Tenosynovial Giant Cell Tumor of the Thigh: Positron Emission Tomography Findings

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Abstract

Tenosynovial giant cell tumors (TGCTs) are pigmented villonodular proliferative lesions originating from the synovium, bursa, or joint. TGCTs tend to be locally aggressive, and there is a chance for multiple occurrences, which often lead to impairment of joint function.

In this article, we report the case of a diffuse-type extra-articular TGCT found in the thigh of a 36-year-old woman. Surveillance F-18 fluorodeoxyglucose positron emission tomography detected increased activity within the left thigh. This activity was confirmed with magnetic resonance imaging and with surgical excision and histopathologic determination of the tumor. This patient's case suggests that TGCTs may be discovered and followed after resection with positron emission tomography.

Tenosynovial giant cell tumors (TGCT), originally described by Jaffe and colleagues[1] in 1941, are pigmented villonodular proliferative lesions originating from the synovium, bursa, or joint.[2,3] TGCTs tend to be locally aggressive, and there is a chance for multiple occurrences, which often lead to impairment of joint function.[3] They occur mostly in women[4,5] and patients between ages 30 and 50.[3,4,6] Two forms have been recognized based on growth characteristics: The diffuse form occurs predominantly in the periarticular soft tissue around large joints, and the localized form occurs more often in the synovium of tendon sheaths or interphalangeal joints.[6,7] However, TGCTs also occur in extra-articular locations.

We present an unusual case of a diffuse-type extra-articular TGCT in the thigh involving the sciatic nerve of a 36-year-old woman with a history of breast cancer, first diagnosed with F-18 fluorodeoxyglucose (FDG) positron emission tomography (FDG-PET) and later confirmed with magnetic resonance imaging (MRI). The patient provided written informed consent for print and electronic publication of this case report.

Case Report

A 36-year-old woman with a past history of breast cancer and Graves disease presented with left leg pain that had progressively worsened over the preceding 3 months. She described the pain as sharp, with intermittent burning that traveled down the left buttock, posterior thigh, calf, and lateral portion of the left foot. She also experienced occasional numbness and back spasms but denied back or right leg pain. This pain was aggravated by sitting. Physical examination of the extremities revealed tenderness along the posterior aspect of the thigh, with the presence of a Tinel sign at the level of the sciatic nerve, but no obvious subcutaneous nodule or edema. Breast cancer surveillance PET detected increased activity within the left thigh (Figures 1A, 1B). MRI of the thigh showed a 1.7-cm enhancing lesion contiguous with the tibial portion of the sciatic nerve (Figures 2A, 2B). Subsequent, preoperative ultrasound also identified this lesion and allowed for further localization (Figure 3). During surgery, a firm encapsulated tumor was identified compressing but not arising from the sciatic nerve (Figure 4). The tumor was excised. Histopathologic examination revealed a tan-yellow, 1.6×1.4×0.9-cm^3 tumor and a proliferation of rounded to ovoid and slightly spindled cells growing in sheets. The cytoplasm was relatively abundant, pale,

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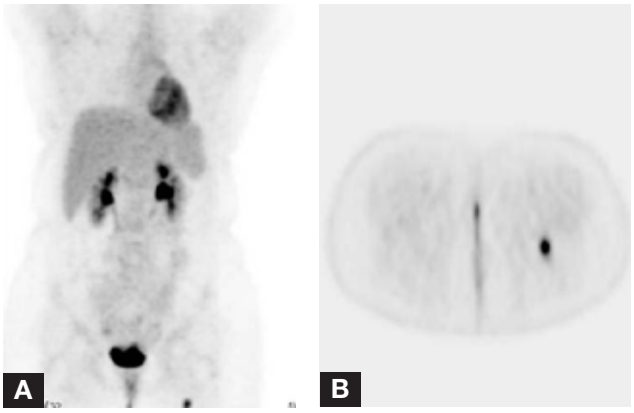

Figure 1. Coronal (A) and axial (B) positron emission tomography images show large mass around left thigh. Of note: no significant uptake at sciatic nerve.

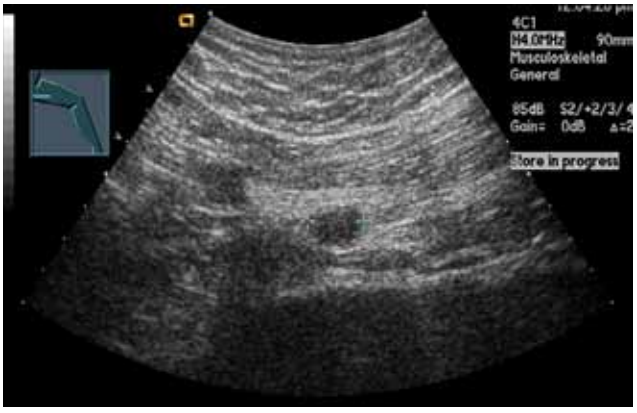

Figure 3. Preoperative ultrasound of tumor.

