

The Role of Rehabilitation in Pigmented Villonodular Synovitis: A Multidisciplinary Approach with Surgery and Radiotherapy

Pigmente Villonodüler Sinovitte Rehabilitasyonun Rolü: Cerrahi ve Radyoterapi ile Multidisipliner Yaklaşım

 Emine DÜNDAR AHİ^a,  Rabia TERZİ^b

^aDepartment of Primary Care-İntercal Medicine, Pfizer Pharmaceuticals Ltd., İstanbul, Türkiye

^bPrivate Physician, Kocaeli, Türkiye

ABSTRACT Pigmented villonodular synovitis (PVNS) is a rare but locally aggressive proliferative disease of the synovial membrane. It most commonly affects large joints, particularly the knee. Despite surgical excision, it has a high recurrence rate and may require adjuvant treatment. In this case report, we discuss a 40-year-old female patient. Despite undergoing 2 surgical procedures, she experienced 2 recurrences. Complications such as post-operative infection further complicated the treatment process. Due to the aggressive course of the disease and the high risk of recurrence, the patient underwent radioisotope therapy (radiosynovectomy). This case highlights the necessity of adjuvant treatments alongside surgery in the management of PVNS and underscores the importance of a multidisciplinary approach. Long-term follow-up plays a critical role in disease management.

Keywords: Pigmented villonodular synovitis; knee joint; magnetic resonance imaging; physical therapy

ÖZET Pigmente villonodüler sinovit (PVNS), sinovyal membranın nadir ancak lokal olarak agresif seyreden proliferatif bir hastalığıdır. Büyük eklemleri, özellikle diz eklemi en sık etkiler. Cerrahi eksizyona rağmen yüksek nüks oranına sahip olup, adjuvan tedavi gereksinimi doğurabilir. Bu olgu sunumunda 40 yaşında bir kadın hasta ele alınmıştır. İki kez cerrahi uygulanmasına rağmen 2 kez nüks yaşanmıştır. Cerrahi sonrası enfeksiyon gibi komplikasyonlar tedavi sürecini zorlaştırmıştır. Hastalığın agresif seyri ve yüksek nüks riski nedeniyle, hastaya radyoizotop tedavisi (radyosinovektomi) uygulanmıştır. Bu olgu, PVNS tedavisinde cerrahinin yanı sıra adjuvan tedavilerin gerekliliğini ve multidisipliner bir yaklaşımın önemini vurgulamaktadır. Uzun dönem takip, hastalığın yönetiminde kritik bir rol oynamaktadır.

Anahtar Kelimeler: Pigmente villonodüler sinovit; diz eklemi; manyetik rezonans görüntüleme; fizik tedavi

Pigmented villonodular synovitis (PVNS), also known as tenosynovial giant cell tumor (TGCT), is a proliferative disease of histiocytes originating from the synovial membrane that can affect joints, tendon sheaths, and bursae. It most commonly affects large joints, such as the knee (accounting for almost 80% of cases), followed by the hip and ankle.^{1,2}

It most commonly occurs between the ages of 30-50 and affects both sexes equally.^{3,4} The diagnosis of

PVNS is primarily made using MRI, physical examination findings, radiographs, and tissue pathology.⁵

There are 2 types of PVNS: localized and diffuse (D-PVNS). Although these 2 types are histologically similar, they differ clinically and radiologically.⁶

The main symptoms include pain, swelling, stiffness, and mild to severe limitation of the range of motion (ROM) in the affected joint.^{3,7}

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Correspondence: Emine DÜNDAR AHİ

aDepartment of Primary Care-İntercal Medicine, Pfizer Pharmaceuticals Ltd., İstanbul, Türkiye

E-mail: eminedundarahi@gmail.com

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Treatment strategies are primarily based on the excision of the pathological tissue, but the optimal treatment approach remains unclear. Surgical resection is the primary treatment method for both localized and diffuse PVNS and includes arthroscopic or open excision as well as partial or extensive synovectomy.⁸

In addition to surgical resection, various treatment modalities have been used to achieve favorable outcomes in PVNS, including external beam radiation, radiosynoviorthesis (most commonly with Yttrium-90), cryosurgery, and, more recently, targeted therapy with monoclonal antibodies and specific inhibitory molecules.¹

CASE REPORT

A 40-year-old female patient presented to the orthopedic clinic approximately 3 years ago with complaints of pain in her left knee and swelling behind it. The patient was 165 cm tall and weighed 70 kg. The patient had no history of any additional diseases or regular medication use. There was also no history of trauma to the left knee in her medical background. MRI revealed grade 2 degeneration of the medial meniscus, a lobulated cystic lesion with septations in the popliteal fossa measuring 140×58×84 mm, and 2 additional cystic lesions measuring 26×12 mm and 20×10 mm in the popliteal fossa.

