Popliteal pseudoaneurysm and arteriovenous fistula after arthroscopic anterior and posterior cruciate ligament reconstruction: A case report

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A B S T R A C T
INTRODUCTION: Vascular injuries are a well recognised but very rare complication of surgery or trauma around the knee, especially associated with arthroscopic anterior and posterior cruciate ligament reconstruction. Arthroscopic knee surgery is considered a safe procedure with a low complication rate [1]. Vascular injuries associated with this surgery are very rare and account for <1% of all complications presented [2]. To our knowledge, few cases of vascular complications following arthroscopic ACLR/PCLR, formation of pseudoaneurysms, thrombosis or emboli of popliteal artery have been reported [3–11]. We herein report a rare case based on Surgical Case Report (SCARE) Guidelines [12]. The aim of this report is to present an uncommon iatrogenic complication of Arthroscopic anterior and Posterior Cruciate Ligament Reconstruction with its surgical management and propose preventative clues in order to avoid this complication.

2. Case presentation

An 57-year-old male patient who complained of pain and swelling around the left lower extremity after the ACL and PCL reconstruction using a semitendinosus graft from the two limbs caused by bicycle accident half a year ago. The patient declared that soon after the operation he started to suffer from pain and swelling behind her left knee. But the surgeon considered her complaints as normal consequences of the surgery. He was discharged from the hospital after suture removal. On his follow-up visits he received conservative therapy. Meanwhile his left lower leg and foot had also swollen. He consulted a cardiovascular surgeon. He was diagnosed with the popliteal pseudoaneurysm and arteriovenous fistula by the Doppler ultrasonographic examination and CTA (Fig. 1). The patient was transferred to the interventional radiology suite where a successful vascular stent implantation was made (Fig. 2). There was no postoperative complication. Anticoagulant therapy was administered. He was mobilized on the second post-

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operative day and discharged on the 7th postoperative day. Her pain subsided after the operation and the swelling disappeared gradually.

3. Discussion

The most important finding of the present case was a popliteal pseudoaneurysm and arteriovenous fistula after the ACL and PCL reconstruction. To our knowledge, very few cases reporting an arteriovenous fistula with popliteal pseudoaneurysm following arthroscopy have been described. There have been two reported cases of arteriovenous fistula after arthroscopic surgery published until now. One of the most recent articles was published in 2012. The implants used for the reconstruction of the ligaments mentioned in this article are BTB grafts, a bulky screw used for fixing the ligaments. The exact mechanism of vascular injury is not known. And the author presumes femoral drilling and the bulky screw caused direct vascular damage and subsequent AV fistula formation. With the advancement of technology, the implants have been developed for button plate. The whole operation process is more simple and rapid, and the risk of vascular injury is even smaller, so our case is even more rare. We had a detailed examination of the patient before the operation. The MRI and ultrasound examination did not show vascular injury (Fig. 3). So the injury caused by trauma can be ruled out. The main cause of the formation of the arteriovenous fistula is the operation. But the patient had the arthroscopic anterior and posterior cruciate ligament reconstruction at the same time, It is difficult to determine which surgical procedure caused vascular injury. In the literature, we found that the mean distance between popliteal blood vessels and the posterior tibial cortex is less than 8 mm [13]. Riksson and Bartlett used Doppler ultrasonography to measure the distance from the popliteal vascular bundle to the tibial plateau, it is (7 + 2.71) mm. It can be seen that the location of the popliteal vascular bundle is very close to the platform cortical bone in the horizontal plane of the tibial plateau, and it is closely matched with the posterior capsule and the posterior tibial cortex from the actual anatomy of the structure. The literature pointed out [14] a dangerous triangle area, it is a high incidence zone where the blood vessels can be easily damaged for the knee surgery. During the operation of this case, the surgical site of the posterior cruciate ligament tibial tunnel was close to high incidence zone for vascular injury in the posterior tibial plateau, so the possibility of vascular damage is greater. We need to use guide pins and an electric drills when establishing tibial tunnel. If there is a certain deviation of the direction of the guide pin and the depth of the drill, this is likely to cause popliteal arteriovenous damage. The guide pin made a puncture in popliteal artery and formed a penetrating wound, the popliteal vein wall was broken at the same time, blood overflowed and the pseudoaneurysm formed. In the blood vessel sheath, the artery and the vein were connected to form the false passage, which became the direct arteriovenous fistula. From clinical manifestation, vascular rupture was not great and could not cause the distal limb blood supply disorder. But there will be some symptoms, such as lower limb swelling, lower limb pain.

4. Conclusions

In conclusion, vascular injury is a very rare complication of knee surgery, but surgeons should always consider this possibility in patients who have undergone knee arthroscopy. If the patient has symptoms of pain in the popliteal area and unexplainable swelling following arthroscopic ACL and PCL reconstruction, a popliteal vascular injury should be suspected. In order to minimize the risk of vascular complications in ACL and PCL reconstructive surgery, we
advise to look for less traumatizing instruments and to limit the amount of riskful actions, precise attention should be paid in the establishment of the tibial tunnels.

**Patient perspective**

The operation was successful, and I am pleased that my special case can be published in the form of article for the readers to learn.

**Conflicts of interest**

The authors declared no conflicts of interest with respect to the authorship and/or publication of this article.

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**Ethical approval**

The Committee on Research Ethics of the shangyu people’s hospital of ShaoXing city approved the study. Number: SYRY160611.

**Consent**

Written informed consent was obtained from the patient for publication of this case report and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

**Authors contribution**

Ding Xu and Liefeng Ji conceived and designed the study. Yuefeng Xie performed data collection. Ding Xu and Jiang Zhu drafted the manuscript. All authors carefully read and approved the final manuscript.
Guarantor

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