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CASE REPORT

Radiotherapy Inducing Total Knee Prosthetic Component Loosening for Recurrent Pigmented Villonodular Synovitis following Joint Replacement

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Pigmented villonodular synovitis (PVNS) following total knee arthroplasty (TKA) is a rare condition. We reported a case of PVNS following TKA; initially, arthroscopic synovectomy was performed; however, recurrence of PVNS happened. We performed second arthroscopic synovectomy and moderate dose radiotherapy (total dose 44 cGy/22 fractions to posterior fossa, 36 cGy/18 fractions to knee) for the patient. Unfortunately, distal femur osteonecrosis with femoral and tibial component loosening happened 2 months after completing the radiotherapy procedure. Revision TKA with Legacy Constrained Condylar Knee was done. Radiotherapy is not recommended for recurrent PVNS after TKA.

Key words: Pigmented villonodular synovitis, total knee arthroplasty, radiotherapy

INTRODUCTION

Pigmented villonodular synovitis (PVNS) is a proliferative disorder which damages the synovial tissue in joints and results in villous or nodular changes with large effusions or bony erosions.[1] The disease affected commonly in male and present between the ages of 11 and 84 years.[2] Treatment usually needs complete removal of all the diseased synovial tissue by arthroscopic synovectomy; postoperative radiation therapy can be effective in certain cases of recurrent PVNS following arthroscopic treatment.[3] PVNS after total knee arthroplasty (TKA) is rare, and to our knowledge, only few cases have been reported in the literature.[4-7] In this presentation, we reported a case of PVNS following TKA; initially, arthroscopic synovectomy was performed; unfortunately, recurrence of PVNS happened. What should we do for next procedure will be discussed.

CASE REPORT

An 81-year-old woman presented with symptomatic osteoarthritis of the left knee underwent cemented TKA 6 years ago. No abnormality of the synovial membrane was noted during operation. Postoperative radiographs demonstrated good alignment of the prostheses, and the patient's hospital course was uncomplicated. The patient had a range of motion from 0° to 130° and excellent ligamentous stability of the knee.

The patient sustained a fall on her left knee 1.5 years ago. She had a complaint of painful swelling of left knee with repeated effusion since then. She came to our clinic, and physical examination revealed marked, localized medial-sided tenderness with marked effusion. Mild warmth and erythema were noted. Plain films showed well alignment of total knee prosthesis without loosening [Figure 1]. Arthrocentesis was performed, and total volume of 40 ml fresh blood was aspirated out. Two weeks later, repeated hemarthrosis happened with 50 ml fresh blood. The culture was done; the result showed no growth of bacteria. The laboratory examinations revealed normal C-reactive protein, erythrocyte sedimentation rate, and white cell count. There was no sign of septic TKR.

Arthroscopic examination was recommended for her because of recurrent hemarthrosis following TKA. During the

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arthroscopic procedure, diffusely villous, hemosiderin-colored synovial tissue noted within the whole joint [Figure 2]. The components of prosthesis were well fixed; well tracking of patellar prosthesis without polyethylene wear was noted. Arthroscopic synovectomy was performed; the abnormal synovial tissue was removed as much as possible. However, residual some villous synovial tissue over the popliteal region which was very difficult to approach during arthroscopic procedure noted. The pathology report revealed a typical appearance of PVNS, diffuse type [Figures 3 and 4].

Unfortunately, recurrent PVNS with repeated hemarthrosis occurred 8 months after previous arthroscopic procedure. We performed arthroscopic synovectomy again and arranged postoperative radiotherapy for her knee because of recurrent of PVNS. Two months after completing the procedure of radiotherapy (total dose 44 cGy/22 fractions to posterior fossa, 36 cGy/18 fractions to knee), she got painful weight bearing of her left knee. She denied any trauma episode during recent 2 months. Radiographs showed osteonecrosis and fracture of distal femur around femoral prosthesis which also demonstrated femoral component loosening [Figure 5]. The revision total knee replacement with Legacy Constrained Condylar Knee was performed [Figure 6]. During operation, residual some PVNS over popliteal region was still noted. We treated residual PVNS over the popliteal region by direct open synovectomy from the posterior capsule during the revision TKA.

