

## **Transcatheter coil embolization of profunda femoris artery branch pseudoaneurysms in two cases**

*İki olguda derin femoral arter dalı yalancı anevrizmalarının transkateter koil embolizasyonu*

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Pseudoaneurysms of the profunda femoris artery (PFA) are uncommon, usually caused by a traumatic or iatrogenic injury. Symptoms usually become manifest by pain of sudden onset and swelling in the upper thigh due to hemorrhage. In the past, the treatment of pseudoaneurysms was surgical repair. Recently, transcatheter embolization has been recognized as an alternative treatment. We report on two male patients who presented with a pulsatile mass in the thigh following a femoral shaft fracture and a penetrating injury, respectively. The diagnosis of pseudoaneurysms was made by Doppler ultrasonography and/or angiography. In one patient, the pseudoaneurysm was 3x3 cm in size and originated from one of the perforating branches of the right PFA. In the other, it measured 1.5x1.5 cm and originated from the ascending branch of the lateral femoral circumflex artery of the left PFA. Both patients were successfully treated by selective arterial embolization with platinum coils.

**Key words:** Aneurysm, false/radiography/therapy; angiography; catheterization; embolization, therapeutic/methods; femoral artery/injuries/surgery; radiography, interventional.

Pseudoaneurysms of the profunda femoris artery (PFA) or its branches rarely occur and are serious complications following blunt or penetrating injuries, or they may develop as a complication of transfemoral catheterization or surgery. They can be diagnosed by Doppler ultrasonography (US), computed tomography (CT), or magnetic resonance imaging (MRI). Angiography, however, is needed for definitive diagnosis. Transcatheter embolization is now regarded as the treatment of choice.<sup>[1-3]</sup> This report describes two cases of pseudoaneurysm arising from the branches of the PFA which were successfully treated by transluminal platinum coil embolization.

### **CASE REPORT**

**Case 1-** A 34-year-old male was referred from a provincial hospital with a suspicious soft tissue mass in the

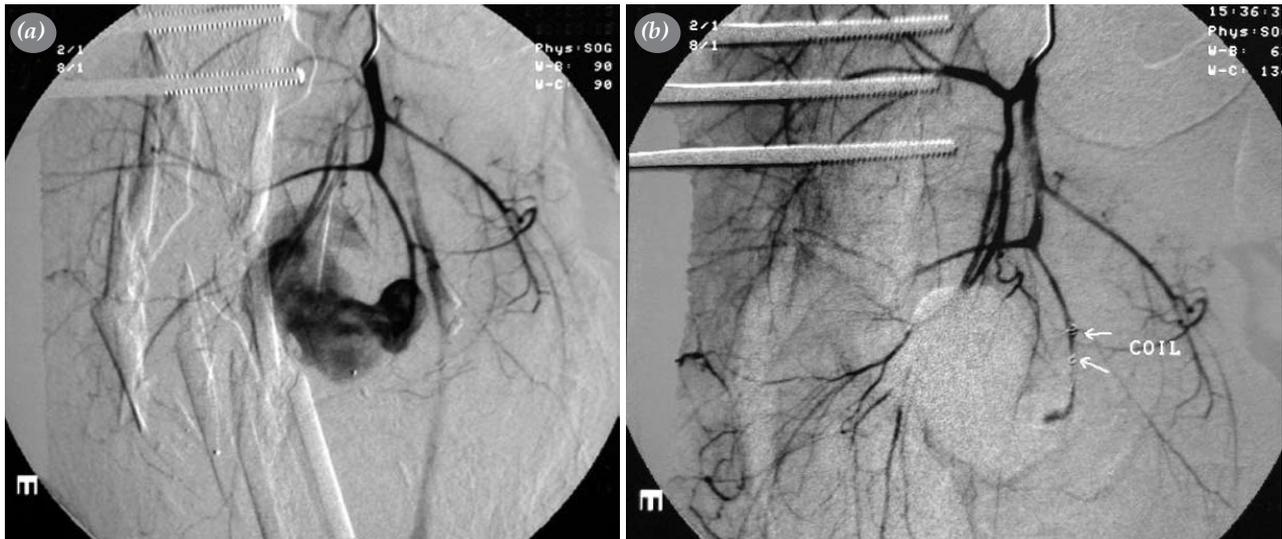
Derin femoral arterin (DFA) travmatik yaralanması nadir görülür ve genellikle travmatik veya iyatrojenik yaralanma sonucu meydana gelir. Semptomlar genellikle ani başlangıçlı ağrı ve üst uyluk bölgesinde kanamaya bağlı şişlik şeklinde ortaya çıkar. Geçmişte yalancı anevrizmaların tedavisi cerrahi tamirdi. Son dönemlerde transkateter embolizasyon alternatif bir tedavi olarak kabul görmektedir. Bu yazıda uyluk bölgesinde pulsatil kitle ile başvuran iki erkek hasta sunuldu. Bir hastanın öyküsünde femur cisim kırığı, diğerinde delici yaralanma vardı. Yalancı anevrizma tanısı Doppler ultrasonografi ve/veya anjiyografi ile kondu. Yalancı anevrizma bir hastada 3x3 cm büyüklüğünde idi ve sağ DFA'nın perfore dallarının birinden kaynaklanmaktaydı; diğer hastada ise 1.5x1.5 büyüklüğünde ve DFA'nın lateral femoral sirkumfleks arterinin çıkan dalından kaynaklandığı görüldü. İki hasta da platin koil kullanılarak selektif arteriyel embolizasyon ile başarılı şekilde tedavi edildi.

