Hong Kong J Radiol. 2013;16:296-300 | DOI: 10.12809/hkjr1312128

CASE REPORT

Localised Nodular Synovitis: an Uncommon Cause of Knee Pain

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ABSTRACT

Localised nodular synovitis is a benign localised synovial proliferative tumour that occurs in the tendon sheath. This tumour rarely involves the large joints such as the knee. This report is of a patient with localised nodular synovitis at the infrapatellar region of the knee, who presented with chronic knee pain. Magnetic resonance imaging was performed and the diagnosis was confirmed histologically after excision of the tumour. There are many differential diagnoses for solitary lesion of the knee, and the clinical manifestations can be non-specific. Systematic imaging is an important part of making the diagnosis. Synovial lesion of the knee is an infrequent condition, and localised nodular synovitis is one of the rarer differential diagnoses, but it should be considered in cases of knee pain and solitary nodule in the knee.

Key Words: *Giant cell tumors; Knee joint; Patella; Soft tissue neoplasms; Synovitis, pigmented villonodular*

中文摘要

局限性結節性滑膜炎：膝關節疼痛的罕見病因

鄭加勁、陳志軒、葉紹亮、陳紹騏、仇鴻烈

局限性結節性滑膜炎發生於腱鞘，屬於一種局部滑膜增生的良性腫瘤。這種腫瘤很少累及如膝關節的大關節。本文報告一名臨床表現為膝關節慢性疼痛的髕下區局限性結節性滑膜炎病例。病人接受了磁共振掃描，腫瘤切除後得到病理學證實。膝關節孤立性病變可有多種不同的鑑別診斷，而且臨床表現並無特異性。系統性成像成為診斷的重要部份。膝關節滑膜病變不常見，局限性結節性滑膜炎是其中一種更罕見的鑑別診斷；但當出現膝關節疼痛合併孤立性病變時，須考慮該病的可能性。

INTRODUCTION

Localised nodular synovitis (LNS) is a benign localised synovial proliferative tumour that occurs in the tendon sheath.[1] LNS predominantly affects the small joints of the fingers and toes and rarely involves the large joints such as the knee.[2] When LNS occurs in the large joints, it can be difficult to diagnose, as symptoms are non-specific and there are few signs. Plain radiographs are often unhelpful for making the diagnosis unless bone erosion or soft tissue mass is seen.[3] Magnetic resonance imaging (MRI) is an important diagnostic tool. LNS shares common histological features with pigmented villonodular synovitis (PVNS) and distinction between the two conditions is important because their clinical

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Submitted: 15 Aug 2012; Accepted: 19 Dec 2012.

presentation and response to treatment is different.

CASE REPORT

A 36-year-old woman with good past health presented to the Kwong Wah Hospital, Hong Kong, in January 2010 with progressive increase in right knee pain and swelling after a mild sprain while she was getting out of bed 1 month earlier. She had no other joint pain or constitutional symptoms. Physical examination revealed mild right knee swelling and reduced range of movement. Lachmann test, varus and valgus stress tests, and anterior and posterior drawer tests were all negative.

Radiographs of the right knee showed no fractures, although a faint oval opacity was discerned over the infrapatellar region in the lateral projection (Figure 1). Gadolinium contrast-enhanced MRI of the right knee subsequently showed a 2-cm well-defined oval mass over the anterior knee, touching the transverse ligament and displacing the infrapatellar fat pad. The mass was T1-weighted and proton density–hyperintense relative to skeletal muscle (Figures 2a and 2b) and mainly of high signal intensity on T2-weighted images (Figure 2c). Circular regions of haemosiderin concentration were seen in gradient echo (Figure 2d) images. Mild enhancement was noted after gadolinium administration (Figure 2e). There was no intraosseous extension or bone oedema. The rest of the knee joint was unremarkable. Provisional MRI diagnoses included intra-articular chondroma and osteochondroma.

Figure 1. Lateral radiograph of the right knee shows a faint oval opacity over the infrapatellar region (arrows).

Subsequent right knee arthrotomy showed a 2 x 2 cm spherical well-defined intra-articular brownish mass with a pedicle arising from the synovial capsule (Figure 3), which was excised. Histologically, the lesion was a well-encapsulated nodular tumour composed of mononuclear cells and scattered multinucleated (mini-osteoclastic) giant cells embedded in hyalinised stroma (Figure 4). An extensive area of infarction and haemorrhage was also present. These findings were compatible with a differential diagnosis of giant cell tumour of the tendon sheath or PVNS. Overall, the radiological, intraoperative, and histopathological findings were compatible with LNS.

At the most recent follow-up 20 months after operation, the patient was asymptomatic, having regained the full range of motion and resumed normal activities. MRI performed 20 months after surgery showed no evidence of recurrence.

DISCUSSION

There are many differential diagnoses for a solitary nodule of the knee, including synovial lipoma, lipoma arborescens, synovial haemangioma, intra-articular chondroma, fibroma, ganglion cyst, synovial cyst, haematoma, and synovial proliferative lesions.[4,5] Systematic imaging is therefore important for making the diagnosis.

