**Ten-Year Retrospective Study on Pigmented Villonodular Synovitis of the Knee at the National Orthopaedic Hospital, Igbobi, Lagos**

**Abstract**

**Background:** Pigmented villonodular synovitis (PVNS) is a rare, benign proliferative disorder affecting the synovium, commonly involving the knee joint. This study aimed to provide an overview of PVNS, discuss its clinical presentation and diagnostic challenges

**Methods:** This retrospective study analyzed medical records of patients diagnosed with pigmented villonodular synovitis (PVNS) at the National Orthopaedic Hospital, Igbobi, Lagos, between January 2010 and December 2021. Patients with histopathologically confirmed PVNS and complete medical records were included. Data were collected on demographics and clinical presentation.

**Results:** A total of 10 patients were included, with a mean age of 37.7 ± 7.4 years. The cohort was predominantly female (60%) and urban residents (80%), with 70% having tertiary education. Pain was the most common symptom (50%), followed by swelling (30%) and limited mobility or joint instability (10% each). The right knee was affected in 80% of cases, and 20% had bilateral involvement.

**Conclusions**: PVNS predominantly affects middle-aged individuals and frequently involves the knee joint, with pain as the leading clinical symptom. It is important for the physician to have a high index of suspicion and target treatment to ensure removal of all abnormal tissue, reduce pain, reduce the risk of joint destruction and avoid recurrence.

**Keywords:** Pigmented villonodular synovitis, diffuse PVNS, knee, Lagos, orthopedic

**1. INTRODUCTION**

Pigmented Villonodular Synovitis (PVNS) is a rare but significant synovial proliferative disorder that presents a diagnostic challenge due to its nonspecific clinical presentation and subtle radiographic features (Koutalos et al., 2022). First described over a century ago (Jaffe et al., 1941), PVNS remains a relatively uncommon condition, with an estimated annual incidence of 1.8 cases per million (Mwangangi et al., 2023). Its rarity often complicates timely diagnosis and management, necessitating heightened clinical awareness among healthcare providers.

PVNS is characterized by a benign yet locally aggressive proliferation of synovial tissue, leading to excessive growth of histiocytes within the synovium (Aggarwal et al., 2019; Zhao et al., 2021). This results in synovial hyperplasia and pigment deposition, particularly hemosiderin, which can affect the joints, tendon sheaths, and bursae (Kapoor et al., 2016). The knee is the most commonly affected joint, accounting for approximately 70% of cases, followed by other large joints such as the hip, ankle, and shoulder (Kapoor et al., 2016). The condition is largely monoarticular (Pereira et al., 2021), although rare cases of polyarticular involvement have been documented (Zhao et al., 2016; McKean et al., 2016).

PVNS can be classified into two types: diffuse PVNS (DPVNS), which involves the entire synovium of the joint, and localized PVNS (LPVNS), which is typically confined to a specific area, such as a tendon sheath or bursa (Gao et al., 2017). Furthermore, these types can be categorized based on their anatomical location as intraarticular or extraarticular (Kim et al., 2018). This classification aids in diagnosis and guides treatment decisions, as diffuse forms tend to be more aggressive and recurrent than localized forms.

PVNS commonly presents with symptoms such as progressive joint pain, swelling, and stiffness, leading to a reduced range of motion in the affected joint (Qureshi and Dudani, 2020). Patients may also report recurrent joint effusion, localized tenderness, and mechanical symptoms like joint locking or giving way (Kim et al., 2019; Chen et al., 2022). The diagnosis of PVNS typically involves a combination of clinical evaluation, imaging studies, and histopathological confirmation (Sharma et al., 2005). Clinically, patients often have a history of worsening symptoms that do not respond to standard treatments (Cook et al., 2020). During a physical examination, the joint may appear swollen and tender, with limited movement. Imaging plays a critical role in diagnosing PVNS. Magnetic resonance imaging (MRI) is considered the gold standard because it provides detailed images of the synovium (Hill et al., 2007). On MRI, PVNS appears as areas of low signal intensity on T2-weighted images due to the presence of hemosiderin (a blood breakdown product) and synovial thickening (Yang et al., 2019). Histopathological examination is essential for confirming the diagnosis. This involves analyzing synovial tissue obtained through biopsy or surgical excision (Koutalos et al., 2022; Ramzi et al., 2022). The characteristic findings include hemosiderin-laden macrophages, multinucleated giant cells, and a highly vascularized synovium (Sikaria et al., 2013; Prieto-Potin et al., 2015). Arthroscopy, a minimally invasive procedure, can also aid in diagnosis by allowing direct visualization of the pigmented and hypertrophic synovium and facilitating tissue sampling (Li et al., 2023).