During the follow-up period after revision TKA, there was no any symptomatic syndromes such as knee pain over swelling. We highly suspected that there was no recurrence. Postoperative recovery of knee function was achieved; the

Figure 1: Postoperative radiographs of total knee arthroplasty showed a good alignment

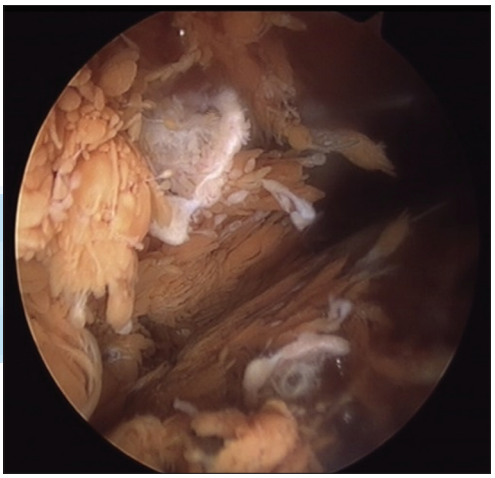

Figure 2: Arthroscopy demonstrates mirror view of diffuse pigmented villonodular synovitis with femoral prosthesis

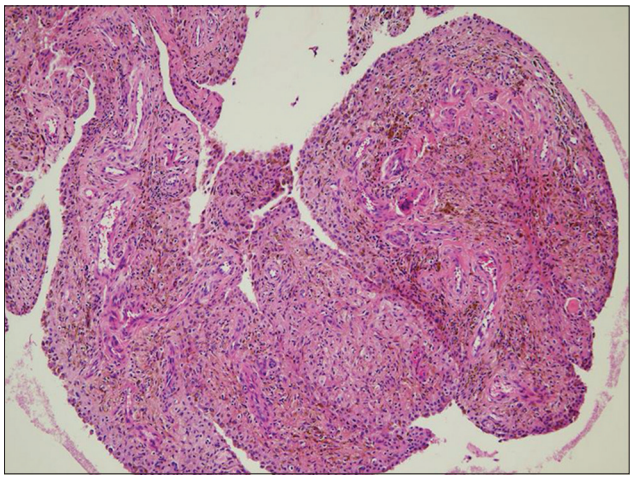

Figure 3: Villous appearance of the proliferation and hyperplastic synovium in low power field (×100)

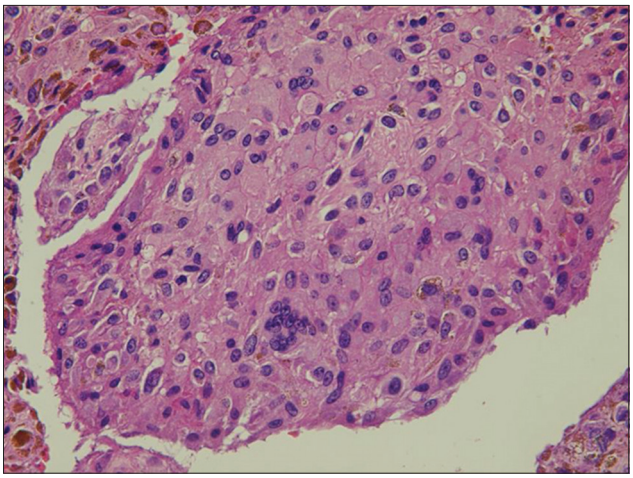

Figure 4: Rounded or polygonal histiocyte-like mononuclear cells with eosinophilic cytoplasm and scattered multinucleated giant cells in high power field (×400)

Figure 5: Postoperative radiotherapy 2 months later, radiographs showed osteonecrosis and fracture of distal femur, the femoral component was loosening

range of motion of knee after revision TKA achieved 0–120° flexion.

