

# Acute prosthetic vascular graft distortion in the subclavian region: A case report and a review of the literature

## Subklavian bölgede akut prostetik vasküler greft distorsiyonu: Literatürün gözden geçirilmesi ve bir olgu sunumu

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### Abstract

A 68-year-old male patient was admitted to the emergency department with complaints of sudden swelling under his right clavicle. He had undergone right axillo-femoral and femoro-femoral crossover bypasses 1.5 months ago due to peripheral artery disease. The subclavicular swelling had started one day ago. Physical examination revealed a pulsatile mass expanding from under the right clavicle towards the right breast. In auscultation, a murmur was heard on the mass and the patient was hospitalized with a diagnosis of pseudoaneurysm. Doppler ultrasonography revealed a 10x10 cm pseudoaneurysm sac in the right subclavian area. Hemoglobin level had decreased to 5.9 mg/dL. 2 units of erythrocyte suspension was transfused, after which the patient was operated emergently. During the operation, hemorrhage from the proximal and distal subclavian arteries was controlled with a Fogarty catheter advanced to the subclavian artery via the brachial artery and axillo femoral graft. When the pseudo-aneurysm sac was incised, the synthetic vascular graft between the right axillary and right femoral arteries was observed to have dislocated distal to the axillary anastomosis area by approximately 1 cm. A new graft interposition was performed after resecting the torn synthetic graft section. The patient was discharged after an uneventful postoperative period.

**Keywords:** Vascular graft, Pseudoaneurysm, Emergency operation, Complications

### Öz

68 yaşında erkek hasta sağ klavikula altında ani başlayan şişlik ile acil servise başvurdu. Anamnezinde hastaya periferik arter hastalığı nedeniyle 1,5 ay önce sağ aksillo-femoral ve femoro-femoral crossover bypass yapıldığı öğrenildi. Subklavikular bölgede kolun aşırı yukarı ve geriye doğru gerilme hareketi sonrası aniden başlayan ve giderek artış gösteren şişliği vardı. Fizik muayenede sağ klavikula altından başlayan koltuk altına ve sağ memeye doğru yayılım gösteren pulsatile kitle tespit edildi. Oskültasyonda kitle üzerinde üfürüm duyuldu ve pseudoanevrizma ön tanısıyla yatırıldı. Acil şartlarda damar cerrahisi tarafından yatak başı yapılan Doppler Ultrasonografide subklavian bölgedeki şişliğin pseudoanevrizma kesesi olduğu ve yaklaşık boyutunun 10x10 cm olduğu tespit edildi. Acil rutin kan tetkiklerinde Hemoglobin seviyesi 5,9'e kadar düşmüştü. Bunun üzerine acil kan hazırlığının ardından 2 ünite eritrosit süspansiyonu verildikten sonra acil operasyona alındı. Hastanın proximal ve distal subklavian arterdeki kanama kontrolü brakial arter ve aksillo-femoral greft yoluyla subklavian artere gönderilen fogarty kateteri ile sağlandı. Pseudoanevrizma kesesi açıldığı zaman sağ aksiller arter ile sağ femoral arter arasındaki sentetik vasküler greftin aksiller anastomoz alanına yaklaşık 1 cm mesafeden ayrılmış olduğu görüldü. Yırtılmış olan sentetik greft bölümü rezeke edilerek yeni bir greft interpozisyonu yapıldı. Postoperatif dönemde problemi olmayan hasta şifa ile taburcu edildi.

**Anahtar kelimeler:** Vasküler greft, Pseudoanevrizma, Acil operasyon, Komplikasyonlar

## Introduction

The use of grafts in vascular surgery began in 1913 with Pringle, who used vein grafts in two patients. The rapid development of prosthetic grafts in the last 40-50 years led to their use in vascular surgery [1]. Polytetrafluoroethylene (PTFE) and Dacron are the most commonly used prosthetic grafts. Various complications may occur due to errors in their manufacture or use. We herein present a case of PTFE graft rupture and associated pseudoaneurysm.

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## Case presentation

A 68-year-old male patient was admitted to the emergency department with complaints of sudden swelling under his right clavicle. He had undergone right axillo-femoral and femoro-femoral crossover bypasses 1.5 months ago due to peripheral artery disease. The subclavian swelling began suddenly one day ago when the patient fully extended and raised his right arm. Physical examination revealed a pulsatile mass expanding from under the right clavicle towards the right breast. All peripheral pulses of the patient were palpated. In auscultation, a murmur was heard on the mass and the patient was hospitalized with a diagnosis of pseudoaneurysm. Doppler ultrasonography revealed a 10x10 cm pseudoaneurysm sac with turbulent blood flow in the right subclavian area (Figure 1).

His hemoglobin level had decreased to 5.9 mg/dL. Two units of erythrocyte suspension was transfused, after which the patient was operated emergently. Under general anesthesia, a skin incision was made at the level of the 6th intercostal space; the previous right axillo-femoral graft was found and slung. 5000 units of heparin was administered. Graftotomy was performed to the axillo-femoral PTFE (Brand unknown) graft. There was bleeding from both the proximal and distal ends of the graft, and a 6F Fogarty catheter could not be advanced more than 30 cm toward the proximal end. Thinking it was in the pseudoaneurysm sac, the catheter was withdrawn to be advanced through the brachial artery in order to control the hemorrhage within the sac. An incision was made in the right antecubital region and the brachial artery was slung. The distance from the skin to the proximal end of the previous subclavian anastomosis was measured. Following brachial arteriotomy, a 4F Fogarty catheter was advanced to the proximal end of the subclavian pseudo-aneurysm, its balloon inflated until vessel occlusion occurred and left in position. The pulsation in the sac disappeared and pressure dropped. Having reduced blood loss by achieving hemostasis in the proximal subclavian artery, the old infraclavicular incision scar was re-incised and hematoma was evacuated. Pseudo-aneurysm sac was visualized and incised to explore the area of the previous anastomosis. The Fogarty catheter just advanced from the brachial artery was seen in place. The PTFE graft with a 7 mm ring was observed to have dislocated approximately 1 cm distal to the axillar anastomosis (Figure 2). After the resection of the torn parts of the previous graft, 7 mm ring PTFE (Bards®) graft interposition was performed with 6/0 prolene suture for vessel continuity (Figure 3). After the hemorrhage control, one Hemovac drain was placed in the incision site. The subcutaneous and skin layers were closed anatomically.