The mass and synovial tissue in the popliteal area were excised arthroscopically. Pathological examination revealed thick papillary structures covered with synovium, multinucleated giant cells, and chronic inflammation with stromal and hemosiderin accumulation. Based on these findings, a diagnosis of PVNS was made.

The patient, who had no complaints for 1 year, experienced swelling and pain in another area behind the knee 1 year after the operation. An MRI examination revealed a cystic structure in the popliteal fossa with dense content and lobulated contours, measuring approximately 6×2 cm and 3×1.5 cm, respectively (Figure 1). Considering the recurrence of PVNS, arthroscopic surgery was performed again, and the synovial tissues were excised.

Two years after the second operation, the patient presented with the same complaints. MRI revealed

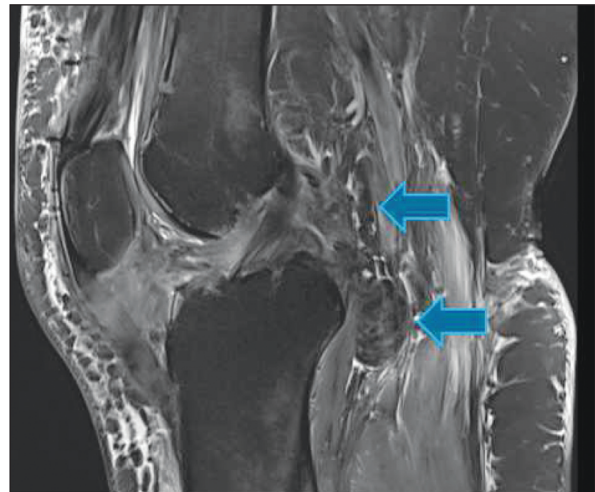


FIGURE 1: In the T2-weighted fat-suppressed sagittal MRI section, diffuse, irregular synovial hypertrophy with lobulated contours and villous projections is observed.

giant lesions extending from the posterior cruciate ligament (PCL) tendon to the popliteal fossa, measuring 8.5×3 cm, connected to each other, containing hypodense cystic foci on T1 and T2 sequences, along with synovial hypertrophy, suggesting PVNS recurrence. This time, open surgery was planned. A 15-cm posterior knee incision was made, and the mass with PVNS appearance was dissected and excised along the medial gastrocnemius to the PCL and posterior capsule. In addition, the mass adjacent to the suprapatellar medial and lateral Hoffa fat pad was excised through a 10-cm longitudinal anterior incision.

One month after the operation, a discharge wound developed behind the knee. The wound was opened, the infected tissue was curetted, and the cultures were taken. In the patients' laboratory results: the leukocyte count was 10,500 per microliter of blood, the erythrocyte sedimentation rate was 35 mm/h, and the C-reactive protein level was 65 mg/L. The patient was started on infection treatment with 1,000 mg ampicillin and 500 mg sulbactam (Vial containing DUOCID® 1 g IM/IV injectable powder, Pfizer, Türkiye) administered intravenously for 10 days. After completing the infection treatment and observing a decrease in the elevated infection markers, the patient was enrolled in a rehabilitation program at our clinic due to knee stiffness and pain. Transcutaneous electrical nerve stimulation was applied for 20 min and infrared therapy for 15 min, 5

days a week for 2 weeks. ROM exercises and quadriceps strengthening exercises were performed within the patients' pain threshold. As a result, the patient's pain significantly decreased, and the knee ROM improved from 30° to 130°.

