Recurrent Haemarthrosis after Total Knee Arthroplasty: Investigation and Management

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Abstract

Recurrent haemarthrosis is a relatively rare complication of total knee arthroplasty, and only a few cases have been reported; hence, it is hard to determine comprehensive diagnosis and treatment guidelines. We report a case of haemarthrosis in 50-year-old male patient 14 months postoperatively. Investigations (ultrasound, aspiration, and arthroscopy) and managements (non-surgical, arthroscopy and open exploration) were performed, and the clinical effects of these interventions were analyzed separately. Clinical evidence indicates that the cause of this case was rupture of a pseudoaneurysm of the medial superior genicular artery. A brief review is involved in discussion part.

Keywords: Total knee arthroplasty; Recurrent haemarthrosis; Arthroscopy; Open exploration

Introduction

Recurrent haemarthrosis is a relatively rare complication of total knee arthroplasty (TKA) [1], with an incidence of 0.3% to 1.6% [2-5]. Appropriate management should be implemented as early as possible to minimize the risk of severe consequences. Diagnosis and treatment of recurrent haemarthrosis after TKA has been conducted on a case-by-case basis, and there are too few published cases to determine comprehensive guidelines. In the present case, various investigations and managements were performed, and the clinical effects of these interventions were analyzed separately.

Case Report

The patient was a 50-year-old male diagnosed osteoarthritis, with a main complaint of bilateral knee pain for over 10 years. He had a history of hypertension but was not regularly taking any anticoagulant or antiplatelet medication. After failure of conservative treatment, the patient underwent TKA of the left knee in 2013. There were no problems intraoperatively. A pneumatic tourniquet was used intraoperatively at a pressure of 300 mmHg after exsanguination. The implant used was a Press Fit Condylar prosthesis P.F.C.* SIGMA® (DePuy Synthes, West Chester, U.S.). A single intraarticular drainage without blood recovery system was used and was removed 24 hours postoperatively. The drainage volume was 300 ml. Postoperative rehabilitation was uneventful, and the operation outcome was satisfactory. Thromboprophylaxis was done with sodium enoxaparin (6,100 IU per day), starting on the day of surgery and lasting for 2 weeks. The patient was discharged on postoperative day 7. Clinical tests and radiographs were normal 3 months after TKA. The range of motion of the left knee was 0° extension to 125° flexion, and the femorotibial angle was 178°. The Hospital for Special Surgery Scoring System (HSS) score improved from 50 points to 96 points. The Western Ontario & Mc Master Universities Osteoarthritis Index (WOMAC) score reduced from 62 points to 7 points. However, 14 months postoperatively, the patient experienced acute pain in the left knee that began while he was sleeping. This onset of pain was associated with immediate swelling of the knee and a sensation of warmth in area of pain. Physical examination and clinical testing was performed in the local emergency room. Local findings in the left knee showed that the range of motion was limited to 0° extension and 80° flexion, with positive patellar ballottement and no knee instability. The HSS score had decreased to 71 points and the WOMAC score was 55 points. Radiography showed excellent alignment and no prosthetic loosening (Figures 1A and 1B). Ultrasonography revealed hydrarthrosis of the left knee. Aspiration of the knee joint produced 40 ml of dark, bloody fluid (Figure 2). No organisms were seen, and culture was negative for bacteria over a 72-hour period. The knee was compressed, and non-surgical treatment including cryotherapy and immobilization was performed. The symptoms had resolved 10 hours later; however, the patient experienced numerous similar episodes in the following 2 months.

The patient presented to our department for definitive diagnosis and treatment, and arthroscopic exploration was performed. A tourniquet was initially used. After thorough lavage of the joint, there was no visible bleeding (Figure 3A). However, progressive haemorrhage blurred the view soon after releasing the tourniquet, and it was difficult to determine the source of the bleeding (Figure 3B). Therefore, open exploration was performed. Pulsatile bleeding was discovered in the medial sulcus close to the upper pole of the patella (Figure 4). The bleeding artery was about 1–1.5 mm diameter. According to the anatomy of the knee and the structure of the blood vessel, the bleeding source was identified as the medial superior genicular artery. The artery was ligated with three sutures. There was no sign of bleeding during intraoperative flexion and extension of the knee. The patient was symptom-free in the 15 months after surgery. The left knee had a range of motion of 0° extension to

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120° flexion, and the standing femorotibial angle was 177°. The HSS score returned to 92 points and the WOMAC score was 5 points in 24 months after surgery. We also followed up the patient at 36 months after surgery through video communication since he could not come back to our hospital. At that time, the WOMAC score remained 5 points and knee function were perfect (Figure 5).