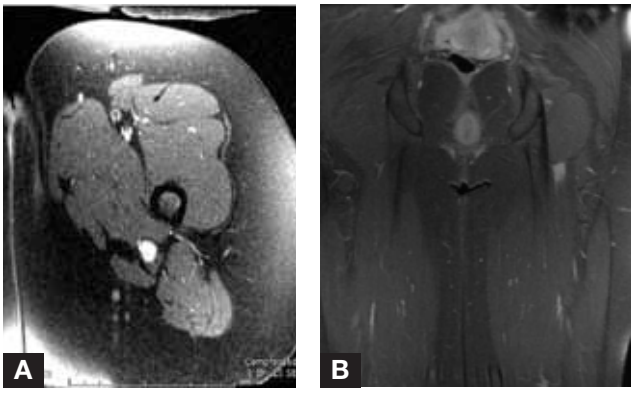

Figure 2. Axial (A) and coronal (B) magnetic resonance imaging shows mass lesion around left thigh.

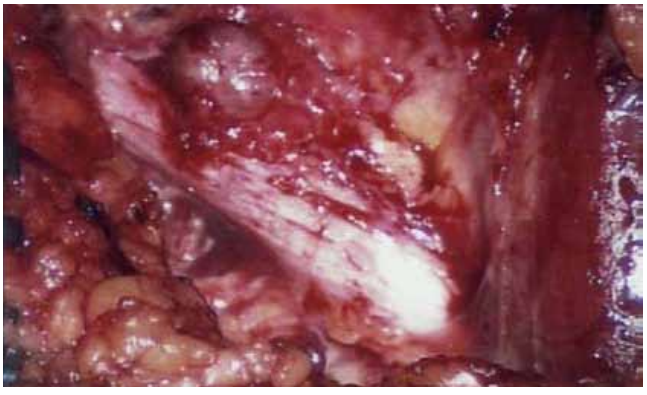

Figure 4. Intraoperative photograph of tumor around tibial portion of sciatic nerve.

amphophilic, and focally vacuolated. The nuclei were vesicular with indistinct to small nucleoli, and a subset of nuclei exhibited indentation of the membrane. Scattered multinucleate giant cells were present, and the proliferations extended to the margins of the excision. This confirmed a diffuse-type extra-articular TGCT.

The patient's preoperative pain resolved completely after surgery, and there were no new deficits. PET repeated 18 months after surgery showed no evidence of increased uptake in the left thigh. There was no recurrent leg pain within the 25 months after surgery.

Discussion

Diffuse-type TGCTs tend to be locally aggressive and often lead to impairment of joint function.[3,8] In rare instances, the diffuse type represents extra-articular extension of pigmented villonodular synovitis.[3] These lesions can show high cellularity, destructive growth, and few giant cells.[5] This unusual extra-articular form, unlike its intra-articular counterpart, presents a diagnostic challenge. It is defined by the presence of an infiltrative soft-tissue mass with or without involvement of the adjacent joint and often goes unrecognized.[3,7,9] Our patient's extra-articular TGCT was distant from any joint. Although the pathogenesis of extra-articular giant cell tumors is not fully understood, gross total resection of these lesions is potentially achievable.

MRI has been suggested as the standard method for diagnosing these lesions, as it allows for size determination, localization, and differentiation into malignant and benign lesions.[6,7] PET on the other hand, has been useful in detecting recurrence through surveillance of certain tumors, such as breast, lung, head, neck, and metastatic liver tumors.[10,11] It uses radiotracers to detect and quantify cellular and biochemical processes noninvasively. FDG, a positron-labeled nonphysiologic analog of glucose, is the PET radiotracer most commonly used in oncology. Malignant tumors preferentially accumulate FDG because of the increased glucose metabolism and rate of transport and utilization in these cells.[12] FDG in the blood is transported into the cells and phosphorylated to FDG-6-phosphate by hexokinase. In most tissues and tumors, glucose-6-phosphatase enzyme is low, which makes it impossible for FDG-6-phosphate to be dephosphorylated back to FDG. Therefore, FDG-6-phosphate cannot cross the cell membrane, resulting in the accumulation of the radiotracer.[12]

To our knowledge, this is the first description of

diffuse-type giant cell tumor in the thigh identified and followed up with PET. This tumor was detected during a post–breast cancer treatment screening PET scan. This finding coincided with the patient's report of radicular pain traveling down the left buttock to the lateral portion of the left foot. Subsequent PET scan, performed 18 months after resection, showed no increased activity in the left thigh. Although previously described in the literature, the tumor location described in our patient's case is rare, even though the Tinel sign over the area was positive. PET facilitated diagnosis of the tumor, which was not palpable because of the patient's body habitus and tumor size. Yoshida and colleagues[11] also described a case in which the tumor discovered in the buttock within the hamstring muscle was detected with PET and was further confirmed by MRI as well as by histopathologic findings after surgical resection. The PET findings led to a modification of the diagnostic and treatment plan in this case and underscore the importance of entertaining extraspinal etiologies of sciatica.

We conclude that, though postcontrast MRI is the standard method for characterizing these lesions, they may be discovered, and subsequently followed after resection, with PET. We do not advocate using PET in cases of sciatica without spinal pathology, but we believe PET may be a useful clinical tool for postoperative surveillance of TGCTs and for providing clinicians with prognostic information when MRI findings are inconclusive. In addition, it may be used to provide a treatment-completion baseline for identification of future tumor recurrence.

Authors' Disclosure Statement

The authors report no actual or potential conflict of interest in relation to this article.

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