Case report

Imaging in a case of giant cell tumor of tendon sheath in foot: A case report with review of literature

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Abstract
Large sized Giant cell tumors (GCT) of the tendon sheaths of the foot are rare. We present a case with a large tumor over the dorsum of foot which was diagnosed and studied by plain radiography, Ultrasound, CT and MRI scans. It was histologically confirmed on biopsy. When the size of the tumor (like Giant cell tumor) is too large and spread over multiple bones of the foot MRI is the imaging modality of choice to precisely define the anatomy to help in taking surgical decisions.

Key words: giant-cell tumor of tendon sheath, imaging of foot, MRI

Bi and soft tissue tumors of feet continue to be a challenging task for both clinicians and radiologists in diagnosis and treatment. Giant cell tumor of tendon sheath (GCT-TS) is an outgrowth from tendon sheaths and is most often seen in the hands. In the feet, it is the second most common soft tissue tumor only next to ganglion cyst. Magnetic resonance imaging plays a vital role in assessing pathologic conditions of ankle and foot due to the superiority over other imaging techniques in depicting the soft tissue structures such as tendons, ligaments, nerves, and fascia. This case is reported due to its rarity and to highlight the importance of imaging in its evaluation.

Case report
A 32 year old male patient presented with painless swelling on dorsal aspect of foot for last five and half years. On examination the lesion was firm, lobulated, with small ulceration on lateral aspect (Fig 1). There were no pulsations or discoloration. It was not tender and did not bleed on touch. Blood investigations were unremarkable. Plain radiograph of ankle lateral view revealed large lobulated soft tissue swelling on dorsal, ventral, and plantar aspect of foot (Fig 2). There was extrinsic erosion of talocalcaneal joint, cuboid, cuneiform and base of 5th metatarsal. On ultrasonic examination mass was heterogeneously isoechoic with mildly increased vascularity (Fig 3 a and b). On CT scan the mass was isodense, diffuse nodular, eroding tibia, talus, calcaneum, cuboid, cuneiform and base of metatarsals. Areas of increased density were noted in the mass (Fig 4). Vascularity was normal. MRI (Fig 5 a and b) revealed mass isointense to muscle with areas of T1, T2 hypo intensity. The lesion was seen in between and encircling peroneal and flexor tendons and limited by plantar aponeurosis. All joints were normal. Biopsy (Fig 6) revealed predominant round to polygonal mononuclear cells with round to oval nucleus. Large polygonal cells with vesicular nucleus, abundant cytoplasm showing hemosiderin granules were seen in addition. Cluster of foamy macrophages and multinucleated osteoclast giant cells
were observed. CD 68 was positive; Desmine negative and K 167 labelling index was less than 1%. All these confirmed the pathological diagnosis as GCT. Patient refused limb amputation which was the only surgical option.

**Fig 1.** Large swelling on the dorsum of foot with small ulceration

**Fig 2.** Plain radiograph showing lobulated soft tissue swelling

### Discussion

GCTs of tendon sheath are benign tumors of uncertain pathogenesis. It was first described in the international literature by Jaffe et al in 1941. It has been given different names like nodular tenosynovitis or Pigmented Villonodular Synovitis (PVNS), or tenosynovitis and bursitis. World Health Organization nomenclature describes the tumor as Giant cell tumor of tendon sheath (GCT-TS) for PVNNNTS or PVNB, diffuse variety of giant cell tumor for the diffuse intra-articular form of PVNS. It is thought that tumor arises from synovial cell of tendon sheath/joint/bursa. GCT-TS grows outward from tendon sheath whereas pigmented villonodular synovitis grows inwards from synovial lining into joint. They constitute the second most common soft tissue tumor of feet after ganglion cyst. Ankle and foot is 2nd most common site of GCT-TS after hand. According to some authors typical site is volar aspect of hand and finger most commonly at metatarsophalangeal joint. Dorsal location is rare. Feet is 2nd most common site and is seen in 3-10%, most commonly fore foot especially great toe. Less common sites include extra-articular areas around the large joints such as knee, wrist, ankle and spine. It generally affects younger patients, 50% are below 40 years. It is rare in children below 10 years and beyond 60 years; there is female preponderance with male to female ratio of 2:3. Although etiology is unclear, most authors believe traumatic involvement or neoplastic origin as possible cause.

