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Villo-Nodular Synovitis of the Knee: A Case Report and Review of the Literature

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Abstract **Case Report**

Villonodular synovitis (VNS) is a benign tumor of the joint synovium, tendon sheaths and bursae. It is a rare condition of unknown pathogenesis [1], occurring preferentially in the knees. There are localized, diffuse and mixed forms [2]. Although the clinical manifestations are aspecific, MRI allows a diagnostic approach, even if it can have differential diagnostic problems in case of atypia or with synovial sarcoma. Treatment consists of complete removal of the lesion to avoid recurrence [3].

Keywords: Villonodular synovitis; Localized form; Knee localisation; magnetic resonance imaging.

INTRODUCTION

Villonodular synovitis (VNS) is a benign tumor of the joint synovium, tendon sheaths, and bursae, with a preference for the knees (70% of cases). It typically affects adults in their 30s or 40s, with an incidence of 1.8 cases per million. Due to the non-specific clinical presentation, diagnosis is often delayed. However. MRI and arthroscopy have improved early detection and biopsy, which is essential for histological diagnosis. Recurrence is a characteristic and a notable risk.

OBSERVATION

A 39-year-old patient with no specific pathological history, was referred for right knee swelling and mechanical pain, with no other joint signs. On physical examination, the knee was swollen and painful, with palpation of a mass on the anterolateral side of the knee.

Magnetic resonance imaging (MRI) revealed a well-limited and lobulated mass in the anterolateral compartment of the knee, with a heterogeneous signal on the T1- and T2-weighted sequence, intensely and heterogeneously enhanced, measuring 32x27 mm (Figure 1).

The formation extends anteriorly into the subcutaneous soft tissue, pushing the lateral patellar retinaculum and coming into contact with the patellar tendon and iliotibial band.

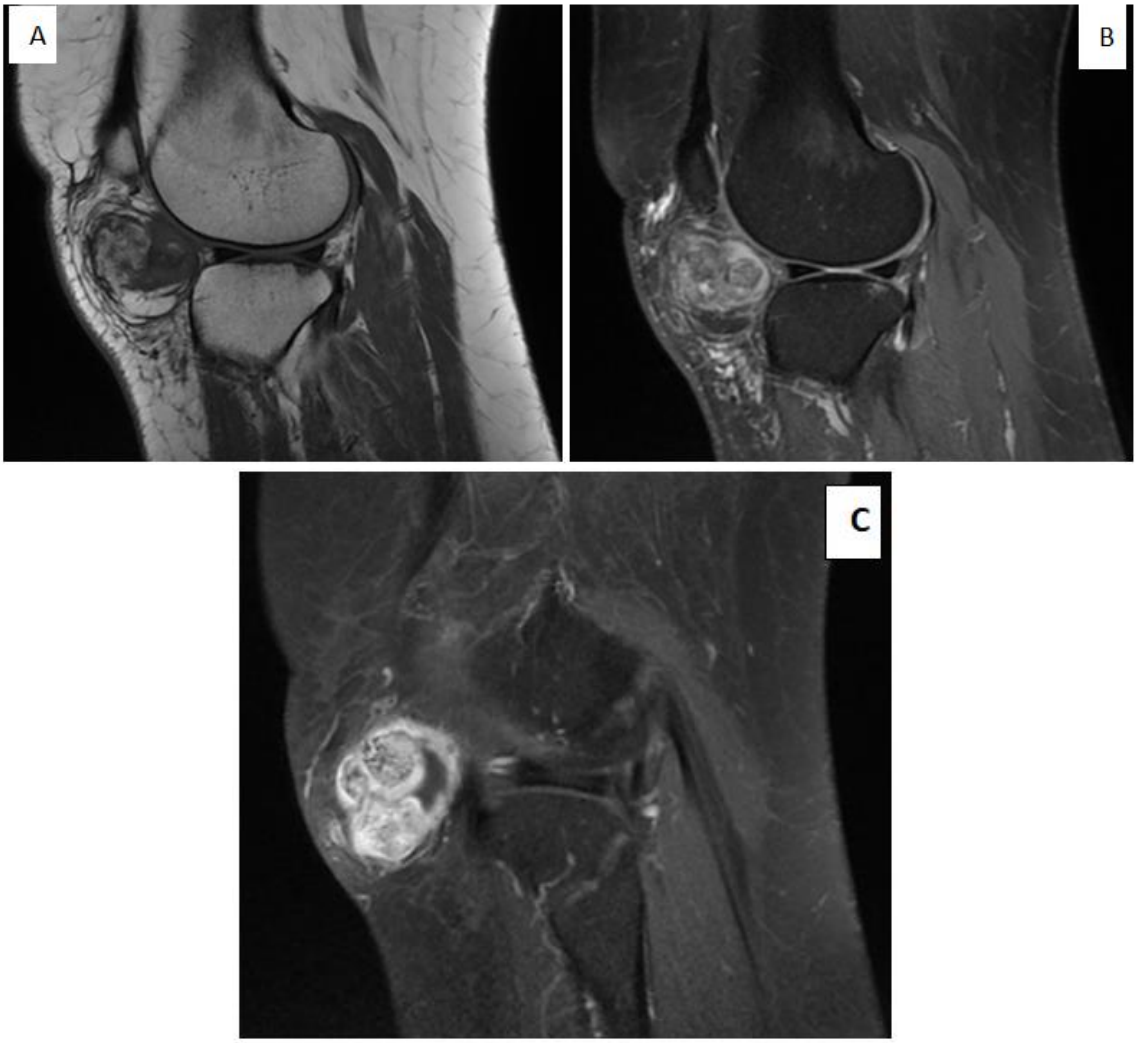

Figure 1: Localized pigmented villonodular synovitis of the right knee. (A) Sagittal SE T1 weighted MR image, (B) Sagittal DP Fat Sat weighted MR image, (C) Sagittal SE T1 weighted MR image after IV gadolinium administration, reveal a lobulated mass in the anterolateral compartment of the knee, with an heterogeneous signal on the T1- and T2-weighted images, limited by a capsule of low signal intensity, intensely and heterogeneously enhanced after IV gadolinium administration

DISCUSSION

Villonodular synovitis was first described by Chassaignac in 1852 and then by Jaff in 1941. It is a rare benign tumor causing hyperplasia of the synovial villi, which may coalesce into a nodule. Lesions may involve the articular synovium, bursa and/or tendon sheath [3].

