CASE REPORT OPEN ACCESS

An unusual case of pigmented villonodular synovitis after unicompartmental knee arthroplasty

Tomohiro Onodera, Hiroshi Tanji, Tokifumi Majima, Tamotsu Kamishima, Akio Minami

ABSTRACT

Introduction: Pigmented villonodular synovitis (PVNS) after replacement arthroplasty is a potential cause of postoperative pain and hemarthrosis. The disease is difficult to diagnose after arthroplasty, since magnetic resonance imaging (MRI) appearances are subject to metal artifact making them less than ideal. Case Report: A case of a 61-year-old woman with PVNS after unicompartmental knee arthroplasty (UKA). She was treated with an arthroscopic synovectomy with good result. Conclusion: MRI evaluation of the residual side of the knee joint after UKA is valuable for the differential diagnosis of PVNS.

Keywords: Pigmented villonodular synovitis (PVNS), Unicompartmental knee arthroplasty (UKA), Hemarthrosis, magnetic resonance imaging (MRI)

Tomohiro Onodera[1], Hiroshi Tanji[2], Tokifumi Majima[3], Tamotsu Kamishima[4], Akio Minami[1]
Affiliations: [1]MD, PhD, Department of Orthopaedic Surgery Hokkaido University Graduate School of Medicine, North 15 West 7, Kita–Ku, Sapporo 060–8638, JAPAN; [2]MD, Sansokai Clark Hospital 2-4 honmachi, Higashi-Ku, Sapporo 065-0042, JAPAN; [3]MD, PhD, Department of Joint Replacement and Tissue Engineering Hokkaido University Graduate School of Medicine North 15 West 7, Kita–Ku, Sapporo 060–8638, JAPAN; [4]MD, PhD, Department of Biomedical Sciences and Engineering Hokkaido University Graduate School of Health Science North 12 West 5, Kita–Ku, Sapporo 060–0812, JAPAN
Corresponding Author: Tokifumi Majima, MD, Ph.D, Department of Joint Replacement and Tissue engineering, Hokkaido University Graduate School of Medicine, North 15 West 7, Kita–Ku, Sapporo 060–8638, JAPAN; Ph: (+81) –11–706–5935; Fax: (+81) –11–706–6054; Email: tkmajima@med.hokudai.ac.jp

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INTRODUCTION

Pigmented villonodular synovitis (PVNS) is a relatively rare, proliferative disease affecting the synovial joints resulting in villous or nodular changes in the synovial tissue, large effusion and bony erosions. PVNS after replacement arthroplasty is rare and to our knowledge, a few cases have been reported in literature [1–5]. We report a case of diffuse PVNS after unicompartmental knee arthroplasty (UKA). This is the first report that uses magnetic resonance imaging (MRI) for differential diagnosis of PVNS after UKA. This disease is difficult to diagnose after arthroplasty, due to artifact typically observed on MRI. However, the appearance of the residual side of the joint on MRI can contribute to the diagnosis of PVNS in UKA patients who present with knee pain and recurrent effusion/hemarthrosis [6].

CASE REPORT

A 61-year-old woman presented with a 5-year history of progressive pain in her knee. Examination and X-ray findings were consistent with a diagnosis of osteoarthritis. She underwent cemented unilateral knee

arthroplasty (Zimmer Unicompartmental High Flex Knee System, Zimmer, Warsaw, Ind) without complication. At the time of surgery, no abnormal synovial membrane findings were detected, and synovectomy was not performed (Figure 1). Although postoperative radiographs demonstrated the oversized prosthesis, the patient progressed well in the first year after the UKA, with a range of motion from 0° to 130° and excellent ligamentous stability. However, 3 years after surgery, she had a spontaneous onset of right knee pain and swelling without history of trauma. She had mild medial-sided tenderness and a moderate knee effusion without erythema or warmth upon examination. Inflammatory markers at the time were normal. Plain radiographs were unremarkable (Figure 2). Arthrocentesis of the right knee showed bloody aspiration, and revealed no growth with cultures. MRI of the right knee was performed using a 0.35 Tesla. Axial T1-weighted spin-echo (TR/TE = 600/15 m·s) and gradient-echo (TR/TE = 800/30 m·s, 30° flip angle) MR images revealed villous shaped synovial proliferation with a large amount of joint effusion (Figure 3). Mild blooming artifact was seen in the synovium on the gradient-echo image. These imaging findings in addition to the bloody aspiration were compatible with PVNS. The patient was then considered to be a candidate for total arthroscopic synovectomy. The synovium was observed to be diffusely inflamed and hemosiderin colored at the time of surgery (Figure 4). The components were well positioned, tracked well, and no polyethylene wear was observed. There was no growth on operative cultures, and histologic analysis of synovial samples revealed PVNS (Figure 5). The patient had no pain with a mild effusion at the one-year follow-up visit after arthroscopic synovectomy.