Due to multiple recurrences, radiosynovectomy (RS) was planned. In June 2024, a 6-mL Y-90 citrate colloid injection was administered into the left knee joint under ultrasound guidance. Following the colloid injection, steroid and saline injections were also performed intra-articularly. Scintigraphic imaging confirmed that the radiopharmaceutical was appropriately distributed within the joint. The patient was then followed up with a home exercise program. A written informed consent was obtained from the patient for this publication.

DISCUSSION

PVNS, now more commonly referred to as TGCT, is a rare but frequently locally aggressive proliferative disease of the synovial joint tissue. PVNS has a high recurrence rate, particularly despite intra-articular surgical interventions.¹ In our case, recurrence occurred despite the initial surgical approach. Ultimately, 6 mL of Y-90 citrate colloid was injected into the left knee joint under ultrasound guidance following open surgery.

PVNS most commonly affects individuals between the ages of 30-50 and occurs equally in both sexes.^{3,4} Our patient was diagnosed at age 40 under similar circumstances.

Our patients' presentation with pain and swelling, followed by surgical intervention, aligned with the typical clinical course of PVNS. The patient's symptom relief for 1 year after the initial arthroscopic surgery indicates that the surgical treatment was successful in the short term. However, the aggressive recurrence tendency of the disease could not be controlled in the long term. Open surgery and additional treatment options following recurrence, particularly modern approaches such as radiosynovectomy, are gaining increasing attention in the literature for the management of PVNS.⁹

RS is a treatment method involving the intra-articular injection of a radionuclide substance in the

colloidal form. Upon reaching the joint space, the colloidal radionuclide is recognized as a foreign body by the cell-rich upper layer of the synovial membrane and is phagocytosed by the synovial cells.¹⁰ Colloidal Y-90 emits beta radiation, with an average tissue penetration of 3.6 mm in the synovial tissue. This results in selective irradiation of the synovial tissue, a reduction in inflammatory cell proliferation, and necrosis of synovial cells.¹¹

The effectiveness of RS largely depends on the treated joint, the radioactive material used, and the method of administration. The feasibility of the treatment is also influenced by the patient's remaining life expectancy. De la Corte-Rodriguez et al. evaluated RS in patients with hemophilia and found that the effectiveness of the treatment depends on both patient- and joint-related factors.¹²

Many factors contribute to the recurrence of PVNS. The prevailing view is that incomplete removal of diseased synovial tissue is the primary cause of PVNS recurrence.¹³ In our patient, arthroscopic surgery was initially performed, but when recurrence was observed 2 years later, wide excision was preferred in open surgery. The mass, which appeared consistent with PVNS, was dissected and excised along the medial gastrocnemius to the vicinity of the PCL and posterior capsule. In addition, the mass adjacent to the suprapatellar medial and lateral Hoffa fat pad and PCL was excised through a 10 cm longitudinal anterior incision. Song et al., in a 2023 study involving 19 cases, continued to advocate for arthroscopic surgery in diffuse PVNS cases. They reported that their arthroscopic total synovial peel method both reduced recurrence rates and facilitated patients' return to daily life.¹⁴ Conversely, some researchers emphasize preserving the mass and maintaining a healthy tissue margin in surgical approaches, considering the crucial role of synovial tissue in joint nutrition.¹⁵

The necessity of adjuvant treatments alongside surgery for PVNS has been emphasized in numerous studies. Postoperative radiotherapy (RT) is considered a preventive treatment approach, particularly in cases with a high risk of recurrence after excision.¹⁶

In Kotwal's series, no recurrence was observed in any patients who received RT, leading to the con-

clusion that postoperative RT is effective in preventing local recurrence in high-risk cases.¹⁷

In PVNS patients with high recurrence rates, long-term follow-up after treatment is crucial. Our case demonstrated that the patients' quality of life is directly related to the frequency of recurrences and that a multidisciplinary approach is essential. As in our case, repeated surgeries followed by physical therapy programs were effective in improving the ROM and symptom control. However, complications such as recurrent infections complicate the treatment process.

In conclusion, although surgery is considered the first-line treatment for PVNS, adjuvant treatment options, particularly RS and targeted therapies, should be considered in recurrent cases. Despite being a rare

disease, PVNS has an aggressive course, requiring a multidisciplinary approach and long-term follow-up for optimal management.

