

Giant Pseudoaneurysm of Brachial Artery after Arteriovenous Fistula Ligation: Case Report of an Endovascular Approach

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ABSTRACT

Brachial artery pseudoaneurysm following long-standing arteriovenous fistula ligation after renal transplantation is uncommon. Herein, we describe the case of a 72-year-old woman who developed a giant brachial artery pseudoaneurysm in the perianastomotic area 5 years after ligation of the fistula. For the clinical conditions, she underwent to endovascular treatment with placement of a covered stents to exclude the pseudoaneurysm.

Introduction

The Autologous Arteriovenous Fistula (AVF) is considered the best vascular access for hemodialysis in patients with end stage chronic kidney disease and remains functional after kidney transplantation in many patients. Nevertheless, AVF can lead to several complications. The most common complications include thrombosis, venous hypertension, artery aneurysm and pseudoaneurysm development, hemorrhage, vascular steal syndrome, stenosis, heart failure, venous aneurysm with skin ulceration and critical hand ischemia [1]. Open surgery is usually preferred as treatment; however, severe local conditions, such as swelling, edema, and ulcerations, and serious comorbidities can make this approach

difficult and challenging. Therefore, endovascular approach is a viable alternative. Herein, we report endovascular treatment with covered stent of giant pseudoaneurysm of brachial artery following AVF ligation. On the favorable results of employing this approach in a patient with a giant pseudoaneurysm of brachial artery.

Case Report

A 72-year-old woman with a clinical history of hypertension, renal failure undergoing renal transplantation, major stroke in 2020 that resulting in right upper limb paresis, aphasia and difficulty swallowing, was admitted to our hospital with arm pain

and a left brachial mass that had developed during the past 6 months. At clinical examination patient showed a pulsatile mass of 8 cm in size, associated to arm ischemia with skin ulceration. The mass was 8 cm in size, pulsatile, and characterized by pain and skin symptoms (edema and skin ulcerations) (Figures 1 & 2). The patient had started hemodialysis 14 years previously from a brachial-median cubital vein AVF on the left arm. She underwent renal transplantation 9 years previously and had been administered immunosuppressive and steroid therapy (tacrolimus at 1 mg/day, mofetil micafenolate at 500 mg/day, prednisolone at 4 mg/day) to prevent renal rejection. The AVF was ligated 5 years after renal transplantation. A brachial artery pseudoaneurysm was diagnosed by clinical and ultrasound examinations, it was confirmed by TC-scan which showed. Duplex ultrasound scan and Computed Tomography Angiography (CTA) revealed an 80-mm-diameter pseudoaneurysm in the perianastomotic area (Figure 3) with intraluminal thrombus but preservation of distal blood flow.

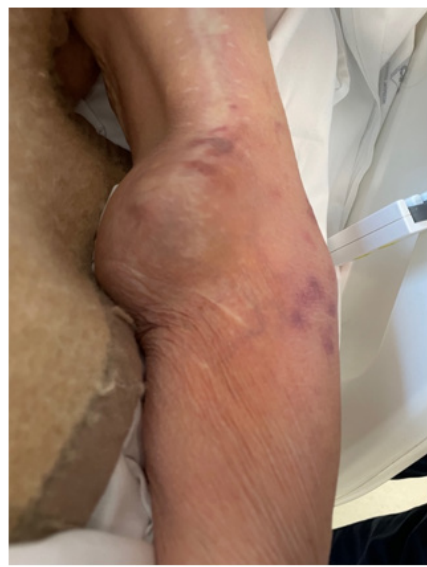


Figure 1: Left brachial mass.



Figure 2: Skin symptoms (edema and skin ulcerations).

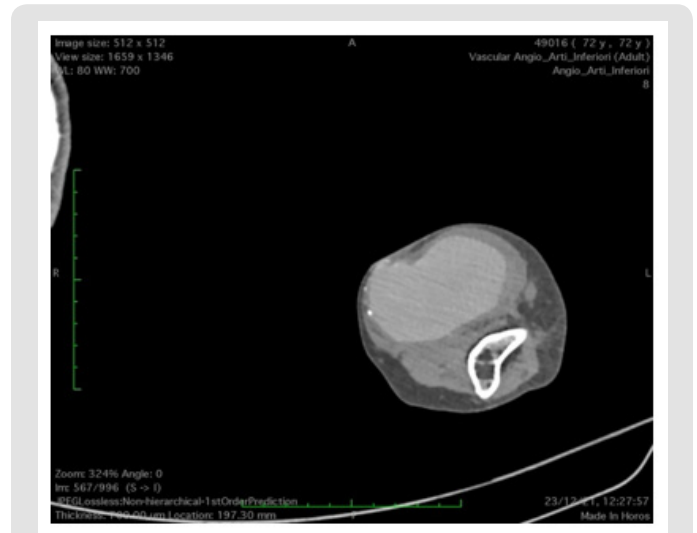


Figure 3: Left brachial artery pseudoaneurysm in the perianastomotic area.

