

Giant Cell Tumor of the Patellar Tendon Sheath Mimicking a Meniscal Tear in Athletes. A Report of Two Cases

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Learning Point of the Article:

All differential diagnoses should be taken into consideration when dealing with any seemingly apparent knee problem.

Abstract

Introduction: Giant cell tumors (GCT) are uncommon and benign tumors originating due to proliferation of the tendon synovial sheath. Most commonly are located in the fingers. Involvement of the patellar tendon in the knee is extremely rare.

Case Report: We report two cases who presented with moderate swelling located in the anterior surface of the knee, localized anterior knee pain, and painful loss of flexion and catching and locking symptoms. Following detailed imaging evaluation, both cases were treated with open surgical excision and patellar tendon synovectomy. Histological examination revealed the presence of a giant cell tumor of the patellar tendon sheath in both cases.

Conclusion: Despite the rarity to GCT, the importance of considering all possible tumors in cases where a soft-tissue tumor is present should be stressed out.

Keywords: Giant cell tumor, patellar tendon, nodular synovitis, knee.

Introduction

Giant cell tumor (GCT), also known as pigmented villonodular synovitis, is a rare, slow-growing, and benign neoplasm which arises from the synovium of a joint, tendon sheath, or bursa. Although it was first described by Jaffe et al. in 1941 [1], it was only in 2002 when the World Health Organization clarified the histological description of this entity [2]. These tumors are separated into two distinct types: Diffuse type GCT and GCT originating from a tendon sheath. The diffuse type demonstrates more extensive involvement of the synovial membrane and capsule while the local form is less aggressive and is being confined to a distinct area of the synovium [3].

Giant cell tumors of the tendon sheath (GCTTS) are predominantly encountered in the hand and especially in the fingers followed by the ankle and foot. The incidence in the adult knee is approximately 1.8 in each million, but this includes both the diffuse and the localized form [4]. These tumors usually affect individuals aged between 30 and 50 years, with female predominance [2]. The etiology remains unclear and a previous trauma history having been reported only in 15% of the cases [5]. The symptoms of GCTTS are non-specific and the diagnosis of GCTTS may be challenging particularly in large joints such as the knee where the symptoms are not specific and can therefore easily be mistaken for common injuries. A high index of

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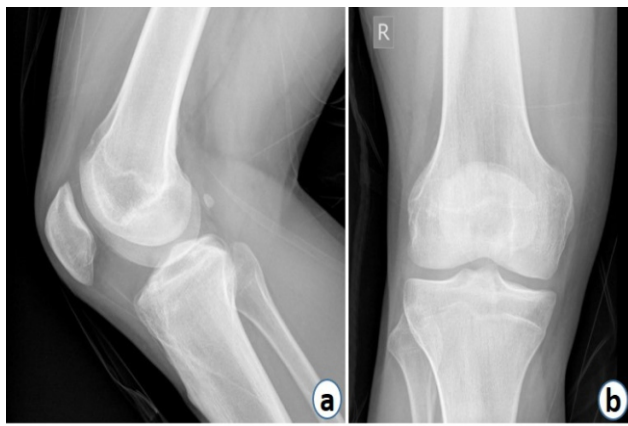


Figure 1: (a and b) Plain knee radiographs. On the lateral view opacity at the infrapatellar region (white arrow) is evident, while there was no obvious abnormality on the anteroposterior view.

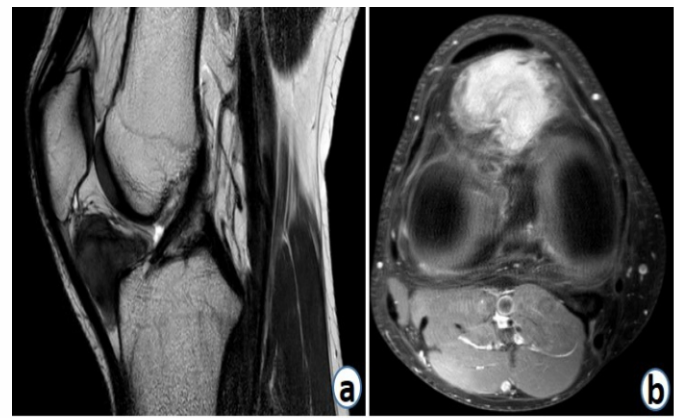


Figure 2: (a and b) Sagittal T2-weighted magnetic resonance imaging image depicts a lobulated mass with heterogeneously low signal intensity occupying the anterior joint space of the knee. The second axial T1-weighted image shows tumor enhancement after administration of gadolinium.

suspicion is thus required. Magnetic resonance imaging (MRI) plays a crucial role in the diagnosis as opposed to plain radiographs which are not helpful [6]. The treatment of choice is surgical excision either arthroscopically or through a limited parapatellar approach. Despite its benign nature, the rate of local recurrence after excision has been reported to range between 10% and 20% [7, 8].

