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Case Report

Hallux rigidus secondary to pigmented villonodular synovitis of the metatarso-phalangeal joint of the hallux: case report

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Abstract

Pigmented villonodular synovitis (PVNS) is a rare, benign proliferative synovial disease that can affect the hallux metatarsophalangeal joint and manifest as secondary hallux rigidus. Clinical suspicion sometimes occurs only intraoperatively, when a synovium with blackened foci of hemosiderin deposits is found. We present a rare case of PVNS in the hallux metatarsophalangeal joint, treated surgically with synovectomy and cheilectomy.

Level of Evidence V; Diagnostic Studies; Expert Opinion

Keywords: Synovitis, pigmented vilonodular; Hallux rigidus; Metatarsophalangeal joint; Synovectomy

Introduction

The etiology of hallux rigidus is multifactorial. It can result from primary causes related to idiopathic cartilage degeneration or secondary causes, such as trauma, infection, biomechanical deformities, rheumatoid arthritis, and gout [(1)].

Among the rare causes of hallux rigidus is pigmented villonodular synovitis (PVNS). It is a benign proliferative synovial disease with local destructive potential, more common in large joints such as the knee, but it can also occur in the foot and ankle, including the hallux[(2)]. Recognition of this etiology is essential because, although less common, it can present with the diffuse form, affecting other joints, as well as malignant transformation[(3)].

Initial treatment of hallux rigidus is conservative; however, in cases refractory to clinical therapies, such as orthoses, infiltrations, and anti-inflammatory agents, surgical procedures may be indicated. Cheilectomy, with or without synovectomy, is widely indicated in the early stages to decompress the joint and increase range of motion[(4)].

The report in question shows a rare case of hallux rigidus secondary to PVNS surgically treated with synovectomy and cheilectomy.

Pigmented villonodular synovitis, also called tenosynovial giant cell tumor (TGCT), is a benign proliferative synovial disease of clonal neoplastic origin, not merely inflammatory. Genetic studies demonstrate that most cases have t (1;2) (p13; q37) chromosomal translocation, resulting in *CSF1* gene overexpression in a small subgroup of neoplastic cells. This overexpression recruits macrophages and non-neoplastic inflammatory cells, which together constitute most of the tumor volume. Histologically, TGCT is classified into two main forms: localized, also called giant cell tumor of tendon sheath (GCTTS), and diffuse**,** corresponding to the classic form of PVNS, which involves extensive synovial areas and can infiltrate adjacent tissues[(5)].

Study performed at the Faculdade de Medicina da Universidade Federal de Alfenas, MG, Brazil.

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Case Report

This is a 58-year-old male patient, a bank clerk, hypertensive, who in January 2025 started experiencing pain and discomfort in the left hallux. On the visual analog scale of pain, the patient rated it 7 out of 10. There was no history of previous trauma or incidents. According to him, pain intensified when walking, when standing upright, and also when manual pressure was applied to the back of the hallux. He noted a discrete nodule in the dorsal aspect of the hallux, which often manifested as phlogosis at the site. The patient received clinical treatment from other specialists during this period, including physiotherapeutic measures, immobilization, non-hormonal anti-inflammatory drugs, and corticosteroid infiltrations, without improvement.

On clinical examination, without deformities in the loaded feet, there was an antalgic gait pattern. On inspection, edema was observed in the topography of the dorsal region of the hallux metatarsophalangeal joint. On palpation, there was a hardened dorsal nodulation of the metatarsal head, in addition to pain in the medial, dorsal, and lateral articular aspects. Regarding mobility, there was a 10-degree restriction in maximum hallux extension compared with the right side, with pain accentuation on forced extension. Normal neurovascular examination.

The patient underwent magnetic resonance imaging, which demonstrated synovitis of the hallux metatarsophalangeal joint, as well as a dorsal osteophyte of the metatarsal head and proximal phalanx (Figure 1).