Despite decades of study, the exact etiology of PVNS remains largely unknown. Current hypotheses suggest that it is a reactive process rather than a true neoplastic condition, potentially triggered by trauma, repeated intraarticular bleeding, or chronic inflammation (Qureshi and Dudani,, 2020; Cao et al., 2020). Genetic and molecular studies have also implicated chromosomal abnormalities and overexpression of colony-stimulating factor 1 (CSF1) in the pathogenesis of PVNS, shedding light on its complex biology (Ota et al., 2015; Dallatorre et al., 2023).

If left untreated, PVNS can lead to severe complications, including joint destruction, deformity, degenerative articular changes, and secondary osteoarthritis (Temponi et al., 2017). The diffuse form is particularly prone to joint damage due to its aggressive nature, resulting in pain, swelling, and functional limitations (Shekhar et al., 2019). Additionally, interventions such as open synovectomy or arthroscopic procedures carry their own risks, including wound infections, joint stiffness, prolonged rehabilitation, and extended hospital stays. These complications highlight the need for a careful balance between timely intervention and minimally invasive treatment approaches. This study presents a retrospective ten-year review (2010–2021) of cases of PVNS of the knee managed at the National Orthopaedic Hospital, Igbobi, Lagos. By examining patient demographics, clinical presentations, radiologic findings, treatment modalities, and outcomes, this review aims to provide valuable insights into the epidemiology, management, and challenges associated with PVNS in a tertiary orthopedic care setting. Understanding the local context of this rare disease will contribute to the global pool of knowledge and potentially guide more effective diagnostic and therapeutic strategies.

**2. METHODOLOGY**

***2.1 Study Design***

This study was a retrospective review of medical records of patients diagnosed with pigmented villonodular synovitis (PVNS).

***2.2 Study Setting***

The research was conducted in the Department of Orthopaedics at the National Orthopaedic Hospital, Igbobi, Lagos, a leading tertiary center for orthopedic care in Nigeria. The hospital offers a wide range of services, including postgraduate training for orthopaedic surgeons and other medical professionals specializing in trauma management and reconstructive surgery. It features several subspecialties, such as spine surgery, arthroplasty, plastic and reconstructive surgery, physiotherapy, prosthetics, and orthotics, ensuring a comprehensive approach to orthopaedic care.

***2.3 Study Population***

The study included all patients diagnosed with pigmented villonodular synovitis (PVNS) by the Pathology Department of the National Orthopaedic Hospital, Igbobi, Lagos, within the specified study period (January 2010 to December 2021). Patients were eligible for inclusion if they met the following criteria: histopathological confirmation of PVNS, availability of complete and detailed medical records, and a diagnosis confirmed through clinical and radiological correlation where applicable. Additionally, patients who underwent surgical intervention and subsequent histopathological analysis were prioritized to ensure diagnostic accuracy. Patients were excluded if their medical records were incomplete or lacked sufficient detail to confirm the diagnosis of PVNS. Cases with ambiguous or inconclusive histopathological findings were also excluded. Further exclusion criteria included patients with coexisting conditions that could obscure the presentation or mimic the features of PVNS, such as rheumatoid arthritis, tuberculosis, or malignant tumors. Ultimately, ten (10) patients who met the stringent inclusion criteria and had comprehensive clinical, radiological, and histopathological documentation were included in the analysis.

***2.4 Data Collection***

Data for this study were collected from the medical records of patients diagnosed with pigmented villonodular synovitis (PVNS) during the study period. Collaboration with the Medical Records and Pathology Departments enabled the identification and retrieval of files using diagnostic codes specific to PVNS. Relevant information was extracted using a standardized data collection form, capturing demographic details (age, sex, occupation), clinical presentation (symptoms, duration, functional limitations), diagnostic methods. Histopathological reports were reviewed to confirm PVNS and note findings such as cellular composition, vascularization, and hemosiderin deposits. **Outcomes such as** recurrence rates and evidence of metastasis (if any) were also reported. To ensure accuracy, data were cross-referenced with records from the Pathology, Radiology, and Orthopaedic units. All records were anonymized using unique identifiers, and data were securely stored in an electronic database. Physical records were handled in a secure environment accessible only to the study team.

**3.1 RESULTS**

The baseline characteristics of the study participants, as shown in Table 1, reveal that 60% were female, while males accounted for 40%. The mean age of the participants was 37.7 ± 7.4 years, ranging from 8 to 72 years. The average height was 167.2 ± 6.4 cm, the mean weight was 71.3 ± 9.8 kg, and the average BMI was 25.4 ± 2.6 kg/m².Regarding residence, most patients (80%) were from urban areas, while 20% resided in rural settings.