On postoperative examination, the patient's peripheral pulses were palpated normally. After a week-long uneventful postoperative period, the patient was discharged.



Figure 1: Doppler ultrasonography image of pseudoaneurysm (arrow sign according to pseudoaneurysm in right subclavian area)

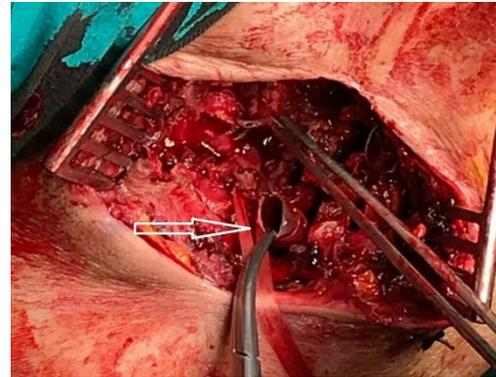


Figure 2: Intraoperative view (Arrow sign showing torn graft in right subclavian area)

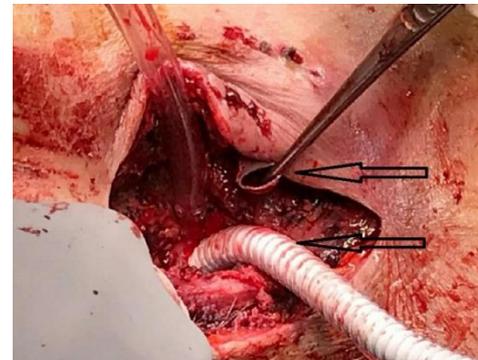


Figure 3: Intraoperative view (Arrow signs indicate graft interposition in right subclavian area)

## Discussion

Graft production technologies have become highly advanced. Easy to suture, flexible, non-aneurysm-forming, low-risk grafts with low thrombogenic potential are being produced. Although the development of this technology reduces complications, the ideal prosthetic graft has not yet been produced. Graft selection according to the anatomical position is an important part of the bypass procedure. Dacron grafts are preferred in aortic surgeries and PTFE grafts are preferred in mid-sized arterial surgeries (inguinal and infra-inguinal regions) [2].

PTFE grafts have been used safely for many years in lower and upper extremity peripheral revascularization procedures. Reasons for preference include low thrombogenicity, easy suturability, flexible structure, low infection risk, high resistance to vascular wall stress, durability, long-term stress protection, no need for pre-intervention before use, no aneurysm development, no bleeding from pores and re-operation possibility due to thrombosis even after a long time [3].

Achieving hemostasis with balloon catheters, a life-saving method in both vascular and cardiac injuries, has been used for many years [4-6]. Bleeding in difficult-to-reach, narrow regions such as the subclavian area, makes it challenging to perform anastomosis and reduces its quality. Hemorrhage control in a proximal anastomotic region, especially in re-do cases, is

quite difficult. In this case, we advanced the Fogarty catheter through the axillo-femoral synthetic graft for hemostasis but failed to access the subclavian artery due to the complete rupture of the synthetic graft. We then advanced a Fogarty catheter intra-arterially through the brachial artery and were able to achieve proximal hemostasis in the pseudo-aneurysm.

Several rings of the PTFE graft should be removed to increase the quality of the anastomosis and reduce the risk of hemorrhage; however, one should be careful not to damage the graft's supportive layer in the process. In our patient, PTFE graft distortion occurred after trauma; however, it may also have occurred secondary to an error in the graft manufacturing phase or damage to the graft structure during the removal of the rings.

Massive blood transfusion is known to cause serious complications and should be avoided if possible [7,8]. Lack of preoperative planning and premature exploration of the pseudoaneurysm sac could have caused life-threatening blood loss until the bleeding source was visualized. In this case, proximal flow and distal back flow at the site of the previous anastomosis were obstructed with the inflated balloons of the Fogarty catheters. Blood recovery systems, i.e. Cell Saver®, may be used for cases which preventive procedures are not performable.

Sullivan et al. reported complications occurring in axillo-femoral bypass patients after fully extending and raising the affected arm [9]. In our patient, complete graft rupture and distortion were observed after the exact same movement. Barht et al. [10] reported successfully operating a traumatic graft rupture after axillo profunda bypass in a 76-year-old patient. The incidence of graft ruptures is around 5% [11]. There are limited number of studies reporting axillo-femoral graft ruptures and distortions [9-15]. PTFE graft rupture and development of pseudoaneurysm are rare complications in vascular surgery. Arterial bleeding, i.e. brachial, radial or femoral arteries, are often controlled by applying pressure. The subclavian region, however, is difficult to reach surgically, which makes its hemostasis almost impossible- particularly during re-do surgeries.

Complications such as graft rupture are rare but life-threatening in vascular surgery. We believe that pre-operative planning is highly important and lifesaving in such cases.

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