It is a rare condition; its annual incidence is estimated at 1.8 cases per million inhabitants/year. The disease mainly affects adults in the 3rd and 4th decade of life. Trauma is often incriminated as a contributing factor [1].

The etiopathogenesis remains uncertain and controversial. However, several hypotheses have been suggested, such as the occurrence of inflammatory synovial hyperplasia, benign neoplasia of unknown etiology, abnormal local lipid metabolism, repeated trauma and intra-articular haemorrhage. There also have been reported some cytogenetic abnormalities such as mono-clonality and chromosomal abnormalities like trisomy 5 and 7 [2, 3].

Villonodular synovitis (VNS) is a condition that can impact any joint in the body. There are two primary types of VNS: the localized form and the diffuse form. The diffuse type primarily affects large joints like the knee and hip, whereas the localized form is more commonly found in the fingers and ankles. While the knee is frequently affected in cases of diffuse VNS, localized involvement of the knee is less common [3].

Villonodular synovitis (VNS) is known to remain asymptomatic for an extended period, and it typically presents with a chronic onset, rarely showing acute symptoms. The clinical presentation of VNS can vary depending on its location, either intra-articular (inside the joint) or extra-articular (outside the joint). In

cases of the extra-articular localized form, it often presents with a soft tissue mass and pain. On the other hand, the intra-articular localized form is associated with pain, swelling, and sometimes a soft tissue mass. Joint dysfunction is less common in the intra-articular localized form and uncommon in the extra-articular localized form [3].

The symptomatology of VNS is not often characteristic. As a result, the time it takes for patients to seek medical consultation can vary.

VNS typically affects one joint (monoarticular involvement) and is rarely found in two joints (biarticular involvement). Furthermore, it usually affects one side of the body, rather than being symmetrical in both sides [1].

Imaging plays a crucial role in accurately diagnosing, treating, and monitoring cases of localized villous synovitis. The fundamental examination is standard radiography, which typically appears normal, especially during the initial disease stages. However, advanced stages may reveal bone abnormalities like erosion and subchondral cysts. Furthermore, opaque regions of soft tissue might be observed, replacing the normal fatty tissue areas of Hoffa's fat pad.

It is essential to note that ultrasound has a relatively low diagnostic value. However, it can potentially reveal a complex, heterogeneous echogenic mass, synovial thickening or intra-articular effusion. It can also help visualize extra-articular lesions in the bursa or tendon.

On CT scan, focal villonodular synovitis usually manifests as a well-defined, non-specific soft tissue mass, similar in density to the adjacent muscle. In addition, CT scans can also demonstrate the formation of subchondral cysts and extrinsic bone erosion on both sides of the affected joint.

MRI is considered the gold standard for diagnosing villonodular synovitis due to its ability to provide precise localization of the lesion and detailed information about its morphology and signal properties, including haemosiderin, lipids, and inflammatory fibrosis, which correspond to its histological composition. The specificity of MRI is particularly attributed to haemosiderin, which exhibits magnetic susceptibility properties, leading to low-signal "blooming" artifacts often observed in gradient echo sequences.

In the case of localized villonodular synovitis, MRI typically reveals an ovoid or multilobed soft tissue mass, presenting heterogeneously with an isointense signal to the adjacent muscle on the T1 sequence and varying signal intensity on the T2 sequence. The lesion's borders are clearly demarcated by capsules of low signal intensity, which are attributed to fibrosis or haemosiderin content. The intensity of these capsules can vary depending on the amount of haemosiderin and the extent of fibrosis. Additionally, localized nodular synovitis tends to grow outward and may develop a pedunculated appearance.

The definitive confirmation of the diagnosis of villonodular synovitis is based on histological examination. Macroscopically, the lesion appears well-defined, whether it is pedunculated or not, and contains septa while being enveloped by a brown collagen capsule. Microscopically, villonodular synovitis is characterized by the proliferation of synovium within villi or nodules without any signs of malignancy. Additionally, brown haemosiderin deposits are observed in fibroblasts, histiocytes, macrophages, and giant cells.

For focal villonodular synovitis, the primary therapeutic approach is surgical intervention. Typically, complete removal of the lesion is performed through either arthroscopy or open arthrotomy, with the choice of procedure mainly dependent on the lesion's location and size. Fortunately, recurrence is uncommon, except in cases where there is incomplete resection of the lesions. Proper surgical management ensures the best outcome for patients with this condition.

CONCLUSION

Localized pigmented villonodular synovitis of the knee is a rare and benign tumor in adults. Its MRI appearance strongly indicates the diagnosis when typical features are present, but not pathognomonic. This report shows the significance of imaging, particularly MRI, for a preoperative diagnosis to reduce the risk of recurrence after surgeries. Histopathology remains the definitive way to confirm the diagnosis.

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