Journal of Orthopaedics, Trauma and Rehabilitation 18 (2014) 44–46

Contents lists available at ScienceDirect

Journal of Orthopaedics, Trauma and Rehabilitation

Journal homepages: www.e-jotr.com & www.ejotr.org

Case Report

Pseudoaneurysm of the Popliteal Artery After Anterior Cruciate Ligament Reconstruction Surgery: A Case Report and Literature Review

前十字叉韌帶重建手術後併發腘動脈假性動脈瘤: 病例報告和文獻回顧

Tam Kelvin Kwok-Wai*, Wun Yiu-Chung, Lau Chi-Yuk, Chow Yuk-Yin

Department of Orthopaedics and Traumatology, Tuen Mun Hospital, Tuen Mun, New Territories, Hong Kong

ARTICLE INFO

Article history:
Accepted February 2013

Keywords:
anterior cruciate ligament reconstruction surgery
popliteal artery
pseudoaneurysm

ABSTRACT

Arterial injury after arthroscopic surgery remains a rare, but devastating, complication. We describe the case of a 28-year-old male patient who presented with a popliteal artery pseudoaneurysm 8 days after anterior cruciate ligament reconstruction with symptoms of a delayed onset of painful calf swelling and compartment syndrome. Subsequent investigations and findings during surgery confirmed a punctured popliteal artery which had resulted in a leaking pseudoaneurysm.

中 文 摘 要

關節鏡手術而引至的動脈損傷是十分罕見的嚴重併發症。 一案例為一位28歲的男性患者進行了前十字叉韌帶重建手術，8天後出現了小腿脹痛，確診為筋膜間隔區綜合症。隨後的檢查與手術證實是因為腘動脈被刺穿導致假性動脈瘤漏血而做成

Introduction

The most common causes of compartment syndrome after anterior cruciate ligament (ACL) reconstruction are the extravasation of fluids from the high pressure inflow during arthroscopy and prolonged tourniquet time leading to reperfusion syndrome. Compartment syndrome after ACL reconstruction remains a rare, but devastating, complication. Vascular injury leading to compartment syndrome is an extremely rare complication after arthroscopic surgery. Vascular injuries have been reported to occur in about 0.008% of all knee arthroscopy procedures.[1] Other workers have reported popliteal artery injury to occur in around 0.01% of knee arthroscopy procedures.[2] Other locations of injuries have been reported, such as the inferior lateral genicular artery, the inferior medial genicular artery, the descending genicular artery, as well as branches of the vastus medialis, recurrent anterior tibialis, or superior medial genicular artery.

Case report

A 28-year-old man sustained a sprain injury of his left knee in a basketball game. He reported intermittent instability symptoms, especially during basketball games. A physical examination, including the Lachman test, the anterior drawer test, and the pivot shift test, all indicated an ACL injury. Magnetic resonance imaging showed that there was a complete tear of his ACL with both medial and lateral meniscus tears. Surgery was performed after 1 year of rehabilitation training from the injury.

Arthroscopic surgery with ACL reconstruction and bone patella tendon bone graft was performed under general anaesthesia. A prophylactic antibiotic was given. A tourniquet was applied for the control of bleeding. A standard arthroscopic two-portal technique was used. The ACL stump was debrided with a 4.2 mm full radius resector. The transtibial technique was used. The graft was fixed with an endobutton at the femoral side and an absorbable interference screw on the tibial side. Partial menisectomy of the medial and lateral menisci was performed. The intraoperative procedure was uneventful. The patient was able to walk with full weight bearing and was discharged on the 2nd day after surgery.

Eight days after surgery the patient reported acute swelling and a dull ache in his left calf. A physical examination showed diffuse

* Corresponding author. *E-mail:* kel_tam@hotmail.com.

http://dx.doi.org/10.1016/j.jotr.2013.12.001

Figure 1. Magnetic resonance image of the knee showing the pseudoaneurysm.

ecchymosis around his knee and a grossly swollen calf. However, he had no pain on passive stretching of his ankle and the distal circulation was intact. His vital signs were normal with no tachycardia nor hypotension. Doppler ultrasound of his left calf was arranged to look for deep vein thrombosis.

While waiting for the ultrasound appointment, the patient sought help in another hospital. The attending orthopaedic surgeon there suspected acute compartment syndrome of the leg which had been operated on based on the clinical symptoms. A standard two-incision fasciotomy of his left calf was performed. During the operation, a haematoma was discovered within the calf and evacuated. The surgeon found a palpable pulsatile mass over the popliteal fossa. The size of the mass was about 6 cm × 5 cm in size. Magnetic resonance imaging and a computed tomography angiogram were carried out. A pseudoaneurysm measuring 7 cm × 5 cm was found arising from the popliteal artery (Figures 1 and 2). The mass was not seen on the preoperative magnetic resonance image of his left knee. The patient was transferred back to our unit for further management.