To date, only a few cases of GCTTS have been reported in the knee, especially arising from the patella tendon sheath. The present study reports two unusual cases in the knee mimicking a meniscal tear due to presence of catching and locking during knee flexion. The present study may assist clinicians in making the correct diagnosis in cases with non-traumatic knee mechanical symptoms and loss of motion.

Case Presentation

Case 1

A 22-year-old male football player presented to the outpatient orthopedic clinic with pain on the right knee localized at the medial joint line. The pain had appeared 2 weeks prior his initial visit to the hospital after a mild injury during a football game. After the injury, the patient was not able to continue the game due to knee swelling and pain. His symptoms failed to improve with rest, anti-inflammatory medication, and physiotherapy. There was no history of prior knee trauma as well as nothing remarkable in his medical history. During the clinical examination, the patient's knee presented mild swelling without increased skin temperature. He reported tenderness on palpation of the anteromedial aspect of the knee and discomfort with McMurray's test. Furthermore, there was a decrease in

knee flexion to 115° with no signs of ligamentous instability. The patient reported that limitation of flexion was present for 6 months compared to the contralateral knee. Neurovascular assessment revealed a

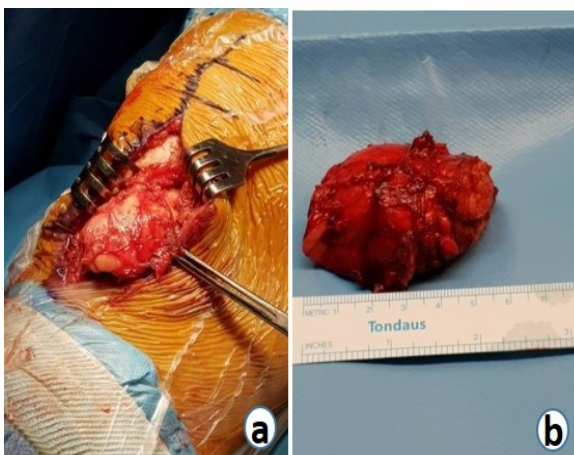


Figure 3: (a and b) Intraoperative pictures showing a unique, solid, lobulated, 49×40×32 mm in size, and intraarticular soft-tissue mass.

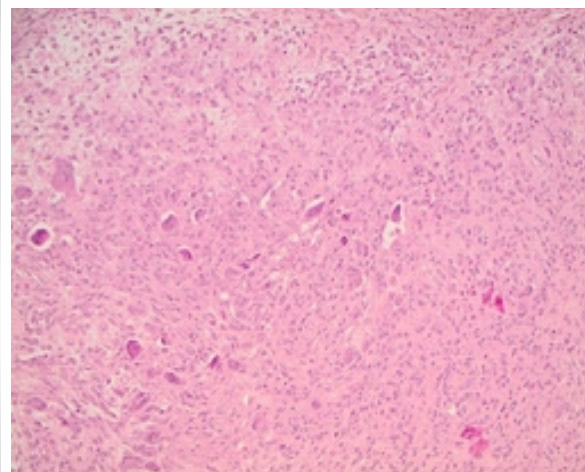


Figure 4: Histological section showing small and round mononuclear cells and osteoclast-like giant cells with varying number of nuclei.