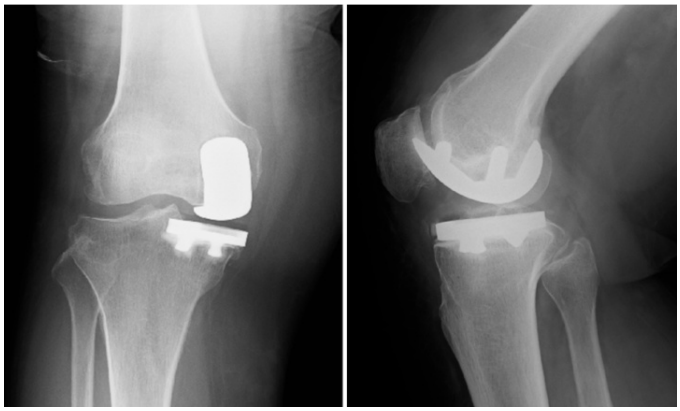

Figure 1: Postoperative anteroposterior and lateral radiographs of the patient showing medial unicompartmental arthroplasty.

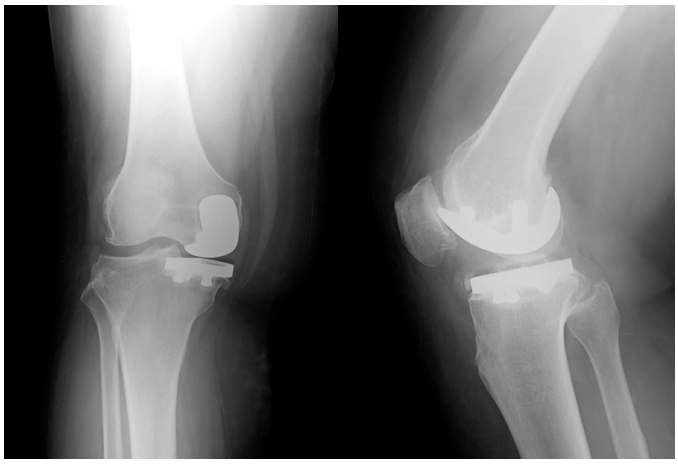

Figure 2: Three years after postoperative anteroposterior and lateral radiographs of the patient showing medial unicompartmental arthroplasty.

DISCUSSION

Pigmented villonodular synovitis is a benign proliferative synovial disorder of unknown etiology that can affect bursae, tendon sheaths, and joints [7, 8]. The incidence of PVNS is 1.8 per one million in the general population and the knee is the most common joint to be affected [9].

It has been reported that PVNS is diagnosed an average of 4.4 years after presentation without MRI [10]. The decision to perform arthroscopic observation in a patient who previously underwent arthroplasty is difficult due to the artifact with the MRI and the risk of infection. Articular implants are considered as devices, which limit MRI visualization due to the induction of susceptibility artifacts. However, the MRI in the residual portion of the joint in patients with a history of UKA is visible [6]. In this case, MRI was safely applied and was valuable in making the decision to proceed with the arthroscopy. Our case shows the clinical value of MRI of patients with UKA.

The etiology of PVNS is unknown, although chronic recurrent micro-trauma and hemarthrosis have been suggested [9]. There were two previous reports in

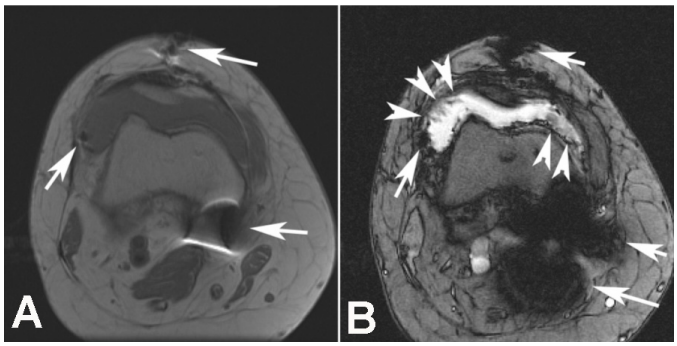

Figure 3: Postoperative axial T1-weighted spin-echo (A) and gradient echo (B) MR images of the right knee. (A) Multiple metal artifacts are seen on the T1-weighted spin-echo image (white arrows). (B) Gradient-echo image on the same slice position as (A) revealed villous shaped synovial proliferation in the expanded joint space. Mild blooming artifact was seen in the synovium (arrowheads). Metal artifacts (white arrows) are stronger on gradient-echo image than on T1-weighted image. These imaging findings in addition to bloody aspiration were compatible with pigmented villonodular synovitis.

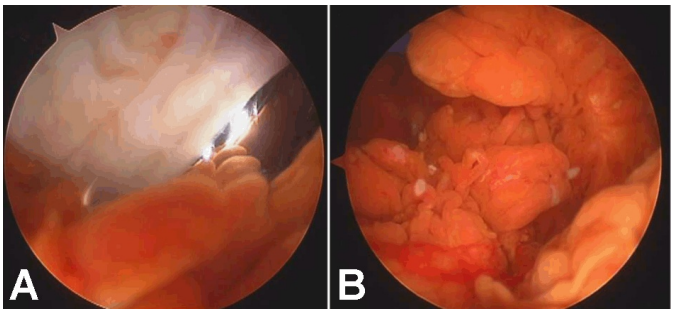

Figure 4: Intraoperative arthroscopic pictures demonstrating pigmented villonodular synovial proliferation in front of the femoral component (A) and suprapatellar pouch (B).

