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Glomus tumor of the patellar tendon: a case report and review of the literature

Mohammad Daher[1*], Dany Aouad[2], Jamal Saade[2] and Joseph Wehbe[2]

Abstract

Background A rare finding, the glomus tumor is made up of cells that resemble modified smooth muscle cells. It usually arises in the deep dermis of the palms and the wrists. However, it can still appear in atypical places such as the knee presenting with atypical symptoms.

Case report This case report is about a 43-year-old previously healthy Middle Eastern male with a glomus tumor of the distal portion of the patellar tendon presenting as continuous dull pain of the right knee for the previous 2 years.

Conclusion Glomus tumor, a mostly benign lesion usually found in subungual area in the hand, can be found in the knee as well. It can be diagnosed with magnetic resonance imaging, appearing bright on T2-weighted images with diffuse enhancement following gadolinium injection and as a well-defined dark lesion on T1-weighted images. Histological examination remains the only confirmatory diagnosis, showing sheets and clusters of homogeneous glomus cells encircling arteries.

Keywords Glomus, Patellar tendon, MRI, Histology, Case report

Introduction

The glomus body, which is widely distributed in the dermis, gives rise to the glomus tumor (GT) [1]. This rare tumor is made up of cells that resemble modified smooth muscle cells found in healthy hemangiospheres [2]. The deep dermis of the palms, wrists, forearms, and feet, as well as the subungual region, which are rich in blood vessels, are all common locations for GTs [3]. About 5% of individuals with neurofibromatosis type 1 (NF1) experience finger and toe GTs, which are referred to as NF1-related tumors [4]. Furthermore, by acting as a blood flow shunt to alternately limit and encourage convective heat loss, the glomus body participates in thermoregulation [1].

Currently, the typical triad of pain, tenderness to palpation, and hypersensitivity to cold is used to make the clinical diagnosis of GT [3]. However, surgical excision for histopathological examination is necessary for a definitive diagnosis [3]. Even though the majority of GTs are often regarded as benign [5], a number of malignant GTs as well as indeterminate potentially malignant GTs have been described [6, 7]. However, surgical excision remains the mainstay treatment.

In cases of extradigital GTs, Orthopedic surgeons can fail to detect them or mistake them for other conditions such as osteoarthritis, soft tissue injuries, popliteal fossa cysts, neurogenic tumors, vascular tumors, pigmented nevi, epidermal cysts, lipomas, leiomyomas, and sarcoidosis [8]. This is mainly due to the lack of knowledge about GTs in unusual places, which may lead to misdiagnosis [3]. This case reports an extradigital glomus tumor in the anterior knee region that caused dull persistent pain, which was completely relieved by resection.

*Correspondence:
Mohammad Daher
Mohdaher1@hotmail.com
[1] Hotel Dieu de France, Beirut, Lebanon
[2] Saint Georges Hospital University Medical Center, Achrafieh, Lebanon

Case report

A 43-year-old previously healthy Middle Eastern male presented to the clinic with continuous dull pain of the right knee for the previous 2 years. There was no history of trauma nor mechanical symptoms. However, upon short-distance walking and stair climbing, intense pain was elicited, especially when exposed to cold weather. After resting, the discomfort subsided, albeit it got occasionally worse at night.

On physical examination, the patient had a skin lesion at the distal portion of the patellar tendon that was extremely tender to palpation with associated cold hypersensitivity. This area presented a palpable purplish nodular lesion. Both the range of motion and skin surrounding the knee were normal. Neurovascular examination showed that the affected lower limb was intact and showed no abnormalities. The patient reported previous excision of this skin lesion without any histopathologic workup, with active recurrence at the same anatomical site (Fig. 1).

Radiographs of the knee were unremarkable. However, magnetic resonance imaging (MRI) of the right knee showed an anterior subcutaneous lesion abutting the superficial and distal bundles of the patellar tendon corresponding to the palpable lesion and measuring around $3 \times 6 \times 5$ mm. This lesion had an intermediate signal on the T1 modality and intense signal on the T2-weighted imaging enhancing after contrast injection. No other abnormalities were seen except mild joint effusion.

Fig. 1 Photo of the knee showing a glomus tumor of the distal portion of the patellar tendon

Surgical excision was recommended, to which the patient agreed. The purplish skin lesion was excised, and surrounding subcutaneous debridement was carried out reaching the patellar tendon. The pain disappeared immediately after the surgery. Numerous mononucleated globus cells with pale and eosinophilic cytoplasm, as well as thin- and thick-walled vessels, were visible after hematoxylin–eosin (H&E) staining. Vimentin, h-caldesmon, and smooth muscle actin were also found to be positively stained by monoclonal antibodies used in immunohistochemistry, confirming the diagnosis of GT.