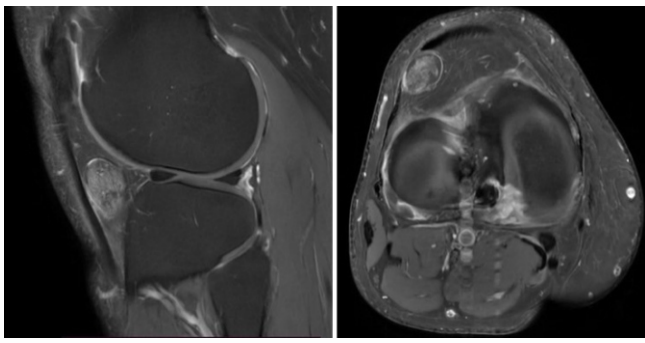


Figure 5: Sagittal and axial fat-suppressed proton-density-weighted FSE magnetic resonance imaging images, revealing a lobulated soft-tissue mass that was attached to the patellar tendon sheath.

strong palpable dorsally pedis and posterior tibial pulse while sensation of the lower extremity was normal. Plain radiography showed increased density at the infrapatellar region on the lateral view while nothing noteworthy was evident on the anteroposterior view (Fig. 1a and b). Blood analysis and basic metabolic panel results were within the normal range. MRI of the right knee demonstrated the presence of a homogenous and discrete mass with low-intensity signal in both T1 and T2 sequences with diffuse enhancement after administration of gadolinium, located in the infrapatellar region posterior and medial to the patellar tendon (Fig. 2a and b). A computed tomography (CT)-guided biopsy with fine needle aspiration was performed revealing the presence of mononuclear cells and giant cells indicative of GCTTS. The patient underwent complete open excision through a medial parapatellar approach. A unique, solid, lobulated, 49×40×32 mm in size, intraarticular soft-tissue mass adherent to the posterior surface of the patella tendon was excised (Fig. 3). Histological revealed the presence of dense fibrous tissue with accumulation of histiocytes and multinucleated giant cells establishing the diagnosis of GCT (Fig. 4). Recuperation of the patient was uneventful, and he returned to sports activities 1-month postoperatively. During the 20-month follow-up period, there was no evidence of tumor recurrence.

Case 2

A 35-year-old female gymnast presented with a history of right knee pain for 1 year, especially with knee flexion along with symptoms of locking and catching. She was referred from her general practitioner with the initial diagnosis of a meniscal tear. There was no history knee trauma. On clinical examination, the patient presented with moderate knee swelling with 110° of knee flexion as opposed to 130° on the contralateral knee. In addition, the patient reported a lateral movement sensation on knee flexion, resembling dislocation of the patella. A mildly painful firm and mobile soft-tissue mass arising from the lateral

aspect of her patella tendon was noted. X-ray evaluation and hematological examination were normal. MRI showed the presence of a well-defined lobulated lesion (2.4×1.7×1.2 mm) with low signal intensity in both T1- and T2-weighted images arising from patella tendon (Fig. 5). The mass was excised with an open parapatellar approach and synovectomy of the patellar tendon was also performed. The post-operative period was uneventful, the effusion resolved, and there were no further episodes of locking or catching.

Discussion

GCTTS are uncommon soft-tissue tumors with limited published cases. They are benign nodular tumors encountered in the extremities and originate from the synovial tissue of the joints, tendon sheaths, bursa, and fibrous tissue adjacent to tendons [9]. The average age of patients with GCTTS is typically from 30 to 50 years old and is particularly encountered in women. However, incidents of the lesion in younger patients have also been reported [10, 11, 12, 13]. Up to now, several cases of GCTTS originating in the knee joint have been reported in the literature [14, 15, 16, 17] and the cases regarding the patellar tendon are extremely rare (Table 1).

One of the most important clinical features of GCTTS is that the symptoms are non-specific. Thus, clinical manifestations vary from a painless slow-growing mass to local warmth, swelling, stiffness, and limitation of knee movements. In exceptional cases, this tumor may present with symptoms that suggest acute mechanical derangement such as catching or locking, imitating meniscal tears, or loose bodies [18, 19]. In this study, we present two cases of GCTTS mimicking a meniscal tear.

Imaging evaluation is an essential part of the diagnostic workup. Conventional plain radiographs are usually of limited benefit but occasionally Hoffa's fat pad with its radiographic lucency may be replaced with areas of soft-tissue opacity [20]. If the disease is more aggressive, small cystic formations or peri-articular cortical erosion can sometimes be observed [21, 22]. MRI imaging is the most valuable diagnostic modality. GCTTS appear as well circumscribed lesions which exhibit low signal intensity on both T1- and T2-weighted images due to the presence of dense fibrous tissue, as exemplified in our cases. The signal features are believed to be correlated with the varying amounts of hemosiderin in the lesion. Therefore, in case of hemosiderin deposits which are much more apparent on gradient echo images, T2-weighted images show variable signal intensity. Adding intra-articular gadolinium can help identify the nodules, especially in cases with minimal hemosiderin deposits [23, 24, 25]. Moreover, it should be pointed out that malignant tumors and other benign soft tissue tumors may be