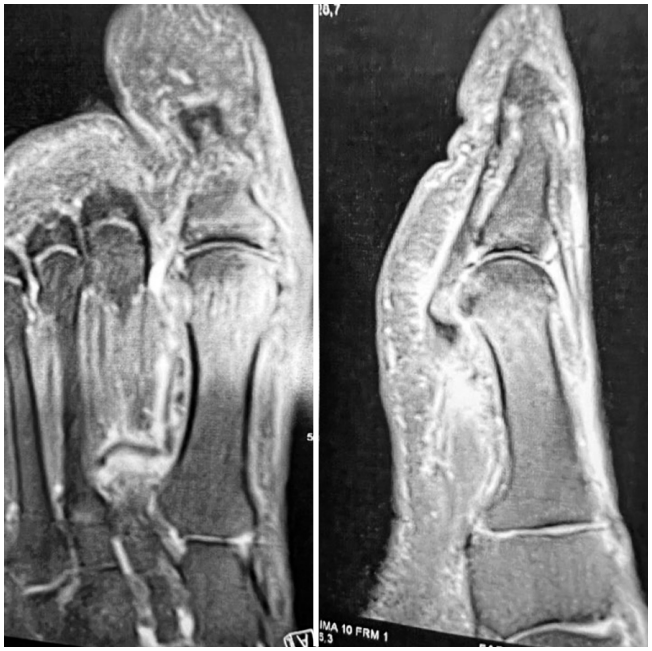

Figure 1. T2-weighted coronal and sagittal cuts from magnetic resonance imaging showing signs of early hallux rigidus.

Given the diagnosis of mild left hallux rigidus refractory to conservative treatment, surgical treatment with synovectomy and cheilectomy was proposed.

In August 2025, the patient underwent surgical treatment of the hallux rigidus. Intraoperatively, when performing the longitudinal capsulotomy of the hallux metatarsophalangeal joint, synovitis of unusual appearance was evidenced, with foci of blackened pigmentations, analogous to hemosiderin visible in villonodular synovitis (Figure 2). As planned, cheilectomy and extensive synovectomy were performed, sending the synovial material for anatomopathological examination (Figure 3). In the postoperative period, barouk sandals were used, with the protective support released immediately.

At one week postoperatively, the patient reported improved pain symptoms and satisfaction with the reduction in hypersensitivity. Three weeks later, the patient presented the anatomopathological result, which, on macroscopy, described four irregular fragments of soft consistency and brown color, the largest measuring 1.0 x 0.5 cm and the smallest 0.3 x 0.2 cm. On microscopy, fragments of synovial membrane form villous projections and irregular glandular invaginations, composed of two to three layers of eosinophilic cytoplasm cells and vesicular nuclei, without nuclear atypia or mitotic figures, typical of PVNS (Figure 4). Over two months of follow-up, the patient showed significant improvement in symptoms, with no significant pain or functional complaints, reporting a score of 1/10 on the visual analog scale for pain.

Discussion

Pain in the hallux metatarsophalangeal joint is a frequent complaint in adults and may result from conditions such as

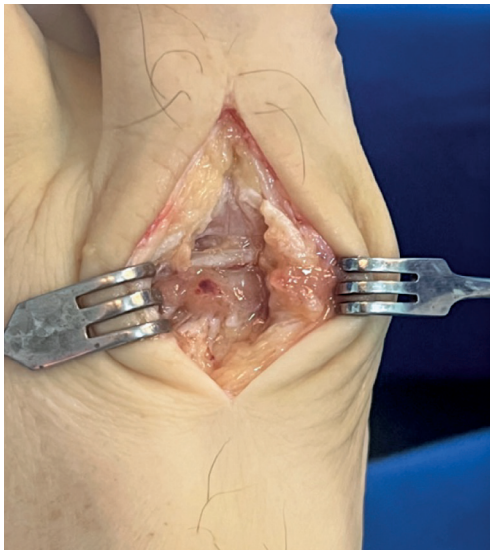

Figure 2. Intraoperative image showing synovitis with blackened hot spots.

primary hallux rigidus, hallux valgus, sesamoiditis, gouty arthritis, rheumatoid arthritis, osteonecrosis, stress fractures, or proliferative synovitis. The clinical similarity between proliferative synovitis makes etiological diagnosis difficult, especially when PVNS presents a localized lesion, with a mild synovial mass and nonspecific imaging findings[6]

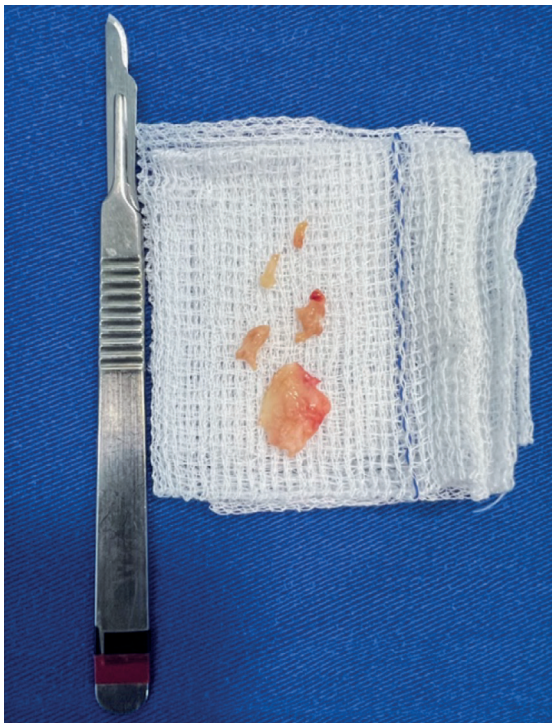

Figure 3. Collected synovial material sent for pathological examination.

