Pigmented Villonodular Synovitis After TKA Associated With Tibial Component Loosening

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abstract

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There is no known causal link between total knee arthroplasty (TKA) and pigmented villonodular synovitis (PVNS). There also is no known relationship between PVNS and implant loosening after TKA in the literature. This article presents a case of PVNS in a patient undergoing revision TKA for tibial component loosening. A 74-year-old woman who had undergone cemented bilateral TKA 5 years earlier presented with painful swelling in her right knee. At the time of the primary TKA, no abnormal signs were found in the synovial membrane. Routine follow-up radiographs did not indicate implant loosening. At the patient’s final follow-up examination before revision surgery, a radiolucent lesion was found below the tibial component. During revision surgery, there was focal proliferation of the synovial tissue with heavy pigmentation around the anteromedial part of the tibial component. The abnormal tissue was removed, and the tibial component was exchanged. The articular surface of the polyethylene was not damaged, and backside wear was not found. For the revision surgery, 5-mm thick medial metal block and extension stem were used. Histological analysis of the resected tissue revealed the typical appearance of PVNS.

We present a typical case of PVNS found during revision TKA 5 years after primary TKA. It is hoped this report will encourage surgeons to consider PVNS in the differential diagnosis of patients who present with painful swelling of the knee and to consider PVNS as one of the causes of implant loosening after TKA. Further research about causal factors between PVNS and implant loosening are needed.
Pigmented villonodular synovitis (PVNS) is a relatively rare benign disorder of the synovial tissue characterized by an exuberant proliferation of synovium. The knee is the most commonly affected large joint. Both diffuse and focal forms of the disease occur in the knee. Bony structures of the knee joint can be affected by PVNS.

There is no known causal link between total knee arthroplasty (TKA) and PVNS. There also is no known relationship between PVNS and implant loosening after TKA in the literature. This article presents a case of PVNS in a patient undergoing revision TKA for tibial component loosening. To our knowledge, this has not been reported previously.

**Case Report**

A 74-year-old woman (height, 158 cm; weight, 71 kg; body mass index, 28.4 kg/m$^2$) presented with painful swelling in her right knee. She had undergone cemented bilateral TKA in January 2005. At the time of the primary TKA, there were no abnormal signs suggestive of PVNS in the synovial membrane. Synovectomy was performed minimally for the purpose of enhancing surgical approach. The components implanted were the UKnee System (United Orthopedic Corp, Taipei, Taiwan), which is a fixed-bearing implant with a posterior-stabilized design. The articular insert was ultra high molecular weight polyethylene.

Postoperative radiographs demonstrated well-aligned implant position in both the coronal and sagittal planes (Figure 1). The patient recovered well with no postoperative complications. She underwent follow-up examinations at 2 weeks, 6 weeks, 3 months, 6 months, and 1 year postoperatively according to our routine follow-up protocol. She visited our outpatient clinic annually 1 year postoperatively. She gained 140° of further flexion and had no flexion contracture. The knee joint was stable in varus and valgus stress at full extension and 30° of flexion. During routine follow-up, radiographic findings representing implant loosening were not seen.

Five years after the initial primary TKA, the patient presented with spontaneous pain and swelling of the knee that had lasted for 1 month. There was no history of trauma. On examination, she had no focal tenderness and erythema in the knee. She had good range of motion, but there was a large amount of effusion in the knee joint. Inflammatory markers such as erythrocyte sedimentation rate and C-reactive protein were within normal value.

Routine radiographs revealed a radiolucent lesion in zone 1, according to the evaluation system of the Knee Society (Figure 2). The position of the tibial prosthesis was changed into varus position because the tibial tray had sunk down into a subsided lesion of the medial part of the proximal tibia. The patient was hospitalized, and revision TKA was performed.

During revision surgery, there was focal proliferation of synovial tissue with heavy pigmentation located around the anteromedial part of the tibial component (Figure 3). Tibial component loosening was found in the medial side of tibial plateau. Abnormal tissue was removed, and the tibial component and polyethylene were exchanged. The articular surface of the polyethylene was not damaged, and backside wear was not found. For the revision surgery, a 5-mm thick medial metal block and extension stem were used. Histological analysis of the resected tissue revealed the typical appearance of PVNS (Figure 4).

**Discussion**

Several cases of PVNS found when performing primary TKA have been reported in the literature. However, PVNS in patients who have undergone TKA is rare. Pigmented villonodular synovitis can involve bone in the knee joint, but there has been no report of PVNS with implant loosening in a patient who underwent TKA.
Case Report

present a unique case of PVNS after TKA that was found during revision TKA.

Bone involvement by PVNS has been reported by many investigators. The features of bone involvement by PVNS may be variable, from cystic to osteolytic lesions similar to a tumor. Patients who have diffuse PVNS may have destructive changes in the knee joint, including periarticular cysts, erosions, and joint space narrowing. Although the knee joint is the most frequently affected site of PVNS, bone changes in this location are unusual, in contrast to the hip, which shows a high prevalence of such anomalies.

Bone involvement in PVNS occurs by the growth of villonodular tissue through the vascular foramina, and the blood supply of intraosseous synovium is arranged along vascular stalks. Some researchers have proposed that increased intra-articular pressure, resulting from entrapment of proliferating synovial mass between articulating surfaces, could lead to focal bone reaction.

Expression of some cytokines and metalloproteinase are known to stimulate bone resorption and cartilage matrix degradation. An immunohistochemical study showed that expressions of interleukin 1β, interleukin 6, tumor necrosis factor α, and metalloproteinase 9 were demonstrated in PVNS patients, and that bone resorptive effect and osteoclastic activity of cytokines and metalloproteinase could induce periarticular lytic lesions and progressive articular degenerations.

However, polyethylene wear and metal or cement debris can induce synovitis after primary TKA. Nonpigmented villonodular synovitis may be found after TKA and is thought to represent a reaction to polyethylene, metal, and cement. Idiosyncratic reaction to fine wear debris has been postulated in a patient who had late onset of recurrent spontaneous hemarthrosis after TKA. Although we cannot identify the cause of loosening in our case, we believe it is more likely to be the result of direct involvement of PVNS than the result of reaction by wear debris because we did not find any other features of polyethylene wear during revision surgery.

This case represents an important consideration in the management of revision TKA. It is hoped that this report will encourage other surgeons to consider PVNS in the differential diagnosis of patients who present with painful swelling of the knee and to consider PVNS as one of the causes of implant loosening after TKA. Further research and report about causal factors between PVNS and implant loosening are needed.

**REFERENCES**