In terms of marital status, 80% of participants were married, with one individual (10%) being single and another (10%) widowed or divorced. Employment status revealed that 64.7% of participants were self-employed, 18.9% were employed in formal roles, and 16.4% were unemployed or retired. Educational attainment varied, with 70% having tertiary education, 20% completing primary or secondary education, and 10% reporting no formal education.

Among patients with pigmented villonodular synovitis (PVNS), pain was the most common presenting complaint, reported in 50% of cases. Swelling was observed in 30% of cases, while limited mobility and joint instability were each noted in 10% of cases. Regarding the affected knees, 80% of patients had involvement of the right knee, 20% had bilateral knee involvement, and no cases involved the left knee only. Diagnostic confirmation was achieved through intraoperative specimens in 90% of cases, while fine needle aspiration cytology was used in 10%. Of the intraoperative specimens, 50% were obtained during total knee replacements, and 40% were collected via arthroscopic synovectomy. Also from our review, recurrence of the condition was documented in two (20%) cases, indicating a potential for reappearance after initial treatment. Additionally, one case (10%) presented with features suggestive of a rare metastasis.

**Table 1: Baseline characteristics of patients, 2010–2021 (n=10)**

|  |  |
| --- | --- |
|  | **N (%)** |
| **Gender** |  |
| Male | 4 (40) |
| Female | 6 (60) |
| Age (Mean ± SD) | 37.7 ± 7.4 |
| Height (Mean ± SD) | 167.2 ± 6.4 |
| Weight (Mean ± SD) | 71.3 ± 9.8 |
| BMI | 25.4 ± 2.6 |
| **Residence** |  |
| Urban | 8 (80) |
| Rural | 2 (20) |
| **Marital Status** |  |
| Married | 8 (80) |
| Single | 1 (10) |
| Widowed/divorce | 1 (10) |
| **Employment status** |  |
| Unemployed/Retired | 2 (16.4) |
| Employed | 2 (18.9) |
| Self employed | 6 (64.7) |
| **Educational Level** |  |
| No formal education | 1 (10) |
| Primary/Secondary | 2 (20) |
| Tertiary | 7 (70) |

**Table 2: Clinical Characteristics and diagnostic methods of Patients with PVNS**

|  |  |
| --- | --- |
|  | **N (%)** |
| **Presenting complaints** |  |
| Pain | 5 (50) |
| Swelling | 3 (30) |
| Limited mobility | 1 (10) |
| Joint instability | 1 (10) |
| **Knees affected** |  |
| Right | 8 (80) |
| Left | 0 (0) |
| Bilateral | 2 (20) |
| **Diagnostic confirmation** |  |
| Intraoperative specimen | 9 (90) |
| Fine Needle Aspiration Cytology | 1 (10) |
| **Intraoperative specimen (n=9)** |  |
| Total knee replacement | 5 (50) |
| Arthroscopic Synovectomy | 4 (40) |

**4. DISCUSSION**

This ten-year retrospective study explores the demographic and clinical characteristics of patients diagnosed with Pigmented Villonodular Synovitis (PVNS) at the National Orthopaedic Hospital, Igbobi, Lagos. PVNS is a rare proliferative disorder of the synovial membrane, predominantly affecting the knee joint, with significant implications for patient outcomes. The baseline characteristics of the study reveal that females constituted the majority of cases (60%), while males accounted for 40%. To the best of the authors' knowledge, this is the first retrospective review to report a cohort of 10 patients, as previous studies have been scarce and primarily limited to individual case reports. Notably, these earlier reports also predominantly involved female patients, consistent with the findings of this study (Ottaviani et al., 2011; Mwangangi et al., 2023; Sitati et al., 2010). This can be due to hormonal influences, as estrogen has been implicated in modulating inflammatory and synovial processes, potentially contributing to the development or progression of PVNS (Staub, 2007; Monteiro et al., 2014). The mean age of 37.7 ± 7.4 years observed in this study aligns closely with a finding from previous research. Patel et al (2007) reported a mean age of 39 years among individuals diagnosed with pigmented villonodular synovitis (PVNS), suggesting that the condition predominantly affects adults in their third to fifth decades of life. However, other studies have highlighted occurrences of PVNS among children and adolescents, albeit less frequently, indicating that the condition is not exclusively age-specific (Willimon et al., 2018; Turkucar et al., 2019; Li et al., 2023).