DISCUSSION

The PVNS following TKA is rare condition and only few cases reported in the literature.[4-7] The true etiology of PVNS is unknown, and repeated hemarthrosis or microtrauma has been suspected.[2] According to this cases report, the treatment of PVNS after TKA included arthroscopic shaving and removal of inflammation tissue or arthroscopic synovectomy plus adjuvant radiotherapy to decrease recurrence or revision arthroplasty if PVNS-induced loosening implant.[4-7] In our case, postoperative radiotherapy for recurrent PVNS because of failure of initial arthroscopic synovectomy inducing prosthesis loosening was not been reported before.

The treatment for PVNS needs meticulous resection of affected synovial tissue by open or arthroscopic synovectomy.[8-15] Arthroscopic synovectomy is preferred to open one because arthroscopic access allows radical synovectomy, as morbidity is lower than open procedure.[16] However, recurrent PVNS may happen after arthroscopic synovectomy because it may not clean all inflammatory synovial tissues, especially in popliteal region.[4] Thus, radiotherapy is considered as an adjunct treatment after synovectomy to prevent recurrence. Thus, adjuvant postoperative external beam radiation therapy for extensive diffuse and recurrent PVNS of the primary knee is a reliable treatment method.[17-20] In current literature, dose of radiotherapy administrated for postoperative PVNS ranges from 20 to 40 Gy, and outcome is preferable with low recurrence. However, many concerns about postoperative

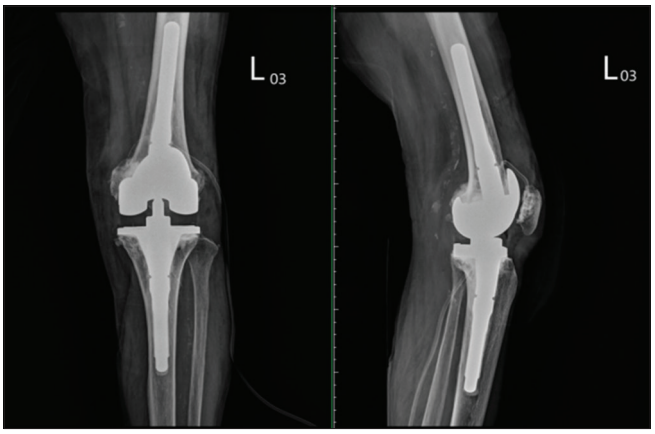

Figure 6: Postoperative radiographs of revision total knee arthroplasty with Legacy Constrained Condylar Knee

radiotherapy of PVNS are radiotherapeutic effect, such as radiotherapy-induced secondary malignancy or joint stiffness. But there is no report about the implant loosening.

In general speaking, dose higher than 60 Gy is considered high dose of radiotherapy, and complications such as malignancy change or osteonecrosis may occur, but they are uncommon. Dose between 30 and 50 Gy is considered moderate dose, and it is commonly used for preventing recurrent disease just like our case, and the most common complications are arthrofibrosis of knee and localized inflammation. Dose lower than 30 Gy is considered low dose and relative complications are rare. Unfortunately, osteonecrosis of distal femur with prosthetic components loosening after radiotherapy happened in our case, this situation is rarely discussed and reported. The cause of this complication is unclear; osteoporosis of the femur around the prosthesis in such old age patient may be not a good candidate for radiotherapy which may induce pathological fracture and components loosening consequently to undergo revision TKA.

According to journal searching, there is no gold standard therapy aiming at failure of subsequent arthroscopic synovectomy due to PVNS after TKA. Secondary arthroscopic synovectomy plus postoperative radiotherapy may recommend for recurrent PVNS according to the literature report in primary knee but in the case of PVNS after arthroplasty is questionable. Ma *et al.* also recommend that revision arthroplasty may indicate if implant loosening occurs for PVNS after TKA.[21]

CONCLUSION

Arthroscopic synovectomy for PVNS after TKA may have a good result. If PVNS recurrence after initial arthroscopic procedure, postoperative radiotherapy is not recommended because it may induce prosthesis loosening due to osteonecrosis

of bone around the implants. Repeated arthroscopic procedure may be a safer procedure than radiotherapy in such patient.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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