**Anahtar sözcükler:** Anevrizma, yalancı/radyografi/terapi; anjiyografi; kateterizasyon; embolizasyon, terapötik/yöntem; femoral arter/yaralanma/cerrahi; radyografi, girişimsel.

proximal right thigh. The patient had a fragmented shaft fracture in his right femur which had been externally fixed ten days before. Post-fixation radiographs showed inadequate reduction of the fractures. After the operation, the right thigh was swollen. The patient was able to ambulate and the pain decreased gradually. Physical examination showed a swollen right thigh, its circumference exceeding that of the left thigh by 6 cm. His vital signs were normal and stable; there were no signs of vascular or neurologic deficit. The distal pulses were normal. A palpable pulse was elicited over the swelling. Admission hemoglobin was 11.5 g/dl. A vascular injury caused by the penetrating trauma was suspected. Diagnostic angiography via the left femoral artery approach demonstrated a 3x3-cm pseudoaneurysm originating from one of the perforating branches of the right

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**Fig. 1.** (a) Angiography in anteroposterior projection demonstrates a large false aneurysm arising from the perforating branch of the right profunda femoris artery. (b) Angiogram obtained after embolization with two coils shows no flow into the pseudoaneurysm.

PFA (Fig. 1a). A microcatheter system was introduced into the contralateral femoral artery through the percutaneously placed catheter. The tip of the microcatheter was delivered into the perforating branch of the right PFA, and embolization with two 5-mm platinum coils (Cook, Bloomington, USA) was performed. Subsequent injection of contrast medium demonstrated no flow into the pseudoaneurysm (Fig. 1b). Following embolization, the patient's symptoms and swelling of the thigh disappeared. During three months of follow-up with clinical and radiological controls (physical examination and color Doppler US), there was no recurrent vascular lesion.

**Case 2-** A 20-year-old man presented with a massive swelling of the left thigh one day after a penetrating stab injury. The peripheral pulses were palpable. He was hemodynamically stable. On physical examination, there was an isolated 2-cm stab wound in the left thigh without active bleeding. Admission hemoglobin was 12 g/dl. Gray-scale sonographic examination showed a cystic structure in the left thigh, surrounded by a thick hypoechoic wall. Color Doppler sonography demonstrated a pulsatile systolic flow into, and a diastolic flow out of the cystic mass. Pulsed Doppler examination showed a to-and-fro pattern in the neck of the vascular mass. These Doppler findings were all consistent with a pseudoaneurysm. Angiographic examination and embolization were performed during the same session. Angiography from the right femoral artery approach demonstrated a 1.5x1.5-cm pseudoaneurysm sac arising from the ascending branch of the lateral femoral circumflex artery of the left PFA (Fig. 2a). The superficial femoral artery and run-off were normal. Potential difficulties of open surgical repair were considered and

a decision was made to occlude the pseudoaneurysm. The ascending branch of the lateral femoral circumflex of the PFA and pseudoaneurysm were superselectively catheterized with a coaxial catheter system and three 5-mm fibered platinum coils (Cook) were positioned immediately proximal to the neck of the pseudoaneurysm in the ascending branch of the lateral femoral circumflex artery. There was no filling of the pseudoaneurysm on subsequent arteriography (Fig. 2b). The patient was asymptomatic over a follow-up period of six months.