The pseudoaneurysm was explored via a posterior approach to the knee. Intraoperatively, there was a 300 mL blood clot extending down to the calf. A 2 mm puncture hole was identified over the anterior aspect of the popliteal artery (Figure 3). The short segment of the injured artery was excised. A long saphenous vein graft was harvested for repair of the popliteal artery. The procedure was successful and there was no sign of arterial insufficiency nor oedema afterwards. The fasciotomy wound site was closed with a split thickness skin graft. The patient was then able to walk and followed the usual ACL rehabilitation training.

Discussion

Arterial injury as a complication after ACL reconstruction is extremely rare, although sporadic cases of arterial injury have been reported. The majority of reported vascular injuries have been related to the graft fixation technique and the type of surgery performed.[1–4] Injuries of the medial genicular branch of the popliteal artery have been reported during hamstring harvesting.[5]

About 30% of reported patients with postoperative aneurysm were asymptomatic.[6] Those who developed symptoms usually presented about 2–3 weeks after the operation,[6] with symptoms including dull pain as in our patient. Patients with arterial deficiency symptoms, such as claudication, discoloration of the skin, or emboli from the aneurysm sac, presented from 1 week to 3 months after surgery.[6] The consequence of misdiagnosis may be permanent compressive neuropathy or severe limb ischaemia. Thromboembolic complications were seen in about 18–77% of these patients and the rate of amputation was over 20% for popliteal aneurysms.[7]

Aldridge et al[8] reported a case of middle genicular artery injury after a bone-patellar tendon-bone autograft fixed with interference

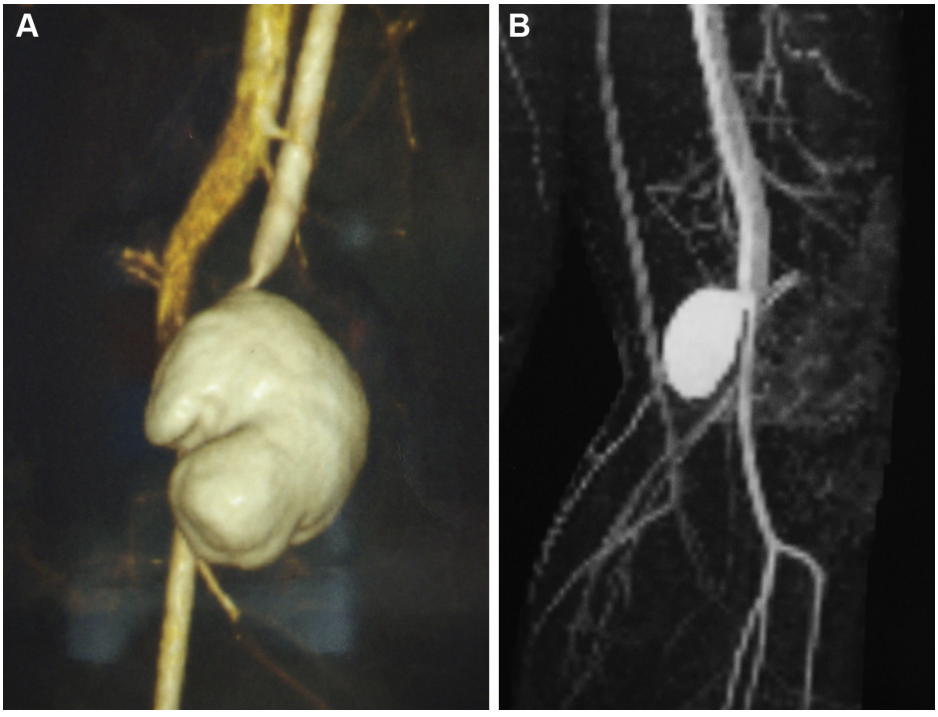

Figure 2. Computed tomography angiogram. (A) Three-dimensional image and (B) two-dimensional image of the pseudoaneurysm of the popliteal artery.

