Case Report

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# A Case Of Pigmented Villonodular Synovitis With Recurrent Hemarthrosis After Total Knee Arthroplasty

**Gamze Yavuz Ozerdem***

Department of Medicine, Turkey.

**Corresponding author:**
Gamze Yavuz Ozerdem,
Department of Medicine, Turkey.
**Email:** gamzeyavuzz@gmail.com

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## 1. Inroduction

Recurrent hemarthrosis (RH) is a rare condition occurring after total knee arthroplasty (TKA), with an incidence ranging from 0.1% to 1.6%. Both systemic and local factors contribute to the etiology of RH. Among systemic factors are the use of anticoagulants and blood dyscrasias, while local factors include iatrogenic causes such as implant malposition and vascular injury, trauma, infective or pigmented villonodular synovitis (PVNS), implant loosening, vascular anomalies, and soft tissue impingement (1, 2). Pigmented villonodular synovitis is a proliferative process that affects the synovial joints, tendon sheaths, and bursae, with an annual incidence rate of 1.8 per 1,000,000. PVNS is a rare complication after TKA. The etiology of PVNS remains uncertain, but recurrent bleeding, neoplasm, and trauma are among the considered causes. The most appropriate treatment for PVNS involves surgical excision of the pathological tissue (3). Several cases of PVNS presenting with RH after TKA have been reported in the literature (4-7). In these cases, PVNS appeared 12 months to 9 years after TKA. Here, we present our patient who presented with symptoms of RH after TKA, was diagnosed with PVNS, and was treated with synovectomy. The most significant difference in our case compared to others is that the post-TKA symptoms started earlier, at 4 months.

## 2. Case Presentation

A 61-year-old female patient underwent cemented TKA first on the left knee due to osteoarthritis (OA) that did not respond to conservative treatment, followed by the right knee three months later. No abnormalities were noted in the synovial membrane intraoperatively. The patient's medical history included arthroscopic meniscectomy on the right knee seven years ago and on the left knee six years ago, prior to TKA. Post-TKA, the patient experienced decreased pain and full range of motion in the operated knee. However, four months after the right TKA surgery, she developed swelling, pain, and ecchymosis, particularly in the anterolateral aspect of the right knee (see Image 3 - swollen appearance). The patient visited the orthopedic clinic where she underwent surgery, reporting no trauma or use of anticoagulants. Laboratory tests revealed an ESR of 27 mm/hour, CRP of 12 (0-5). Complete blood count, aPTT, PT and INR, fibrinogen, and D-dimer values were within normal range. Knee X-ray showed no evidence of prosthesis malposition or malrotation (see Image 4 - X-ray). Hematology consultation did not identify any issues that could cause bleeding. Ultrasound of the right knee revealed effusion with thin echogenic bands in the suprapatellar bursa, thickened wall, and marked vascularity, measuring 6.5 mm at its thickest point extending from the suprapatellar bursa to the medial and lateral recesses. MRI of the right knee showed a large collection within the suprapatellar bursa with hyperintense signal on T2-weighted images and hypointense signal on T1-weighted images, suggestive of fluid levels. Fine peripheral enhancement was observed in the collection following IV contrast injection. The patient was admitted to the orthopedic service, and joint aspiration yielded hemorrhagic fluid. Culture of the aspirate showed no growth. The patient was advised cold therapy, bandaging, and rest, and was discharged with reduced symptoms.

Two to three weeks after aspiration, the patient's symptoms recurred. She started experiencing variable swelling, pain, occasional ecchymosis, and difficulty walking due to pain in the right knee every two to three weeks, sometimes more frequently. Despite rest, NSAIDs, and aspiration, the patient continued to have RH. She was advised arterial embolization by an orthopedic clinic outside the one where she had surgery. Approximately six and ten months after TKA, the patient underwent two sessions of geniculate arterial embolization by interventional radiology. Areas of staining around the prosthesis due to synovial inflammation were observed in the images of geniculate arterial embolization. The most prominent staining areas were detected in the superior lateral genicular artery, descending genicular artery, and inferior genicular artery, and embolization was performed on these vessels. Following the first session, the frequency and severity of swelling in the knee joint decreased, but the patient's symptoms recurred. Five months later, the patient underwent a second session of geniculate arterial embolization. Despite partial improvement after the second session, the patient developed swelling and pain in the right knee approximately three months later. Laboratory values and knee X-rays were normal, and the patient underwent aspiration of the right knee and received a betamethasone injection by a different orthopedist. Swelling and pain decreased after aspiration and steroid injection, but hemarthrosis recurred

Journal of Clinical Cases

2-3 weeks later. Over the past ten months since the initial hemarthrosis, the patient experienced 5-6 episodes of severe, sometimes mild, swelling and pain in the right knee, totaling 20-30 episodes. Due to persistent symptoms, the patient sought care at a different orthopedic clinic, where a decision was made to perform synovectomy/revision surgery.