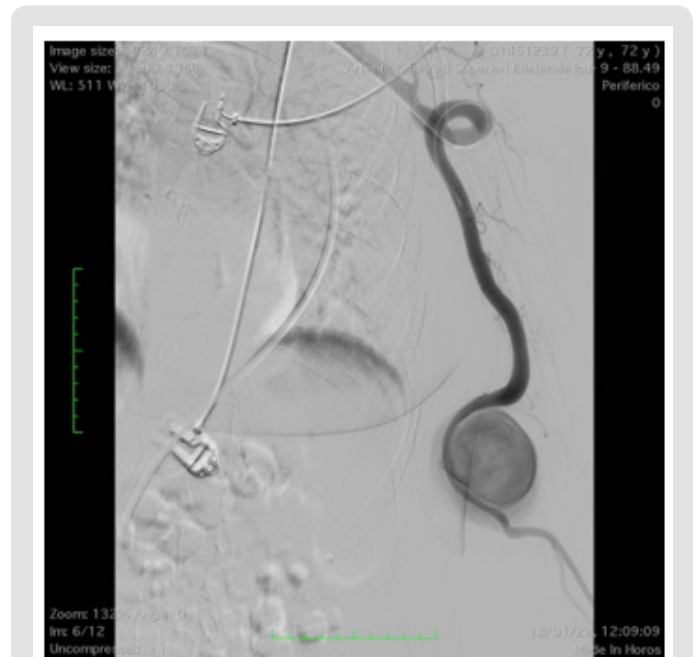


Figure 4: Large pseudoaneurysm of the brachial artery.

The patient was admitted to our vascular surgery unit for therapeutic procedure. The endovascular approach was chosen after considering the patient's age and comorbidities, to minimize the risk of procedure and hospitalization time. Under local anesthesia, a 7 Fr vascular sheath was positioned in the patient's right common femoral artery. A Tegt 5 Fr catheter (Cook) was advanced on a standard guidewire (0.035', Terumo) and catheterization of left subclavian artery was carried out. The following angiographic control confirmed large pseudoaneurysm of the brachial artery (Figure 4). A selective catheterization of the brachial artery was performed. Two 0.018 Viabahn stent grafts (GORE) (7x50mm and

6x50mm) were then placed in overlapping in the left brachial artery (Figure 5). Post-dilatation was performed with 7x40mm balloon (Sterling, Boston Scientific). The last angiogram showed complete aneurysm exclusion and patency of distal vessels (Figure 6). Finally, hemostasis was obtained with a percutaneous closure device (Angio-Seal 8F Terumo). No perioperative complications occurred. Complete resolution of arm pain and progressive reduction of skin lesions were achieved during post-operative period. The patient was discharged after 2 days. The 1-month control ultrasound duplex scan showed patency of the stent grafts with good distal perfusion of the hand and complete exclusion of brachial artery pseudoaneurysm. Clinical examination revealed absence of ischemia with regression of pain and neurological deficit, but radial and ulnar pulses were still present. However, the mass persists, no longer pulsating and the edema and skin lesions have reduced.



Figure 5: Viabahn stent grafts placed in overlapping.

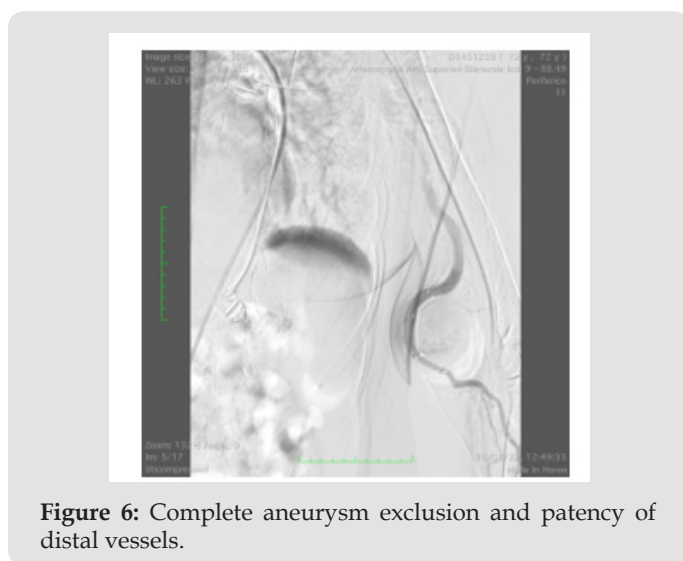


Figure 6: Complete aneurysm exclusion and patency of distal vessels.