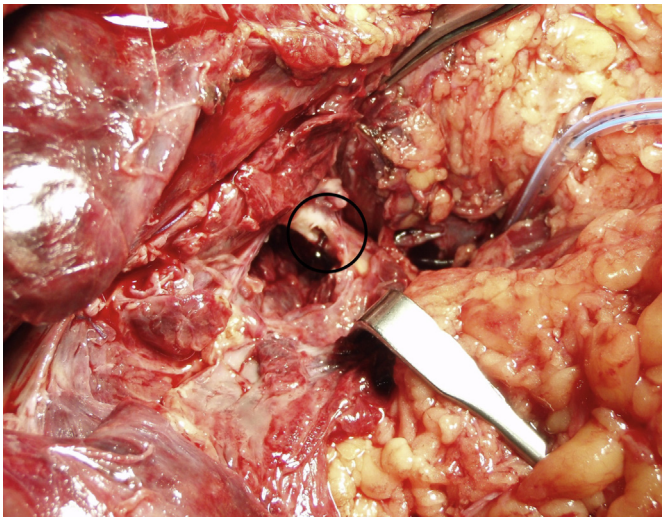

Figure 3. Intraoperative view showing 2 mm hole (circled) over the anterior aspect of the popliteal artery.

screws. The probable cause was postulated to be debridement of the remnant tissue of the femoral ACL, leading to a tear in the middle genicular artery.

Janssen et al[2] reported a penetrating injury of the popliteal artery by drilling of the bicortical tibial screw for tibial fixation of the graft. Janssen et al[9] also reported another case of popliteal artery pseudoaneurysm and thrombosis of the popliteal artery after ACL reconstruction. However, after exploration this was thought to be unlikely to be related to any instrumental damage and it was postulated that it was a pre-existing injury related to a traumatic knee dislocation 15 years prior to surgery. Roth and Bray[10] described a proximal popliteal artery injury that was trapped by the staple used to fix the composite graft to the lateral femur.

In all reported cases, the exact aetiologies of the injuries were not clearly established and most were only postulations. Most of these patients presented with this complication about 4–6 weeks after surgery. The iatrogenic arterial injuries were not usually detected at the time of the operation. The treatment included exploration via a posterior approach to the knee, identifying the pathology, followed by ligation and excision of the pseudoaneurysm. Vein grafting was sometimes performed as well.

The penetrating injury of the popliteal artery in our patient probably happened while attempting to pass the guide pin into the femoral tunnel through the trans-tibial approach as a 2 mm puncture hole was identified during exploration. Some preventive measures may be helpful, including placing the femoral tunnel towards the anterior aspect of the distal femur, hyperflexion of the knee, and using a trans-portal approach with more freedom while drilling the femoral tunnel.

In conclusion, vascular complications after ACL reconstruction are very rare, therefore high levels of suspicion are crucial. Unusual calf swelling, impending compartment syndrome, uncommon deep vein thrombosis in Asian patients, and symptoms of limb ischaemia are critical features to look for in this rare complication. Early detection and timely intervention can prevent the irreversible consequences of leg ischaemia.

Conflicts of interest

The authors declare that they have no financial or non-financial conflicts of interest related to the subject matter or materials discussed in the manuscript.

References

1. Sarrosa EA, Ogilvie-Harris DJ. Pseudoaneurysm as a complication of knee arthroscopy. *Arthroscopy* 1997;**13**:644–5.
2. Janssen RPA, Scheltinga MRM, Sala HAGM. Pseudoaneurysm of the popliteal artery after anterior cruciate ligament reconstruction with bicortical tibial screw fixation. *Arthroscopy* 2004;**20**:E4–6.
3. Kiss H, Drekonja T, Grethen C, et al. Postoperative aneurysm of the popliteal artery after arthroscopic meniscectomy. *Arthroscopy* 2001;**17**:230–5.
4. Evans JD, Boer de MT, Mayor P, et al. Pseudoaneurysm of the medial inferior genicular artery following anterior cruciate ligament reconstruction. *Ann R Coll Surg Engl* 2000;**82**:182–4.
5. Milankov M, Miljkovic N, Stankovic M. Pseudoaneurysm of the medial inferior genicular artery following anterior cruciate ligament reconstruction with hamstring tendon autograft. *Knee* 2006;**13**:170–1.
6. Kanko M, Buluc L. Very rare aetiology of giant popliteal pseudoaneurysm: anterior cruciate ligament surgery. *Post Grad Med J* 2008;**84**:158–9.
7. Gouny P, Bertrand P, Duedal V, et al. Limb salvage and popliteal aneurysms: advantages of preventive surgery. *Eur J Vasc Endovasc Surg* 2000;**19**:496–500.
8. Aldridge III JM, Weaver JP, Mallon WJ. Avulsion of the middle genicular artery: a previously unreported complication of anterior cruciate ligament repair. A case report. *Am J Sports Med* 2002;**30**:748–50.
9. Janssen RPA, Sala HAGM, Prakken WJ. Simultaneous traumatic pseudoaneurysm and thrombosis of the popliteal artery after anterior cruciate ligament reconstruction. *Injury Extra* 2007;**38**:397–9. http://dx.doi.org/10.1016/j.injury.2007.01.038.
10. Roth JH, Bray RC. Popliteal artery injury during anterior cruciate ligament reconstruction: brief report. *J Bone Joint Surg (Br)* 1988;**70**:840.