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Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

REFERENCES

- Panciera A, Colangelo A, Di Martino A, et al. Total knee arthroplasty in pigmented villonodular synovitis osteoarthritis: a systematic review of literature. *Musculoskelet Surg.* 2024;108:145-52. [PubMed] [PMC]
- Tan YC, Tan JY, Tsitskaris K. Systematic review: total knee arthroplasty (TKA) in patients with pigmented villonodular synovitis (PVNS). *Knee Surg Relat Res.* 2021;33:6. [PubMed] [PMC]
- Li Y, Mei L, Li T, et al. Clinical outcomes of patients with pigmented villonodular synovitis of the shoulder after arthroscopic synovectomy. *BMC Musculoskelet Disord.* 2022;23:1023. [PubMed] [PMC]
- Chiang ER, Ma HL, Wang ST, et al. Arthroscopic treatment for pigmented villonodular synovitis of the shoulder associated with massive rotator cuff tear. *Arthroscopy.* 2009;25:716-21. [PubMed]
- Dorwart RH, Genant HK, Johnston WH, et al. Pigmented villonodular synovitis of the shoulder: radiologic-pathologic assessment. *AJR Am J Roentgenol.* 1984;143:886-8. [PubMed]
- Su W, Zhou Y, Lu W, et al. Short-term outcomes of synovectomy and total knee replacement in patients with diffuse-type pigmented villonodular synovitis. *J Knee Surg.* 2021;34:247-50. [Crossref] [PubMed]
- Pereira VL, Baldan AR, Andreoli CV, et al. Subacromial pigmented villonodular synovitis: case report and review. *J Surg Case Rep.* 2021;2021:rjab019. [PubMed] [PMC]
- Verspoor FG, van der Geest IC, Vegt E, et al. Pigmented villonodular synovitis: current concepts about diagnosis and management. *Future Oncol.* 2013;9:1515-31. [Crossref] [PubMed]
- Nacı B, Koca G, Genç H, et al. Kronik uzamış artrit olan andifferansiye artritli bir olguda radyosinovektomi [Radiosynovectomy in a patient with chronic protracted undifferentiated arthritis]. *Türk Fiz Tıp Rehab Derg.* 2013;59:271-2. [Crossref]
- Türkmen C, Zülflükar B, Taşer O, et al. Radiosynovectomy in hemophilic synovitis: correlation of therapeutic response and blood-pool changes. *Cancer Biother Radiopharm.* 2005;20:363-70. [Crossref] [PubMed]
- Schneider P, Farahati J, Reiners C. Radiosynovectomy in rheumatology, orthopedics, and hemophilia. *J Nucl Med.* 2005;46 Suppl 1:48S-54S. [PubMed]
- de la Corte-Rodriguez H, Rodriguez-Merchan EC, Jimenez-Yuste V. Radiosynovectomy in patients with chronic haemophilic synovitis: when is more than one injection necessary? *Eur J Haematol.* 2011;86:430-5. [Crossref] [PubMed]
- Keyhani S, Kazemi SM, Ahn JH, et al. Arthroscopic treatment of diffuse pigmented villonodular synovitis of the knee: complete synovectomy and septum removal-midterm results. *J Knee Surg.* 2019;32:427-33. [Crossref] [PubMed]
- Song HQ, Wu GF, Qi WZ, et al. Diffuse pigmented villonodular synovitis treated with arthroscopic total synovial peel. *BMC Surg.* 2023;23:12. [Crossref] [PubMed] [PMC]
- Demiral AN, Bayman E, Havıçioğlu H, et al. Pigmente villonodüler sinovistite radyoterapi, iki olgu sunumu [Pigmented villonodular synovitis and radiotherapy, report of two cases]. *Türk Onkoloji Dergisi.* 2004;19:119-24. [Link]
- O'Sullivan B, Cummings B, Catton C, et al. Outcome following radiation treatment for high-risk pigmented villonodular synovitis. *Int J Radiat Oncol Biol Phys.* 1995;32:777-86. [PubMed]
- Kotwal PP, Gupta V, Malhotra R. Giant-cell tumour of the tendon sheath. Is radiotherapy indicated to prevent recurrence after surgery? *J Bone Joint Surg Br.* 2000;82:571-3. [PubMed]