## DISCUSSION

Pseudoaneurysms usually occur after penetrating injury, infection, aspiration, fracture, blunt trauma, or surgical intervention. A traumatic pseudoaneurysm may occur when a penetrating injury to the arterial wall results in partial transection.<sup>[1,4]</sup>

Physical examination often reveals a pulsatile, painful mass with a bruit or thrill, as seen in our cases. The pulsations are synchronous with cardiac systole and, in some cases, they may be absent, too weak, or masked by hematoma or thrombus formation. Physical examination is not helpful in distinguishing between a false and true aneurysm.<sup>[5]</sup>

Several techniques can be used for the diagnosis of pseudoaneurysms, including gray-scale and duplex Doppler US, CT, MRI, and angiography. Angiography is the best method for detecting vascular pathologies,<sup>[6-8]</sup> in particular, in cases with bleeding, giving valuable information on the site and size of the pseudoaneurysm, the feeding vessels, and patency and adequacy of distal flow.<sup>[9]</sup>



**Fig. 2.** (a) Selective left profunda femoris arteriography in anteroposterior projection shows pseudoaneurysm formation at a branch of the lateral circumflex femoris artery. (b) Control angiography shows total obliteration of the pseudoaneurysm from the circulation after embolization with three coils.

Injuries to the proximal part of the PFA may cause external hemorrhage because of the superficial location of the artery. This provides easy and rapid access for surgical exploration and reconstruction. Pseudoaneurysms may require immediate surgical or endovascular treatment. The treatment approach depends on the origin of the pseudoaneurysm, whether it originates from a major arterial branch or small deep muscular branches. Pseudoaneurysms associated with injured major arterial branches require endovascular or surgical repair, while those involving deep muscular branches must be treated by endovascular embolization.<sup>[8,10]</sup> In our cases, deep muscular branches of the PFA were affected and endovascular embolization was performed.

Percutaneous transcatheter embolization of pseudoaneurysms originating from deep and small arterial branches can be achieved using embolic agents including coils, polyvinyl alcohol (PVA), N-butyl cyanoacrylate (NBCA), autologous clot, or Gelfoam.<sup>[11]</sup> Embolization with a coil provides a less-invasive technique than open surgical repair, is highly selective, and permits the embolization of branches of an artery. Since microcoils (platinum coils) are highly thrombogenic, radiopaque, and biocompatible, they can be particularly useful in superselective coil embolization. Their thrombogenic effect primarily results from the addition of silk or synthetic fibers. Sometimes collateralization may prevent successful coil embolization by allowing flow into the vascular territory of the embolized vessel. In addition, proximal occlusion with coil embolization may make repeat intervention to the same artery difficult.<sup>[12]</sup>

There are several reports on successful transcatheter treatment of penetrating injuries to the PFA.<sup>[2,3,10,12]</sup> Waldherr et al.<sup>[13]</sup> described the use of transluminal

coil embolization to treat pseudoaneurysms of the deep femoral artery branch in two patients, which developed after coronary angiography in one patient and after hip replacement in the other. They demonstrated complete closure of the pseudoaneurysms by immediate control angiography. In our cases, with the use of platinum coils with fiber strands, the branches of the PFA were occluded immediately distal and then proximal to the neck of the pseudoaneurysm. Fiber strands provide maximum thrombogenicity, making fiber coils more effective than plain metal coils. Distal embolization is needed to ensure that no retrograde flow occurs from collateral formation. Preservation of the medial and lateral circumflex branches maintains adequate supply to the muscle groups that PFA supplies.<sup>[14]</sup>

In conclusion, the diagnosis of a pseudoaneurysm can be made noninvasively. Catheter angiography is essential to evaluate these lesions and transcatheter arterial embolization is the treatment of choice. With an experienced interventional radiologist, potential complications of selective embolization are minimal.

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