Study	Cases	Size	Clinical features	Treatment	Outcome
Akahane et al. [21]	1	N/A	Decreased ROM	Open excision	1-year follow-up No recurrence (MRI evaluation)
Aricanet al.[34]	1	4×2×1.5 cm	Swelling, tenderness along the joint line and pain with ROM	Arthroscopic-assisted mini-open excision	2-year follow-up No recurrence (MRI evaluation)
Lu [35]	1	5×3×2 cm	Mild joint effusion, mild tenderness along the inferior margin of the patella	Arthroscopic excision	3-year follow-up No recurrence (MRI evaluation)
Chechik et al. [31]	2	N/A	Nontender palpable mass (1st case) Intermittent locking (2nd case)	Arthroscopic excision (both)	36-month follow-up (1st case) 24-month follow-up (2nd case) No recurrence (both)
Goyal et al.[36]	1	5×3×3 cm	Swelling and pain	Open excision	20-month follow-up No recurrence
Kılıçaslan et al.[32]	1	3.5×3×1.8 cm	Anterior knee pain	Open excision	18-month follow-up No recurrence (MRI evaluation)
Abdullah et al. [12]	1	3×3.5×1.5 cm	Painless lump	Open excision	35-month follow-up No recurrence Mild pain after prolonged sitting
Khanduja et al.[17]	1	N/A	Anterior knee pain and extension limitation	Arthroscopic-assisted mini-open excision	18-month follow-up No recurrence
Atik et al.[13]	1	3×3×1.5 cm	Intermittent knee swelling	Open excision	N/A
Panagopoulos et al. [29]	1	5×4×2 cm	Painful Locked Knee	Open excision	2-year follow-up No recurrence (MRI evaluation)
Relwani et al. [37]	1	2.5×2×2 cm	Anterior knee pain	Open excision	2-year follow-up No recurrence (MRI evaluation)
Sun et al.[11]	1	3.8×2×1.7 cm	Occult-growing swelling and infra-patellar pain	Open excision	5-month follow-up No recurrence

differentiated from GCTTS based on their radiographic features. Synovial sarcoma and malignant fibrous histiocytoma exhibit a non-homogenous appearance on MRI while they are characterized by calcifications and poorly defined margins [26]. Ganglion cysts show high signal intensity on T2 images without gadolinium enhancement, while lipomas demonstrate high signal on both T1- and T2-weighted images and saturation on fat suppression sequences [27].

Imaging-guided percutaneous needle biopsy for histopathological examination may occasionally be indicated, using ultrasound or CT imaging, although the definitive diagnosis can only be safely made with excision biopsy. The criteria for the diagnosis of GCT are proliferation of the synovial tissue with villi or synovial nodules, hemosiderin deposits, a variable number of fibroblasts, and giant cells with fibrosis and hyalinization [28].

The principal treatment for GCTTS is surgical resection. For this purpose, either open or arthroscopic surgery can be performed. At present, there is no consensus regarding which technique is superior. The size, the site, and the extent of the tumor are important factors for the selection of the surgical excision. In Case 1, the size of the lesion was 4.9 cm at its largest dimension, so an open arthrotomy was preferred. It is of note that only a handful of giant cell tumors of the patellar tendon of

this size have been reported in the literature [12, 29, 30, 31, 32]. Arthroscopic approaches have increased their popularity because they are minimally invasive procedures and reduce the risk of complications. A systematic review conducted by Van der Heijden et al. [9], showed no significant difference in terms of recurrence rates after open and arthroscopic resection of tumors. On the contrary, a recent international, multicenter, and cohort study showed that two factors associated with increased recurrence rates were the size of the tumor and initial treatment with arthroscopy. The same study concluded that open surgical approach most commonly leads to fewer complications and better functional outcomes [32].

Conclusion

GCTTS involving the patellar tendon is a rare entity and may mimic a variety of intraarticular knee problems. Adequate pre-operative imaging and complete tumor excision lead to permanent treatment of the tumor.

Clinical Message

The present case study underlines the unique features of GCTTS in the knee mimicking a meniscal tear. Although it is uncommon, this entity should be taken into account more often in differential diagnosis of knee problems.

Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given the consent for his/ her images and other clinical information to be reported in the journal. The patient understands that his/ her names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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