Plain radiograph of the knee may be unremarkable or occasionally reveals a soft tissue mass. However, plain radiographs are useful for detecting calcified chondroid matrix in intra-articular chondroma, which is typically seen in the infrapatellar fat pad, and for detecting pressure erosion of bone. Ultrasonography of the knee is a convenient imaging modality that can readily differentiate cystic lesions, namely ganglion and synovial cysts, from other soft tissue nodules. Doppler study may be useful for detecting hypervascularity of the lesion. MRI enables superior anatomical delineation and tissue characterisation, and thus remains the most useful imaging modality.

Among the differential diagnoses, lipoma is the most distinctive. Synovial lipoma usually presents as a solitary fatty lesion at the suprapatellar pouch, whereas lipoma arborescens is usually a large frond-like intra-

Figure 2. Magnetic resonance images of the right knee. (a) An axial spin-echo T1-weighted image shows a well-defined oval mass (arrow) occupying the anterior joint space of the knee with a hyperintense signal relative to muscle; (b) a sagittal turbo spin-echo proton density–weighted image shows the mass at the infrapatellar region with a mildly hyperintense signal relative to muscle (arrow); (c) a sagittal turbo spin-echo T2-weighted image shows the mass (black arrow) at the infrapatellar region, touching the transverse ligament (white arrow) and the infrapatellar fat pad (asterisk), with a hyperintense signal relative to muscle; (d) a sagittal fast field echo T2-weighted image shows regions of hypointensity (arrows) within the mass, which represent haemosiderin deposition; and (e) a contrast-enhanced turbo spin-echo T1-weighted sagittal image with fat suppression shows mild enhancement of the lesion (arrow).

articular lesion that follows fat intensity in all MRI sequences. Synovial haemangioma can be a localised or diffuse poorly circumscribed intra- or juxta-articular lesion that is composed of dilated tortuous vessels with variable enhancement. Fibroma is typically an oval soft tissue mass abutting the tendon sheath, and is heterogeneously low-to-intermediate signal in T1-weighted images and heterogeneously low-to-high signal on fluid-sensitive sequences. Intra-articular chondroma has a signal intensity pattern consistent with either cartilage or bone marrow and lacks deposition of haemosiderin. Ganglion and synovial cysts present as thin-walled cystic structures near the joint, with peripheral enhancement. Synovial cysts are contiguous with the joint unlike ganglion cysts. Haematoma usually appears as less nodular and lacks solid enhancing tissue, and a fluid-fluid level may be observed. PVNS and LNS share similar histological characteristics, but represent different manifestations of synovial proliferative disease. Other differential diagnoses for infrapatellar fat pad mass include Hoffa's disease, synovial osteochondromatosis, and focal arthrofibrosis.[6,7]

LNS, also called synovial giant cell tumour (GCT), is a benign proliferative disorder that originates from a small area of the synovium. LNS is considered to be an intra-articular or localised form of GCT, which is infrequently seen.[2,6,8] In a study of 166 patients with PVNS and GCT by Myers and Masi,[2] intra-articular LNS was only seen in 6% of patients, for an estimated prevalence of 1.8/1,000,000 population.[9] The most typical presentation of LNS is a focal intra-articular

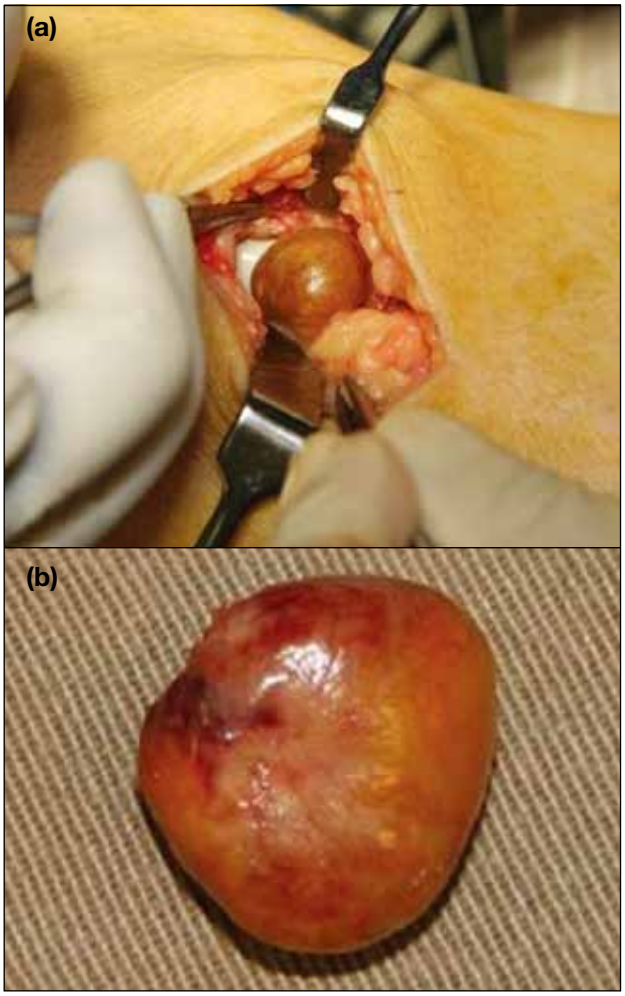

Figure 3. Localised synovial tumour: (a) intraoperative and (b) specimen showing an intra-articular well-capsulated firm brownish mass.