The presenting complaints among patients in this study were primarily pain (50%) and swelling (30%), with limited mobility and joint instability being less frequent (10% each). This pattern is consistent with findings in the literature, where pain and swelling are commonly reported as the predominant symptoms of PVNS (Chipman et al., 2023; Adenitan et al., 2023). For example, Patel et al. (2017) noted that pain is often the first symptom prompting patients to seek medical attention, particularly in weight-bearing joints like the knee, while swelling tends to develop progressively as the disease advances.

This study also reported right knee involvement in 80% of cases, with bilateral involvement documented in 20%. No cases of left knee involvement alone were noted. These findings align with previous studies that have observed a slight predilection for unilateral involvement in PVNS, though the reasons for this lateralization remain unclear. Pratamanugroho and Hernugrahanto (2024). also reported a higher prevalence of unilateral knee involvement, with bilateral cases being less common. Diagnostic confirmation in this cohort relied predominantly on intraoperative specimen analysis (90%), with fine-needle aspiration cytology (FNAC) contributing to diagnosis in 10% of cases. Among the intraoperative specimens, 50% were obtained during total knee replacement procedures and 40% through arthroscopic synovectomy. This is in line with the standard diagnostic approach outlined in literature, where the macroscopic appearance of pigmented nodules during surgery and histopathological confirmation remain the gold standard for PVNS diagnosis (Ottaviani et al., 2011). FNAC, while less commonly used, has been reported in case studies as a useful tool in resource-limited settings or when surgery is contraindicated (Giri et al., 2023).

The high percentage of intraoperative specimen diagnoses reflects the advanced stage of disease at presentation in this cohort, necessitating surgical intervention. This pattern is echoed in studies from regions with delayed access to healthcare, where patients often present with advanced symptoms requiring invasive diagnostic and therapeutic procedures. Furthermore, the significant proportion of cases involving total knee replacement highlights the disease's potential to cause extensive joint damage when left untreated, a finding corroborated by Sitati (2010) and Patel et al. (2017). From our review, the recurrence rate of PVNS in our cohort was 20%, which aligns more closely with the 27.7% recurrence rate noted in a meta-analysis by Mollon et al. (2015). The relatively lower recurrence in our cases may be attributed to the localized nature of most cases in our study or the use of complete synovectomy in the majority of patients. The recurrence rate in our study mirrors reports in the literature that highlight the challenges of achieving recurrence-free outcomes, especially in DPVNS cases (Palmerini et al., 2015; Lukosius et al., 2022). Studies have shown that even with advanced surgical techniques, recurrence remains common, partly due to the biologically aggressive nature of the diffuse subtype and the difficulty in achieving complete surgical excision (Palmerini et al., 2015).

Regarding complications, while our study did not specifically quantify surgical complications, the literature reports a complication rate of around 9.8% for PVNS treatment, which includes both open and arthroscopic approaches (Aurégan et al., 2014). The rare metastasis documented in our study, though uncommon in PVNS, has been sporadically reported in the literature, particularly in aggressive diffuse cases (Layfield et al., 2009; Sistla et al., 2014).

This study has several limitations. First, as a single-center retrospective review, the findings may not be generalizable to other settings or populations. Given the small sample size, this study was not designed to achieve statistical power sufficient for robust inferential analyses. Instead, it provides valuable exploratory insights into the demographic and clinical characteristics of PVNS, a rare condition. The rarity of PVNS inherently limits the feasibility of large-scale studies, making even small cohorts significant in expanding the understanding of this disease. Additionally, the reliance on medical records introduces the potential for missing or incomplete data, which may affect the accuracy of clinical and demographic information. The lack of detailed follow-up data on long-term outcomes, including functional recovery and recurrence management, further limits the ability to draw comprehensive conclusions about the disease's progression and treatment efficacy.

**5. CONCLUSION**

Pigmented villonodular synovitis (PVNS) is a rare proliferative disorder, most commonly affecting the knee joint, with its exact etiology still largely unknown. Early recognition and diagnosis are crucial, as delayed treatment can lead to significant joint damage and functional impairment. Physicians must maintain a high index of suspicion, particularly in patients presenting with persistent joint pain, swelling, and limited mobility. The primary goal of treatment is to ensure the complete removal of abnormal synovial tissue to alleviate pain, prevent joint destruction, and minimize the risk of recurrence. A multidisciplinary approach, including surgical intervention and postoperative monitoring, is often required to achieve optimal outcomes.

**Ethical Approval:**

Ethical approval for the study was obtained from the hospital’s ethical review committee. Patient confidentiality was maintained throughout the study. No identifiable information was included in the final dataset, and all patient data were anonymized prior to analysis.

**Disclaimer (Artificial intelligence)**

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Details of the AI usage are given below:

1.

2.

3.

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