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Case Report / *Olgu Sunumu*

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Traumatic arteriovenous fistula formation after misplaced femoral tunnel in arthroscopic anterior cruciate ligament reconstruction

Artroskopik ön çapraz bağ tamirinde hatalı femoral tünel sonrası travmatik arteriyovenöz fistül oluşumu

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Vascular injuries are rare complications of arthroscopic anterior cruciate ligament (ACL) reconstruction. In this report, we present a 50-year-old female who has a popliteal arteriovenous fistula formation diagnosed 18 months after arthroscopic ACL reconstruction. The diagnosis was confirmed by angiography. The patient was treated surgically with disconnection of the fistulous communication and repair of the artery and vein with saphenous vein and synthetic grafts respectively. This is the first case report of an arteriovenous fistula following arthroscopic ACL reconstruction.

Key words: Angiography; arteriovenous fistula; arthroscopy; popliteal artery.

Vasküler yaralanmalar, artroskopik ön çapraz bağ (ÖÇB) rekonstrüksiyonunun nadir görülen komplikasyonlarıdır. Bu makalede, ÖÇB rekonstrüksiyonundan 18 ay sonra tanılanan popliteal arteriyovenöz fistül oluşumu olan 50 yaşındaki kadın olgu sunuldu. Tanı anjiyografi ile kondu. Hasta fistül iletişiminin kesilmesi ve arter ve venin sırasıyla safen ven ve sentetik greftler ile tamir edilmesi ile cerrahi olarak tedavi edildi. Bu olgu, artroskopik ÖÇB rekonstrüksiyonunu takiben arteriyovenöz fistül gelişen ilk olgu olma özelliğini taşımaktadır.

Anahtar sözcükler: Anjiyografi; arteriyovenöz fistül; artroskopi; popliteal arter.

Vascular injuries associated with arthroscopic anterior cruciate ligament reconstruction (ACLR) are uncommon injuries. In the few peer reviewed case reports of vascular complications following arthroscopic ACLR, formation of pseudo aneurysms, thrombosis or emboli of popliteal artery are presented.[1-11] The mechanism of vascular injury is proposed to be associated with drilling of either tibial or femoral tunnels and direct damage of bony spikes.[4,5] Up to our knowledge, formation of popliteal arteriovenous (AV) fistula following arthroscopic ACLR has not been reported yet. The aim of this report is to present an uncommon iatrogenic complication of arthroscopic ACLR with its surgical management and propose preventional clues in order to avoid this complication.

CASE REPORT

A 50-year-old woman had sustained an anterior cruciate ligament (ACL) rupture of her right knee approximately 20 years ago. The mechanism of injury was 'falling down on a smooth surface'. She consulted an orthopedic surgeon at another clinic because she was suffering from functional instability which worsened in the meantime. At that clinic an arthroscopic ACLR with bone-patellar tendon-bone (BTB) graft fixed with two interference screws was performed. The patient declared that soon after the operation she started to suffer from pain and swelling behind her right knee. During the postoperative period she declared that her complaints had progressed. But the surgeon considered her complaints as normal consequences of

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the surgery and she was discharged from the hospital on the fourth postoperative day. On her follow-up visits she received conservative therapy. Meanwhile her right lower leg and foot had also swollen. Color alterations had appeared on her skin and she had claudication. She consulted a cardiovascular surgeon. The physical examination revealed positive distal pulses but a thrill on her popliteal region and by a Doppler ultrasonographic examination he declared that she had an AV fistula.

Afterwards she was referred to our clinic. In order to confirm the diagnosis, we performed a femoral digital subtraction angiography which demonstrated popliteal high flow traumatic AV fistula (Figure 1). The radiographs of her right knee showed that the graft was transfixed by interference screws both in the femoral and tibial tunnels. But the lateral radiograph demonstrated that half of the interference screw was outside the posterior femoral cortex (Figure 2, 3). To treat the AV fistula and in case of necessity to revise the previous ACLR procedure an operation was performed by cardiovascular and orthopedic surgeons. The popliteal vessels were surgically explored and it was observed that the tip of the forementioned screw was not in direct contact with the popliteal vessels. That is why the femoral screw was left in its place. The fistula between the popliteal artery and vein was disconnected. The popliteal artery was repaired with interposition of saphenous vein and popliteal vein with synthetic graft (Figure 4-6). There was no postoperative complication. Anticoagulant therapy was administered. She was mobilized on the second postoperative day and discharged on the 12th postoperative day. Her pain subsided after the operation but color alterations disappeared gradually.

We examined the patient on the 24th postoperative month. She did not have any complaints. She could walk unlimited distances without claudication. Her physical examination did not reveal any functional instability (negative pivot shift test). She had a 120° active range of motion of her right knee.

DISCUSSION

In the current literature, vascular complications after arthroscopic ACLR are very rare. In 2003 Allum[12] reviewed the complications of arthroscopic reconstruction of the ACL and they even did not even mention vascular complications.

To our knowledge, there have been eight reported cases of vascular complications after arthroscopic ACLR published between 1988 and 2011.[1-8] Six out of eight complications were direct consequences of vascular damage while the remaining two were accepted to be related to previous knee injuries. Those two patients had traumatic knee dislocations probably resulting in intimal damage and compression of the popliteal artery by cyst formation neighboring the

Figure 1. Image of femoral digital substraction angiography. High flow arteriovenous fistula detected.