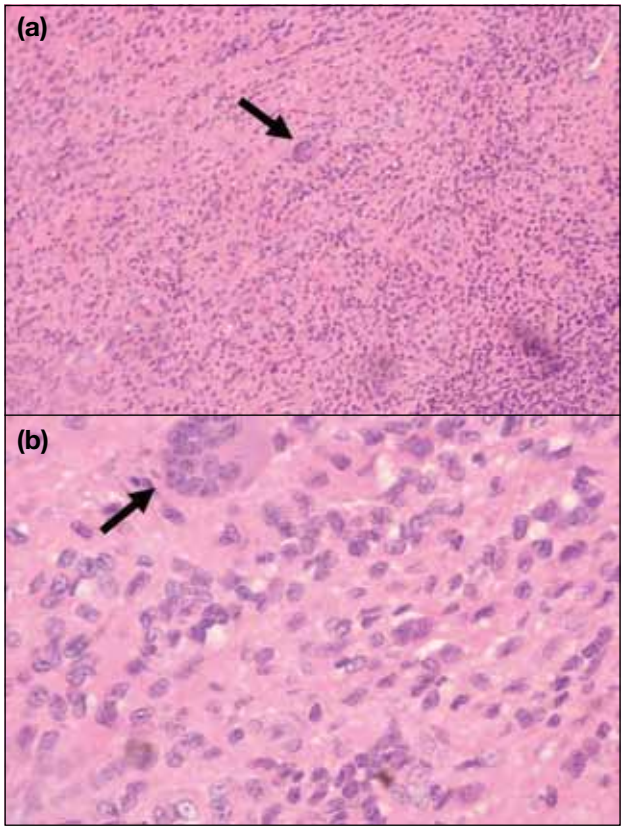

Figure 4. Histology findings show (a) diffuse sheets of mononuclear cells and scattered osteoclast-like multinucleated giant cells (arrow) [H&E; original magnification, x 100]; and (b) mononuclear tumour cells with round-to-ovoid nuclei with fine chromatin and small or indistinct nucleoli — the nuclei in the giant cells (arrow) have similar features (H&E; original magnification, x 200).

mass of the knee joint. Myers and Masi[2] showed that 85% of GCT cases occur in the finger, while only 5% occur in the knee. The infrapatellar fat pad is the most common site of occurrence, followed by the suprapatellar pouch.[6,8-10]

An inflammatory nature of LNS has been suggested,[1] although studies have also suggested a benign neoplastic or reactive granulomatous nature.[9,10] Clinical manifestations of the condition can be non-specific, and include pain, swelling, joint tenderness, restricted knee motion, and a palpable mass.[6] Therefore, the diagnosis of the condition relies heavily on imaging.

The MRI appearance of LNS can be variable. LNS can present as either a well-defined small ovoid lesion or a large polylobulated soft tissue mass. The lesion may be iso- or hyper-intense to skeletal muscle on T1-weighted images with inhomogeneous signal intensity on T2-weighted images. Low-signal circular regions can be seen, which correspond to regions of haemosiderin deposition. Internal cleft-like or linear hyperintensities in T2-weighted images can also be seen, which are thought to be related to tissue necrosis.[6,8,11]

Histologically, LNS and PVNS share common histological characteristics.[6,8,12] In this patient, the histological findings were also compatible with GCT and PVNS. However, distinction between these conditions is important because their clinical presentation and response to treatment is different. The presence of frond-like projections of synovium, abundance of haemosiderin deposition, and haemorrhagic joint effusion are characteristic features of

PVNS. LNS typically consists of smooth lesions with a small tumoural volume of haemosiderin deposition and involves a small region of synovium. PVNS tends to grow inwards and constrict the joint, while LNS tends to grow outwards and become pedunculated.

LNS is best treated by complete excision, either by arthroscopy or open arthrotomy, with negligible chance of recurrence unless the lesion is not excised completely. Follow-up examinations did not reveal any evidence of recurrence in the series described by Huang et al[6] and Rao and Vigorita.[12] PVNS requires extensive synovectomy and recurrence is frequent.[6]

In this patient, MRI showed a well-defined, small ovoid lesion with T1-hyperintensity relative to skeletal muscle and mainly high signal intensity on T2-weighted images. Circular regions of haemosiderin concentration were seen in gradient echo images, with mild enhancement that related to the presence of proliferative capillaries. The features were typical of LNS.

In conclusion, this report is of a patient with LNS of the knee presenting with chronic knee pain. An ovoid mass in the infrapatellar region was detected by MRI. The diagnosis of LNS was confirmed histologically after arthrotomy excision. Synovial lesion of the knee is an infrequent condition,[13] and the presentation can be non-specific clinically. There are many differential diagnoses and systematic imaging is an important part of the diagnostic process. MRI is an important diagnostic tool for LNS. Although LNS is an uncommon diagnosis, it should be considered for knee pain and a solitary nodule in the knee.

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