GCT is classified as localized and diffuse types. It is classified as type 1 when well encapsulated or not type 2. It is again subdivided depending on thickness of capsule, lobulation, presence of satellite nodule, diffuse or multicentric growth. Diffuse variety is considered as soft tissue counter-part of PVNS, typically affects the lower extremity. It is locally aggressive and recurrence after excision is common. Due to its high recurrence rate up to 50% some authors call it a semi-malignant tumor. Diffuse type of GCT-TS is defined by invasive extra-articular disease regardless of whether the GCT arose from a joint or soft tissue. In fact most of the cases are believed to represent extra-articular extension of primary intra-articular disease. Because of its diffuse invasive growth, it may not be possible to define the origin. Commonly it presents as painless mass for a long duration (weeks to 30 years). Occasionally distal numbness is the presenting feature. Masses occur at volar aspect of hands and most commonly at distal interphalangeal joints. Dorsal involvement is uncommon. Less common sites are extra-articular sites around large joints such as knee, wrist, ankle. GCT of tendon sheath are firm, lobulated, non-tender slow growing mass that are firmly attached to underlying structures. Usually overlying
skin is free and mobile. Due to rapid increase in size there may be ulceration of skin as in our case. Because of diffusely invasive growth it is difficult to define site of origin.

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Plain radiography reveals circumscribed soft tissue shadow in 50% cases. Cortical erosion due to pressure effect can be seen in 10-20\%, similar to our case. True bone erosion from this tumor is more common in feet than elsewhere, because the strong ligaments of feet frequently prevent outward tumor growth. Bone involvement is seen in 11 % cases. Joint space is preserved as our case. Rarely intra lesional calcification is seen. Periosteal reaction, osteopenia, calcification, degenerative or cystic changes and intra osseous invasion are rare radiographic findings. GCT has to be differentiated from synovial chondromatosis, periosteal chondroma or calcific tendinitis where calcification is the important radiological feature.

In ultrasonography (USG) the mass appears uniformly hypoechoic or may be heterogeneous, hyper vascular along tendon sheath or joint. Lesion is in contact or close relation with tendon or even encased; but does not move with tendon as it arises from tendon sheath not from tendon. A tendon is said to be involved if mean length of mass 5.7cm or 140 degree of involvement is seen. Bone erosion may be diagnosed in ultrasonography.

MRI delineates exact extent of lesion, intra or extra articular involvement, intrinsic relationship to tendon sheath. Even small extension along tendon margin suggests the teno-synovial origin. Other criteria are as described in USG. It is multilobular generally well circumscribed, may be partially or completely encapsulated or may have extension or satellite lesion connected by as little as a few strands of fibrous tissue. Lesion is low to intermediate signal intensity with well-defined lobular soft tissue mass in T1W and heterogeneous in T2W scans. Due to extensive fibrosis lesion show hypointensity in both T1 and T2 which favors GCTTS. Intermediate signal in T1 and T2 images is due to presence of hemosiderin which blooms in gradient echo images. T1 and T2 foci of hypointensity due to hemosiderin deposition which blooms on gradient-echo images is diagnostic. However hemorrhagic component is more common and extent is more in PVNS, which is a differentiating factor from GCT-TS. Linear /cleft like areas of high signal intensity within soft tissue may represent necrosis or due to entrapped synovial fluid. There may be diffuse enhancement of varying degree; sometimes homogenous or septal enhancement. The T1 and T2 hypointensity is most diagnostic of GCT-TS as it is not seen in extra-articular soft tissue mass of face, hand and feet.
William et al found that the direct involvement of extensor tendon, flexor tendon or joint capsule increases the chance of recurrence whereas involvement of skin neurovascular bundle or tendon sheath has no association with recurrence. No pre or post-operative factors are found to be linked with recurrence.\textsuperscript{13}

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**References**