Figure 2. Image of anteroposterior X-ray.

Figure 3. Image of lateral X-ray.

ruptured synthetic ligament which was used for the reconstructive procedure.[7,8]

Among the six patients the so-called direct vascular damage was in the form of occlusion of the proximal popliteal artery as a result of compression of the vessel between bone and the composite graft in one patient, pseudoaneurysms of the medial inferior geniculate artery and infrageniculate popliteal artery in three patients, simultaneous traumatic pseudoaneurysms and thrombosis of popliteal artery in one patient and avulsion of the middle geniculate artery in one patient.[1-6] In our case the vascular insult was direct damage of the popliteal vessels which led to AV fistula formation over time.

In the current literature two main mechanisms are proposed for the direct vascular damage. Evans

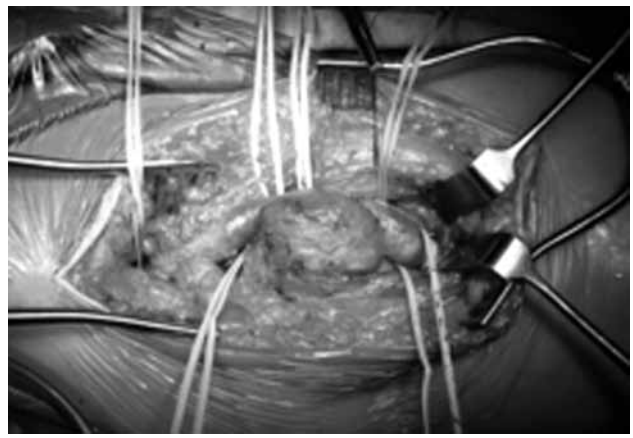

Figure 4. Image of arteriovenous fistula during surgery.

et al.[2] proposed the first mechanism to explain the formation of pseudoaneurysm of the medial inferior geniculate artery following ACLR with BTB procedure. They presumed that elevation of the periosteum on the medial side of the tibia for tibial tunnel preparation caused a pseudoaneurysm. Manning and Marschall[13] supported this theory, stating that "genicular vessels were probably injured more commonly than it was suspected." This was attributed to their small lumen and retraction of the vessels with little bleeding. The other mechanism is direct damage from bicortical tibial drilling.[4,5] A cadaveric study performed to evaluate the neurovascular structures under risk of injury during bicortical tibial drilling revealed that bicortical drilling appeared to be safe but the bifurcation of the popliteal vessels and the anterior tibial vein had greater risks for injury.[14]

Our case presented a unique vascular complication following arthroscopic ACLR with BTB graft. The exact mechanism of vascular injury is not known. But we presume femoral drilling caused direct vascular damage and subsequent AV fistula formation. It is

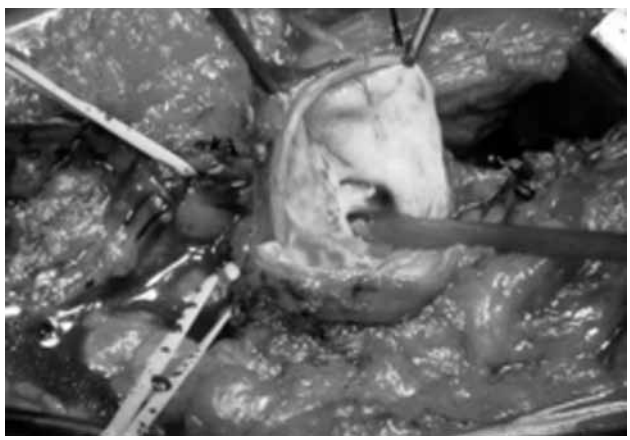

Figure 5. Image of arteriovenous fistula after arteriotomy.

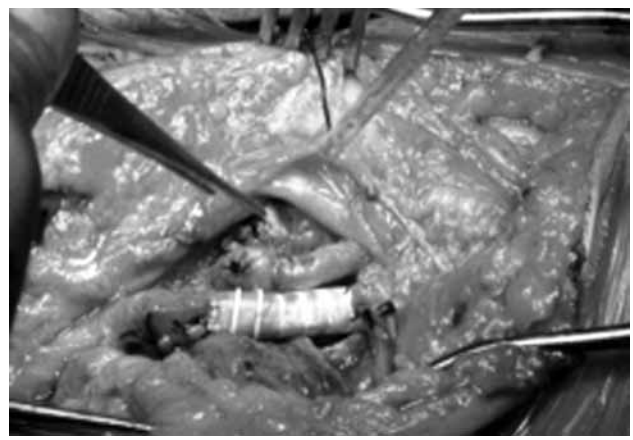

Figure 6. Operative image of the repaired vessels.

very important to determine the exact localization of the femoral tunnel. The posterior cortex of the lateral femoral condyle should be palpated before administration of the guide wire for preserving the posterior vascular structures.

Arterial complications are rare but serious complications of arthroscopic ACLR surgery. It is important to suspect such a complication in the presence of continuous drainage from hemovac drains or unexpected severe pain and dullness in the operated leg. In order to prevent subsequent injuries to the popliteal vessels, precise attention should be paid while inserting the Kirschner wires and drills during preparation of the tunnels.

Declaration of conflicting interests

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