Discussion

The glomus body, which plays a role in thermoregulatory control, is made up of perivascular contractile glomus cells, non-myelinated nerve fibers that affect artery diameter through sympathetic tone, and arterioles and venules with numerous shunts [9]. A GT is mostly a benign lesion that arises from the glomus body and typically manifests in young people's distal upper or lower extremities. They favor the subungual region of the fingers because it contains one of the greatest concentrations of glomus bodies. Although the hand is frequently afflicted, other sites can also develop cutaneous lesions, and extracutaneous GTs have also been documented [9, 10]. However, the location in the knee is very rare. These are uncommon tumors that make up between 1% and 5% of upper extremity neoplasms overall, with 75% occurring in the hand and 50% in the subungual region [11]. They are more common in women than in males in the subungual region, whereas extradigital GTs are more prevalent in men (4:1) [9], which is the case in the patient presented above. Despite being generally considered to be idiopathic, certain investigations point to a connection with trauma or injury to the area before symptoms appeared [9]. However, the patient described above did not report any history of trauma to the area of the GT.

Precise tenderness, paroxysmal pain, and cold hypersensitivity are the three main symptoms reported by patients with GTs. With Love's test, the location of the lesion can be determined by applying pressure to the suspected spot with the head of a pin or paperclip, which causes excruciating pain. The sensitivity and accuracy of the Love's pin test are both 100% [12]. In Hildreth's test, the tenderness is eliminated if a tourniquet or blood pressure cuff is used close to the lesion. The sensitivity and specificity of Hildreth's test are both 71%, while its accuracy is 78% [12]. The sensitivity, specificity, and accuracy of cold sensitivity were all confirmed to be 100% [12]. However, subjective symptoms frequently outweigh clinical symptoms; it is usual for patients to see several healthcare professionals, and sometimes it may be a long period of time before they receive the right diagnosis. In

the knee area, there are several possible diagnoses. It comprises both extra-articular lesions (ligamentous strains and sprains, neuropathic pain syndromes) and intra-articular lesions (such as meniscal tears or cysts, synovitis, plica irritation, pigmented villonodular synovitis, foreign body, and infection) making the diagnosis even more challenging [13].

The gold-standard imaging method for locating and diagnosing GTs is MRI, which has been described as appearing bright on T2-weighted images with diffuse enhancement following gadolinium injection and dark and well-defined on T1-weighted images [14, 15]. The MRI in this study showed images similar to the described appearance of the GT. The specificity of an MRI is believed to be 50%, whereas the sensitivity is close to 90% [16]. With a high suspicion index and a negative MRI, the surgeon should continue with exploration and excision because false-negative results frequently occur with tiny tumors measuring 2–3 mm [9]. With a sensitivity close to 90%, Doppler ultrasound can be utilized to help find the elevated blood flow connected to these lesions [14]. Radiographs have little diagnostic value; however, subungual malignancies can cause bone erosion and can increase the distance between the nail and the dorsum of the phalanx [14]. Angiography, thermography, and scintigraphy have all been studied; however, they do not contribute much to routine examinations of these tumors [16]. However, histology provides the conclusive diagnosis, demonstrating that the proliferating tissue contains glomus cells, vascular structures, and smooth muscle tissues in various amounts [17]. GTs often consist of sheets and clusters of homogeneous glomus cells encircling arteries the size of capillaries. In addition, a present pseudo-capsule is possible. Muscle actin isoforms and vimentin are both expressed by glomus cells [1]. Most of the time, complete excision is curative, and all symptoms resolve. Similar to what happened with the patient described above, this excision ought to result in a dramatic improvement in symptoms. Recurrences [18, 19] and malignant sarcomatous transformation of GTs [20] are incredibly uncommon.

Conclusion

Glomus tumor, a mostly benign lesion usually found in subungual area in the hand, can be found in the knee, presenting with a triad of precise tenderness, paroxysmal pain, and cold hypersensitivity. This rare tumor can be diagnosed with an MRI appearing bright on T2-weighted images with diffuse enhancement following gadolinium injection and dark and well-defined on T1-weighted images. However, the definitive diagnosis remains histological examination after complete resection, which will show sheets and clusters of homogeneous glomus cells encircling arteries the size of capillaries and staining for muscle actin isoforms and vimentin.

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MD: writing. DA: Data acquisition and writing. JS: Data acquisition and writing. JW: operating surgeon and reviewer of the case.

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Availability of data and materials
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Declarations

Ethics approval and consent to participate
Written informed consent was obtained from the patient for participation in this case report however, no ethical approval was needed.

Consent for publication
Written informed consent was obtained from the patient for publication of this case report and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

Competing interests
The authors declare that they do not have any competing interests.

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