During the surgery performed on the right knee, no signs of infection or malrotation were observed in the prosthesis material. Significant synovial thickening and morphological changes resembling PVNS were observed throughout the synovium. The entire synovium from the suprapatellar pouch to the lateral ligaments was excised, and the patellar component was placed after appropriate cutting of the patella. Hypertrophic synovial tissue was seen, and synovectomy and patelloplasty were performed. Macroscopically, synovial material measuring 10x7x3 cm with an irregular appearance and yellow-brown color was removed during the operation. Microscopically, the material was reported as PVNS. Pain gradually decreased after the operation, swelling did not recur, and walking distance increased. During the 6-month follow-up after synovectomy, it was learned that swelling did not recur in the knee, pain had diminished, but there were mild knee pains associated with walking.

**3. Discussion**

In our case, PVNS was detected and successfully treated with synovectomy 14 months after TKA in a patient who developed RH four months after right TKA. Both local and systemic factors may be responsible for the etiology of RH after TKA. Among systemic factors are the use of anticoagulants/antiplatelets, blood dyscrasias, while local factors include iatrogenic causes such as implant malposition and vascular injury, vascular anomalies like aneurysms or AV fistulas, implant loosening, soft tissue impingement such as hypertrophic synovial tissue, PVNS, intra/extrarticular tumors, trauma, infective or proliferative synovium (2, 8). In our case, only iatrogenic vascular injury and the possibility of PVNS among factors that could contribute to RH etiology are present. The intraoperative findings in our patient initially ruled out the presence of PVNS. In cases where RH develops after arthroplasty and PVNS is diagnosed, examining the history of trauma reveals varied scenarios(5). In one case, the patient reported daily treadmill exercise before the onset of symptoms (6), while in another case (4, 9), a direct fall onto the right knee was reported. Conversely, in other cases, there was no history of trauma. Similarly, in our case, there was no history of trauma, but there was a history of intense physical activity for 2-3 days related to moving houses before the onset of swelling and pain in the right knee.

In the cases presented in the literature, the history typically reveals complaints of pain, swelling, and limited movement in the knee joint. Physical examination usually reveals normal range of motion, swelling, effusion, and tenderness in the knee joint, without erythema or increased warmth. Similarly, in our case, RH began with typical symptoms of pain, swelling, and joint stiffness, but unlike other cases, there was also a complaint of redness (erythema) around the knee during episodes of swelling. Laboratory investigations in our case and other cases showed inflammatory markers like ESR and CRP to be normal or slightly elevated, hemorrhagic fluid on aspiration, and no growth on cultures. In two cases from the literature, no specific findings were observed on plain radiographs (4, 5), while in one case, findings consistent with loosening of the tibial component were noted (9). Another case showed findings on knee MRI suggestive of reactive synovitis and posterior PVNS (6). In our case, significant findings were not observed on knee radiographs. On ultrasound, effusion with thin echogenic bands, thickened wall, and marked vascularity were seen in the suprapatellar bursa, with effusion measuring 6.5 mm at its thickest point extending from the suprapatellar bursa to the medial and lateral recesses. MRI of the right knee showed a large collection within the suprapatellar bursa with hyperintense signal on T2-weighted images and hypointense signal on T1-weighted images, suggestive of fluid levels. Fine peripheral enhancement was observed in the collection following IV contrast injection.

Although the etiology of PVNS is unknown, chronic repetitive microtrauma and hemarthrosis have been proposed (4). In the literature, the time interval between TKA and the onset of complaints in cases reported to develop PVNS after TKA was reported as 12 months, 18 months, 3 years and 9 years, respectively (4-7). In a patient who developed non-pigmented villonodular synovitis after TKA, symptoms started 4 years later (9). Ma X et al. presented a case of PVNS developing 14 years after total hip arthroplasty (THA) (10). In cases of PVNS developing 9 and 14 years after TKA and THA, it was suggested that polyethylene abrasion combined with microtrauma due to movements in daily life caused bleeding episodes to form pigmented synovitis. Considering the long interval between arthroplasty and presentation, it was concluded that PVNS was probably due to chronic inflammation that developed as a reaction to polyethylene, metal and cement abrasion (7, 10). In cases of PVNS in the knee reported 12 and 18 months after TKA, the authors stated that it is unlikely that a significant erosion and development of the disease in a relatively short period of time such as 12 and 18 months led to the development of the disease, and that the surgical procedure itself may have initiated the proliferative process or it may have developed spontaneously independent of the surgery (4, 5). In our case, symptoms started 4 months after TKA, which is a much shorter period than in other cases. RHs that develop within the first 6 months after TKA probably occur due to iatrogenic vascular injuries occurring during tibial or posterior condylar incisions (1). In our case, the fact that the complaints appeared after a short period of 4 months suggested that the surgical procedure itself or RH occurring after vascular injury may cause the development of PVNS rather than chronic inflammation developing as a reaction to polyethylene, metal and cement abrasion.

**4. Summary**

In early post-TKA (<6 months) cases of RH, differential diagnosis should include not only trauma, infection, use of anticoagulants/antiplatelets, blood dyscrasias, implant malposition, and vascular injury but also PVNS.

Journal of Clinical Cases

**Referances**


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