

〈Case Report〉

## Recurrent spontaneous hemarthrosis after lateral unicompartmental knee arthroplasty treated with selective embolization

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**ABSTRACT Background:** Recurrent intra-articular hematoma is a rare complication after knee joint replacement surgery. In this report, we describe a case of recurrent intra-articular hematoma in a knee joint that was successfully treated using embolization.

**Case presentation:** A 62-year-old woman underwent lateral unicompartmental knee arthroplasty for right knee osteoarthritis at our hospital. The postoperative recovery of the patient was overall positive, though some swelling developed in the knee with excessive movement. However, 4 years after the surgery, the patient returned to the clinic with a primary complaint of right knee pain. A right ballottement was observed, and a hematoma of approximately 50 cc was found at the puncture site. Symptoms of the patient improved after the puncture, but the hematoma continued to recur. Therefore, the patient was kept under rest, and oral tranexamic acid was administered. However, the conservative treatment did not improve her symptoms, and she was readmitted to our hospital. Right knee ultrasonography revealed a blood clot in the joint capsule. The synovial membrane was diffusely thickened, and contrast-enhanced blood flow in the synovial membrane was observed. The lateral superior knee artery was suspected to be the source. Based on these results, the patient underwent embolization by a radiologist. Contrast-enhanced images of the synovial membrane were obtained in the lateral superior and inferior knee arteries, followed by embolization of these vessels using Embosphere®. The patient had a positive postoperative recovery and was discharged in a few days. After discharge, the knee condition improved, and she became more active, engaging in activities, including shopping and movie outings. This could be the cause of the recurring intra-articular hematoma. Approximately one month after the previous embolization, she was readmitted to the hospital and underwent another embolization. Embolization was performed again using Embosphere® and imipenem/cilastatin. Postoperatively, the patient was not allowed to leave the hospital early. Instead, a

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knee extension brace was applied for 2 weeks, and the patient was instructed to be bed-rested as much as possible. Three weeks after the surgery, no recurrence was confirmed, and the patient was discharged.

**Conclusions:** In cases of recurrent intra-articular hematoma of the knee after knee arthroplasty, the recommended first-line treatment for patients who do not respond to conservative treatment is addressing the intra-articular hematoma. This can be treated with either intravascular surgery or embolization. Postoperative rest is also important.

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Key words : Spontaneous hemarthrosis, Knee arthroplasty, UKA, Embolization

## INTRODUCTION

Recurrent spontaneous hemarthrosis is a rare complication of total knee arthroplasty (TKA) with an incidence ranging from 0.1% to 1.6%<sup>1-5)</sup>. The onset of recurrent spontaneous hemarthrosis has been reported to be an average of 2 years post-surgery, although it can range between 2 months to 18 years<sup>1, 3, 5, 6)</sup>. Hemarthrosis has been reported in unicompartmental knee arthroplasty (UKA) as well<sup>7)</sup>.

The etiology of this condition remains unclear, but it may result due to various conditions, including direct vessel injury such as the popliteal artery, geniculate arteries<sup>8, 9)</sup>, arteriovenous fistula, and pseudoaneurysms<sup>10)</sup>. After excluding coagulopathies,

impingement of the proliferative synovium between the articulating components is the most common cause of recurrent proliferative hemarthrosis<sup>10)</sup>. Prompt diagnosis and appropriate treatment of this condition are crucial to prevent complications, such as stiffness, chronic pain, and limited function.

We report a case of spontaneous recurrent hemarthrosis following UKA 4 years post-operatively, which was successfully treated with selective arterial embolization.

