PA of AVG was between 2-10%. Tordoir et al. found PA formation in 5% of the e-PTFE AVGs in their study which included 37 chronic HD patients.⁶ In our case, the graft was made of stretch e-PTFE material which had better conformability, increased resistance to kinking and improved puncture hole healing.

Currently, standard treatment for PA of AVG is surgical repair consisting of either aneurysm re-

section or interposition of a new graft through a new route. Endovascular treatment was also reported as an alternative treatment method.⁷ But the materials which are used for endovascular treatments are not produced to withstand puncturing with HD needles so durability is the major concern about them. Also, some cases of material kinking, failure or rupture causing recurrent PA were reported.⁸ We had chosen conventional surgical excision of the PA and primary suturing of the graft in this case because of the disadvantages of endovascular treatment.

In spite of the improvements in design and manufacturing process of e-PTFE grafts, PAs could still be seen because of the nature of the chronic HD therapy. Surgical repair is still more reliable and feasible than the endovascular treatment.

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

This study is entirely author's own work and no other author contribution.

REFERENCES

1. National Kidney Foundation. KDOQI Clinical practice guidelines and clinical practice recommendations for 2006 updates: hemodialysis adequacy, peritoneal dialysis adequacy and vascular access. *Am J Kidney Dis* 2006;8 Suppl 1:S1-322.
2. Ballard JL, Bunt TJ, Malone JM. Major complications of angioaccess surgery. *Am J Surg* 1992;164(3):229-32.
3. Eiseman B, Birnbaum D, Leonard R, Martinez FJ. A new gas permeable membrane for blood oxygenators. *Surg Gynec Obst* 1972;135(5):732-6.
4. Campbell CD, Brooks DH, Webster MW, Bondi RP, Lloyd JC, Hynes MF, et al. Aneurysm formation in expanded polytetrafluoroethylene prostheses. *Surgery* 1976;79(5):491-3.
5. Chakfé N, Dieval F, Thaveau F, Taghavi I, Le Magnen JF, Laroche G, et al. Aneurysm of an expanded polytetrafluoroethylene vascular graft: an ultrastructural evaluation. *Eur J Vasc Endovasc Surg* 2003;25(4):360-6.
6. Tordoir JH, Hofstra L, Leunissen KM, Kitslaar PJ. Early experience with stretch polytetrafluoroethylene grafts for haemodialysis access surgery: results of a prospective randomised study. *Eur J Vasc Endovasc Surg* 1995;9(3):305-9.
7. Kinning AJ, Becker RW, Fortin GJ, Molnar RG, Dall'Olmo CA. Endograft salvage of hemodialysis accesses threatened by pseudoaneurysms. *J Vasc Surg* 2013;57(1):137-43.
8. Vesely TM. Use of stent grafts to repair hemodialysis graft-related pseudoaneurysms. *J Vasc Interv Radiol* 2005;16(10):1301-7.