Discussion

The blood vessel could be directly injured during procedures such as resection of the proximal tibia or posterior femoral condyles, posterior capsule release, posterior cruciate ligament removal, and screw insertion [6]. Besides, a relatively low power injury can cause the formation of an arteriovenous fistula, arterial aneurysm, or pseudoaneurysm, creating the potential for future blood vessel rupture [7-10]. Drexler et al., [11] reported an atypical tibial defect was found in open surgery and biopsy results revealed high-grade epithelioid angiosarcoma, which was treated by amputation above the level of the knee. In addition, haemarthrosis may be caused by anticoagulation medication such as warfarin, aspirin, rivaroxaban, or clopidogrel [12]. Some rare causes like hemophilia, an inherited disease with a deficiency of factor VIII (hemophilia A) or factor IX (hemophilia B) [13,14], and PVNS, a proliferative tumor of synovial tissue, may also induce haemarthrosis [15-17].

Routine blood tests including inflammatory markers and a coagulation profile are essential in cases of swollen and painful knees after TKA [5]. In 1996, Worland et al., [3] emphasized the necessity of aspiration as an important way to differentiate the cause of knee swelling after TKA. Ultrasound can present a luminal turbulence with a “Yin-Yang” sign which can easily detect arterial aneurysms, pseudoaneurysms, and arteriovenous fistulae [5]. Radiography can evaluate the position of components and determine whether the components are loose. MRI is valuable for detecting pathological changes of the synovium [18]. Angiography is a very effective method of diagnosing and treating recurrent haemarthrosis in both early and late cases. Vascularized synovium could present as a “tumor blush” sign in angiography [19].

All anticoagulant medication should be stopped after consultation with related departments. Cryotherapy, aspiration, and immobilization can resolve the symptoms and stop the bleeding temporarily or definitively [4,8]. Although some cases will fail conservative therapy and require surgical therapy, non-surgical therapy should be performed first [5]. Open surgical repair such as synovectomy is a direct way to explore the bleeding area and ligate the blood vessel.
or remove the hypertrophic synovium [2,3]. However, open surgery is associated with operation-related complications such as iatrogenic injury, more blood loss, and longer rehabilitation. Arthroscopic synovectomy is a minimally invasive approach that allows dissection of hypertrophic synovium with less bleeding and trauma than open surgery. However, arthroscopic synovectomy is not always successful. Suzuki et al., reported a case of recurrent haemarthrosis in which the source of bleeding could not be determined in an unclear arthroscopic view, and it was treated via open exploration, which presented in our case. Therefore, angiographic embolization has been regarded as a more optimal choice in cases of vascular injury and of synovial impingement. Compared with open exploration and arthroscopic surgery, angiographic treatment is a less invasive therapy with lower risk of complications and easier rehabilitation [18,19].

In the present case, the patient did not undergo angiography, and the cause of the bleeding could not be determined preoperatively. In fact, the source of bleeding was suspected to be synovium impingement according to recently reported cases [5,8], and the ultrasound examination. However, open exploration revealed a bleeding artery, which strongly indicated that the cause of haemarthrosis was rupture of a pseudoaneurysm of the medial superior genicular artery. Arthroscopy was initially performed and was found to be inadequate compared with angiography. A clear scope is essential to determine the source of bleeding, unfortunately, it was difficult to visualize the effusion or jet point before the view became bloody.

**Conclusion**

The present case indicated the following perspectives. Firstly, angiography is essential in cases of haemarthrosis after TKA. Secondly, arthroscopy may not always be adequate, as it may not provide a clear view. Lastly, traditional open exploration is still effective and sometimes necessary.

**References**