## CASE REPORT

A 62-year-old woman underwent lateral UKA for lateral osteoarthritis in her right knee at our institution (Figs. 1 and 2). Her post-operative

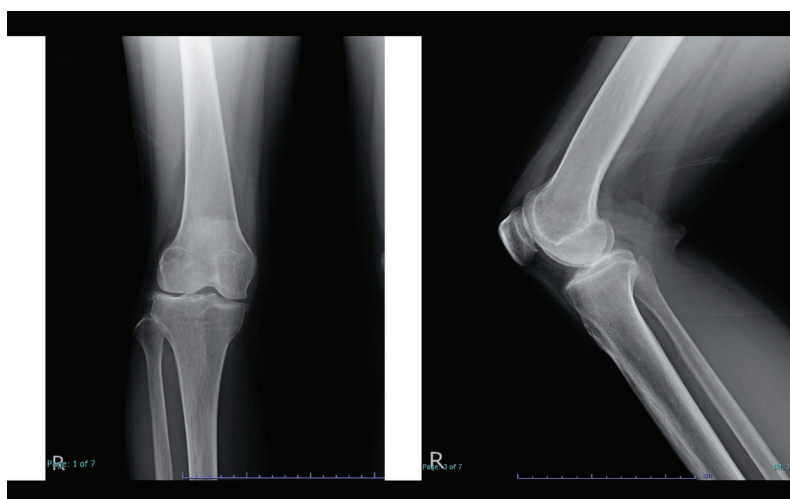


Fig. 1. Images showing right knee osteoarthritis (lateral).

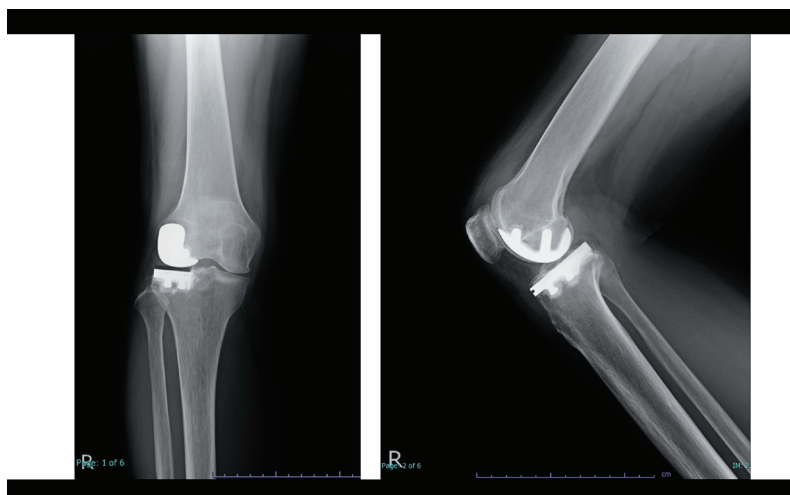


Fig. 2. Right knee post-lateral unicompartmental knee arthroplasty.

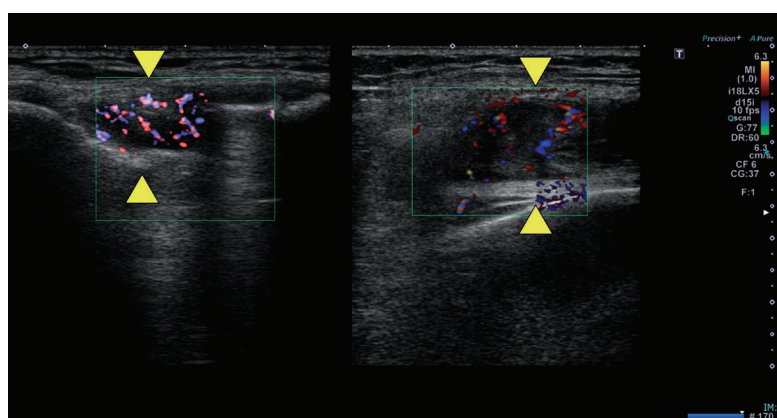


Fig. 3. Ultrasonography showing a clot, thickened synovial membranes (both ends of the thickened synovium are indicated by  $\triangle$ ), and increased blood flow within the right knee bursa. However, no extravasation was observed.