Discussion

The autologous AVF is considered the best vascular access for hemodialysis in patients with chronic kidney disease but in time can lead to several complications [2,3]. Aneurysmal Degeneration (AD) of the donor artery may occur in patients with long-term AVF and might be associated with a history of renal transplant and immunosuppressive treatment [4]. According to Eugster et al., the risk of brachial artery dilatation is increased by the duration of immunosuppressive treatment [5]. As described in literature, the ligation of AVF following renal transplantation may determine an increase in blood flow inside the vessels that causes stress to the vessel walls resulting in the release of endothelial factors like Nitric Oxide (NO) which may promote the development of brachial aneurysm [6]. Repeated cannulation of arteriovenous fistulas during hemodialysis is the commonest cause of a brachial artery pseudoaneurysm with a reported incidence of 1/13 000 hemodialysis sessions. Pseudoaneurysms of the brachial artery are still uncommon, with a limited number of cases reported in the literature. Treatment for a pseudoaneurysm depends on the size of the aneurysm, the size of the neck, location of the aneurysm and the etiology. Treatment options include percutaneous thrombin injection, endovascular stenting and open surgical repair [7]. The most widely accepted intervention for brachial artery aneurysm and pseudoaneurysm includes prompt diagnosis and operative resection of the aneurysm with interposition vein grafting. This has been shown to have excellent outcomes with resolution of symptoms by removing the mass compressing local structures and adequate long-term results [8,9].

Other authors used the cephalic or basilic ipsilateral vein, with the aim to reduce incisions and, therefore, the duration of the procedure with consequent lower morbidity and to preserve leg veins for future procedures in the arms or other vascular reconstructions. If technically possible, another possibility to consider is the end-to-end anastomosis. Several authors used PTFE grafts and showed that a prosthetic graft was a valid alternative; in their individual cases the autologous veins were unavailable [10,11]. Some authors support that endovascular approach is not the first choice for this type of aneurysms due to some technical difficulties and complications, related to the relative vessel tortuosity, the size of the inflow artery and the proximity of the elbow joint that usually prevents to impede the implantation of stent grafts [4,12]. Another complication described is the risk of contrast-induced nephropathy. Contrast nephropathy is characterized by the development of acute renal damage after administration of intravascular iodinated contrast media and the incidence ranges from 3 to 30%, depending on pre-existing risk factors, with a higher incidence found in the presence of diabetes mellitus, chronic kidney disease and advanced age [13].

However, they go although in clinical practice the open technique is the most used, it has undoubted disadvantages and

more severe complications compare to the endovascular technique, such as bleeding, wound healing times, more complex proximal control, longer hospitalization times. The endovascular technique cannot be excluded as an alternative in some selected patients, as it remains less invasive and with reduced hospitalization times. In the literature, we noted only one case of brachial artery aneurysm with endovascular treatment after AVF ligation. Maynar at all reported, in 2003, a case of brachial aneurysm who was repaired with endovascular technique. In this case a covered stent was used to exclude the aneurysm. At 8-month follow-up the treated segment has remained patent without evidence of deformation, kinking or signs of recurrent aneurysm [14]. For our case we decided to treat the patient with an endovascular approach, not only considering the general conditions (suffering from stroke), but also because the pseudoaneurysm was very large and the endovascular approach allowed us to limit the bleeding, the difficulty of isolating the vessel due to various previous operations and wound healing difficulties due to edema and skin symptoms. This approach was the ideal choice for that patient, allowing her to be discharged two days after surgery without any need for treatment and with complete resolution of the lesion. Furthermore, the notable advances in endovascular techniques and the improvements in materials suitable for these segments may open new treatment options.

Conclusion

Brachial pseudoaneurysm following AVF are most often treated with surgical approach with high rate of success but risk of complications such as bleeding wound healing times, more complex proximal control and longer hospitalization times. However, in selected patients' endovascular treatment with implantation of covered stent may be a viable solution with good results and reduction of hospitalization. More studies with a larger number of patients are needed to establish the appropriate treatment.

Authors' Contribution

M. Panagrosso, A. Petrone, P. Quassone and R. Vigliotti wrote the manuscript. G.Santini, M. Di Filippo and G. Vigliotti supervised the writing of the manuscript.

Conflicts of Interest

- All the authors report no conflicts of interest.
- All authors read and approved the final version of the manuscript.

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