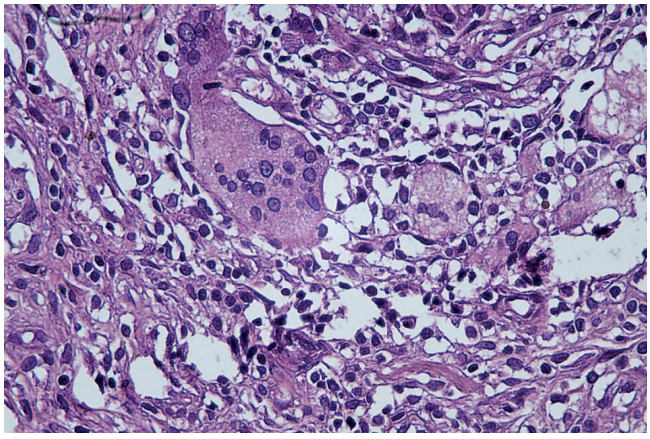

Figure 4. Histological aspect of pigmented villonodular synovitis of the hallux metatarsophalangeal joint.

Secondary hallux rigidus represents a diagnostic challenge. The literature highlights the need for advanced imaging, especially magnetic resonance imaging, but it does not always enable the identification of atypical synovitis, pigmented lesions, and bone erosions compatible with PVNS[7]. In the report in question, magnetic resonance imaging did not demonstrate any typical alterations of PVNS; however, blackened synovitis was observed intraoperatively, raising suspicion of PVNS, which was confirmed histologically.

Localized PVNS occurs most often in small joints of the hands and feet, whereas the diffuse form is more common in large joints such as the knee and ankle. Both variants share the same molecular profile but differ in synovial extension and recurrence rate, which can exceed 40% in diffuse forms[5].

Surgical treatment of hallux rigidus secondary to PVNS aims to restore joint movement and relieve pain. In mild and moderate stages, cheilectomy associated with synovectomy brings good results[4], as in this case, where pain relief and functional improvement were achieved while preserving the joint. These results are consistent with the findings of Siegel et al. [5], who, in a systematic review of PVNS of the foot and ankle, demonstrated that lower recurrence rates are achieved after complete resection.

Nabeshima et al. [8] it is the only study in the literature that describes diffuse PVNS of the hallux metatarsophalangeal joint, corroborating the rarity of this location. As shown in this report, surgical treatment resulted in significant pain reduction and functional preservation, supporting the validity of a conservative surgical approach to the joint when degeneration is not advanced.

Scheele et al. [9] reported recurrence in 34 cases of PVNS of the foot and ankle: 26.7% in localized forms and 50% in diffuse forms, underscoring the importance of confirmatory pathological examination and the need for prolonged follow-up. In the present case, the histopathological examination revealed a thickened synovial membrane with villous projections and irregular invaginations, composed of mononuclear cells with eosinophilic cytoplasm and vesicular nuclei, without atypia or mitotic figures—findings consistent with localized PVNS. Hemosiderin deposits and multinucleated giant cells were observed. These findings are consistent with those reported by Nabeshima et al.[8] and Guo et al.[6], which showed similar patterns in ankle and foot injuries. In contrast, Chen et al.[10] and Staals et al.[11] reported aggressive or malignant forms, present nuclear atypia, marked mitotic activity, and tumor necrosis, changes not found in our case, confirming the benign behavior of the lesion.

Pigmented villonodular synovitis, although rare, should be considered as an etiological possibility in hallux rigidus. The suspicion sometimes occurs only intraoperatively, considering the characteristic blackish synovium. Despite the usually benign behavior, clinical follow-up is recommended due to the risk, albeit small, of recurrence and eventual malignancy.

Authors' contributions: Each author contributed individually and significantly to the development of this article: EV *(https://orcid.org/0000-0002-5054-874X) Conceived and planned the activity that led to the study and wrote the article; TS *(https://orcid.org/0000-0001-9244-5194) Wrote the article and participated in the review process. All authors read and approved the final manuscript. *ORCID (Open Researcher and Contributor ID).

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