recovery was overall positive, though some swelling in the knee developed with extensive movement. However, 4 years after surgery, she returned to the outpatient clinic with right knee pain. A ballottement was observed, and a 50 cc hematoma was found by puncture. No findings suspicious of infection were observed. Her symptoms improved after the puncture, but the hematoma continued to recur. Therefore, the patient was kept under rest, and oral tranexamic acid was administered. However, the conservative treatment did not improve

her symptoms, and she was readmitted to our institution. After re-admission, an ultrasound was performed on the right knee, which revealed a clot, thickened synovial membranes, and increased blood flow within the knee bursa. However, there was no extravasation. The lateral superior knee artery was suspected to be the source (Fig. 3).

Based on these results, we diagnosed impingement of the synovium between the articulating components as the cause of her recurrent proliferative hemarthrosis. She underwent

embolization, which was performed by our radiologist. Contrast-enhanced images of the synovial membrane were obtained in the lateral superior and inferior knee arteries, followed by embolization of these vessels using Embosphere® (Figs. 4 and 5).

She had an overall positive recovery and was discharged in a few days after embolization.

Immediately after discharge, her knee was in

good condition, but the intra-articular hematoma recurred approximately 1 month after the previous embolization. She became more active, engaging in activities, including shopping and movie outings, which might have contributed to the recurrence. She was hospitalized again. Magnetic resonance (MR) imaging showed thickening of the synovial membrane and a hematoma on the lateral knee joint; MR angiography showed abnormal net-like vessels



Fig. 4. A is an angiographic image of lateral superior knee artery before embolization, and B is an image after embolization using Embosphere® ; Contrast-enhanced images in A has disappeared in B.

In A, contrast agent is injected from the  $\triangle$  site, and in B, Embosphere® is injected after contrast agent from the  $\triangle$  site.

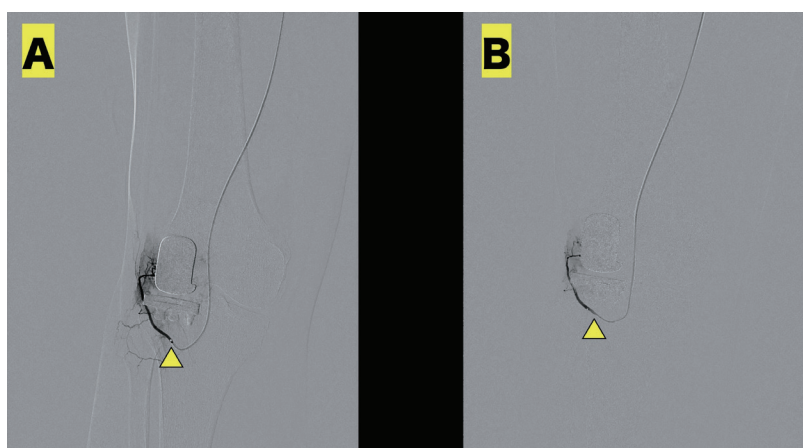


Fig. 5. A is an angiographic image of lateral inferior knee artery before embolization, and B is an image after embolization using Embosphere® ; Contrast-enhanced images in A has disappeared in B.

In A, contrast agent is injected from the  $\triangle$  site, and in B, Embosphere® is injected after contrast agent from the  $\triangle$  site.



Fig. 6. A is an angiographic image of popliteal artery before embolization, and B is an image after embolization using Embosphere® and IMP/CS; Contrast-enhanced images in A has disappeared in B. Contrast agent is injected from the  $\triangle$  site

in the peripheral portion of the lateral superior knee artery. She underwent another embolization using Embosphere® and imipenem/cilastatin (IMP/CS). Embolization technique was performed as before. One difference from the previous procedure was the use of IMP/CS to embolize smaller vessels (Fig. 6). Based on the previous recurrence, we determined that post-operative bed rest was critical. Post-operatively, she was not allowed to leave the hospital early. Instead, a knee extension brace was applied for 2 weeks, and the patient was instructed to be bed-rested as much as possible. Three weeks after the second embolization, no recurrence was confirmed, and she was discharged.