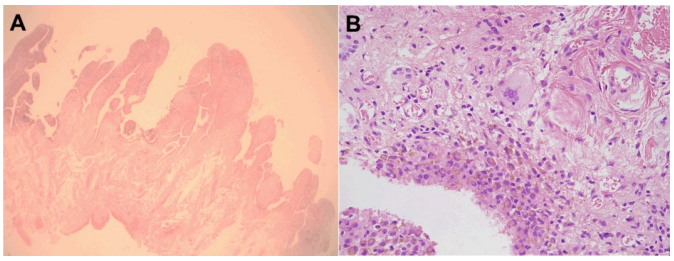

Figure 5: Histopathological findings. Hematoxylin and eosin-stained section of resected synovium showing multinucleated giant cells, foamy cells, hemosiderin deposition, and stromal and fibroblast cell proliferation. (Original magnification, x100 for Figure 5A and x400 for Figure 5B).

literature of patients who presented with PVNS 9 and 14 years after total hip arthroplasty [3, 9]. Both reports suggested that the proliferative synovitis was possibly due to a chronic inflammatory reaction from the implants because of the long period between arthroplasty and presentation. Some authors have considered the etiology of relatively early onset of the PVNS after arthroplasty [2, 5]. One possibility is that the condition spontaneously develops independent of the surgery. Another possibility is that the operative procedure itself could initiate PVNS. Although we could not detect any implant failure or visible wear particles arthroscopically in our case, inadequate size or position of the implants might induce PVNS. MRI did detect some metal artifacts in the knee joint, suggesting that we should consider the possibility of an inflammatory reaction to the wear of implanted materials. Further reports and studies are required to fully understanding the etiology of PVNS.

We present an unusual case of PVNS after UKA. Although rare, we recommend considering PVNS in the differential diagnosis of patients presenting with knee pain and recurrent effusion/hemarthrosis after UKA. MRI is typically considered not valuable following arthroplasty; however, we found it helpful in assisting with making the diagnosis of PVNS in our patient following UKA.

CONCLUSION

The evaluation of the residual side of knee joint after UKA by MRI is potentially valuable for the different diagnosis of PVNS.

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Author Contributions

Tomohiro Onodera – Substantial contributions to conception and design, Analysis and interpretation of data, Drafting the article, revising it critically for important intellectual content, Final approval of the version to be published
Hiroshi Tanji – Substantial contributions to conception and design, acquisition of data, Drafting the article, Final approval of the version to be published
Tokifumi Majima – Substantial contributions to conception and design, Revising it critically for important intellectual content, Final approval of the version to be published
Tamotsu Kamishima – Analysis and interpretation of data , Drafting the article, Final approval of the version to be published
Akio Minami – Substantial contributions to conception and design, Revising it critically for important intellectual content, Final approval of the version to be published

Guarantor

The corresponding author is the guarantor of submission.

Conflict of Interest

Authors declare no conflict of interest.

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REFERENCES

1. Ballard WT, Clark CR, Callaghan JJ. Recurrent spontaneous hemarthrosis nine years after a total knee arthroplasty. A presentation with pigmented villonodular synovitis. J Bone Joint Surg Am 1993;75(5):764–7.
2. Bunting D, Kampa R, Pattison R. An unusual case of pigmented villonodular synovitis after total knee arthroplasty. J Arthroplasty 2007;22(8):1229–31.
3. Ma X, Xia C, Wang L, Zhao L, Liu H, He J. An unusual case of pigmented villonodular synovitis 14 years after total hip arthroplasty. J Arthroplasty 2011;26(2):339.e5–6.

4. Mohanlal P, Pillai D, Jain S. A rare case of pigmented villonodular synovitis after unicompartmental knee replacement: a case report. Cases J 2009;2:9076.
5. Oni JK, Cavallo RJ. A Rare Case of Diffuse Pigmented Villonodular Synovitis After Total Knee Arthroplasty. J Arthroplasty 2011;26(6):978.e9–978.e11.
6. Aliprandi A, Sconfienza LM, Randelli P, et al. Magnetic resonance imaging of the knee after medial unicompartmental arthroplasty. Eur J Radiol 2011;80(3):e416–21.
7. Dorwart RH, Genant HK, Johnston WH, Morris JM. Pigmented villonodular synovitis of synovial joints: clinical, pathologic, and radiologic features. AJR Am J Roentgenol 1984;143(4):877–85.
8. Goldman AB, DiCarlo EF. Pigmented villonodular synovitis. Diagnosis and differential diagnosis. Radiol Clin North Am 1988;26(6):1327–47.
9. Myers BW, Masi AT. Pigmented villonodular synovitis and tenosynovitis: a clinical epidemiologic study of 166 cases and literature review. Medicine (Baltimore) 1980;59(3):223–8.
10. Cotten A, Flipo RM, Chastanet P, Desvigne-Noulet MC, Duquesnoy B, Delcambre B. Pigmented villonodular synovitis of the hip: review of radiographic features in 58 patients. Skeletal Radiol 1995;24(1):1–6.