## DISCUSSION

Recurrent spontaneous hemarthrosis is a rare complication after TKA, with an incidence ranging from 0.1% to 1.6%<sup>1-5)</sup>. Hemarthrosis has been reported in UKA as well<sup>7)</sup>. The onset of recurrent spontaneous hemarthrosis has been reported to be an average of 2 years post-surgery, although it can vary between 2 months to 18 years<sup>1, 3, 5, 6)</sup>. The patient in our case experienced an intra-articular hematoma 4 years post-operatively.

Hemarthrosis should be promptly diagnosed, and a course of conservative treatment should always be tried before considering any surgical procedures. Saksena *et al.* recommended the following algorithmic approach for the evaluation of hemarthrosis in the knee<sup>10)</sup>: ①All anticoagulation medications should be ceased, and the patient should be evaluated for any coagulopathies. ②In case of large hemarthrosis, rest, ice, aspiration, and immobilization should be implemented. ③Prosthetic joint infections should always be ruled out with inflammatory markers and cultures of aspirates<sup>10, 11)</sup>. When the conservative treatment method fails, and recurrent hemarthrosis occurs, angiography is used as the first-line procedure to help with diagnosis, which is followed by treatment<sup>10)</sup>. This technique has previously been successfully used in the treatment of pseudoaneurysms and arteriovenous fistulas<sup>12, 13)</sup>. In the present case, no findings to suspect infection or pigmented villonodular synovitis were observed. US findings also strongly suggested hypertrophic synovium. Since rest and oral tranexamic acid administration did not improve her symptoms, she underwent embolization.

Many professionals have used selective arterial



embolization of the geniculate arteries to reduce blood flow to the hypertrophic synovium, thereby treating recurrent hemarthrosis. Weidner *et al.* have also reported successful resolution of recurrent hemarthrosis in 12 of 13 patients treated with geniculate arterial embolization<sup>11)</sup>. One clinical failure probably represents a misdiagnosed prosthetic joint infection. Two patients experienced transient cutaneous ischemia following embolization, which resolved spontaneously.

Guevara *et al.* conducted a study that included 10 patients who underwent geniculate artery embolization, and hemarthrosis was resolved in six patients<sup>14)</sup>. Among them, four patients required repeat embolization, of which hemarthrosis resolved in two patients. Three of the four patients who required repeat embolization had severe medical comorbidities, such as blood dyscrasias, or were on therapeutic anticoagulation. Their study showed that geniculate artery embolization had limited clinical success and higher repeat embolization rates in patients with severe comorbidities. Dhondt *et al.* included eight patients with spontaneous hemarthrosis in their study, five of whom underwent selective embolization and three of whom were successful after the first attempt<sup>15)</sup>. Hemarthrosis resolved in one patient after the second attempt, and another patient required open surgery after two failed attempts.

In the present case, no anticoagulation treatment was used, but our patient experienced a recurrence after the initial embolization. The first embolization was performed using Embosphere® only, while the second embolization was performed using Embosphere® and IMP/CS, which allows the treatment of smaller vessels and has fewer side effects due to inhibition<sup>16)</sup>. Based on the medical interview, the cause of the recurrence was determined to be overactivity, and she was asked to rest after re-embolization.

It is unclear whether the use of IMP/CS had a

positive effect or whether the postoperative rest period contributed to the outcome. However, no recurrence has been observed to date.

## CONCLUSION

We successfully treated a case of recurrent intra-articular hematoma after UKA. Impingement of the proliferative synovial membrane between prosthetic components is the most commonly reported cause of recurrent intra-articular knee hematomas after TKA/UKA. For patients unresponsive to conservative treatment, the recommended first-line treatment is an open surgery or embolization; embolization was performed in this case. Since recurrence was also observed, another embolization was performed, and the hematoma improved after thorough bed rest.

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