Giant-cell tumour of the tendon sheath: A review

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Abstract

Introduction
Giant-cell tumour of the tendon sheath is a solitary, firm, extra-articular localized, benign, soft tissue tumour that usually presents with painless swelling for several years. Aetiology of the disease is unknown. It is a relatively rare soft tissue tumour, an overall incidence is 1 in 50,000 individuals and usually affects people between 30 to 50 years. It is more often seen in women, the female to male ratio is 3:2. There is no certain treatment protocol but complete local excision with or without radiotherapy is the treatment of choice. Local recurrence after excision is approximately 10 % to 20 %. It typically affects small joints of hands and feet. Also, it can be found around the ankle, knee joints, elbow or hip. The aim of this review was to discuss giant-cell tumours of the tendon sheath.

Conclusion
There are lots of obscurities about this topic, so more prospective well – designed studies including large number of cases are necessary to determine the prognostic factors, recurrence rate and proper treatment protocol for each individual patient.

Introduction
Giant-cell tumour of the tendon sheath (GCTTS) is a solitary benign soft-tissue tumour of the limbs. The tumour was first described by Chassaing in 1852 as fibrous xanthoma. Since then it has been referred to by other names such as fibrous histocytoma of synovium, pigmented nodular synovitis, tenosynovial giant cell tumour, localised nodular tenosynovitis, benign synovioma, sclerosing haemangioma, xanthogranuloma, xanthosarcoma, myeloid endothehlioma, fibrohemosideric sarcoma, giant cell fibrohemangioma, and fibrous xanthoma1,2.

Synovial membrane makes the lining of joints, tendons and bursae. GCTTS typically presents as a localised slow-growing, painless, firm tumour, arising from the tendon sheath mostly of small joints of the hands and feet. It is unusual for giant cell tumours to involve larger joints but it can be found around the ankle, knee joints, elbow or hip3,4.

Whether GCTTS presents a neoplasm or this is a bulk reactive proliferation is still controversial4. This article presents a review of literature about this entity to assess the epidemiology, presentation, histological characteristics, prognosis and recurrence rate of GCTTS.

Discussion
Aetiology of the disease, indeed, is unknown so the tumour is generally considered idiopathic. Some patients have history of trauma (in up to 15% of cases), but the reason cannot be determined in most of the cases. There are also some other risk factors that are mentioned in the literature such as infection (the tumour is considered as an inflammatory process arising as a consequence of chronic antigenic stimulation), disorder in the immune system, osteoclastic proliferation, vascular abnormality, localised lipid metabolism disorder, etc5,6,7,8.

Even though GCTTS was initially considered mostly as an inflammatory disease, the finding of aneuploidy in some cases and the demonstration of clonal chromosomal abnormalities support a neoplastic origin6.

Recent studies showed the presence of clonal chromosomal translocation, t(1;2)(p13;q37), which fuses colony stimulating factor (CSF1) coding sequences to the promoter of the collagen type VI alpha-3 gene. As a result, the tumour cells overexpress CSF1, a chemoattractant for macrophages, which infiltrate the tumour in large numbers9.

There is also proof of cytogenetic abnormality in the form of trisomy and autonomous growth, in addition to local recurrence and reports of metastatic GCTTS. Those facts raised the possibility that it is a cancer. On the other side, Vogrincic et al. used a polymerase chain reaction (PCR) based assay for methylation of the X linked human androgen receptor (HUMARA) to demonstrate that GCTTS is a polyclonal proliferation. They debated that if one accepted that a population of cells forming a tumorous mass must show clonality to be classified as a neoplasm, then GCTTS is either a hyperplastic or reactive process. A high mitotic rate is indicative of local recurrence, but there is a question of how many mitoses are required.

Few cases of malignant GCTTS have also been documented4,11. GCTTS is characterised by proliferation of synovial-like cells accompanied by giant cells, inflammatory cells, siderophages, and xanthoma cells with polyhedral, fibrilic material and hemosiderin deposits. It is grey to yellow – orange in colour with brownish areas, depending on the amount of hemosiderin, collagen and present hystiocites. According to the World Health Organization classification system for bone and soft tissue tumours, it is classified as a “fibrohistiocytic tumour”7,12,13,14.

It can be divided into localized nodular type (common in hand) and diffuse type (common in joints). Diffuse form is hypercellular with several giant cells, while localized form is relatively hypocellular with numerous giant cells. Another classification proposed by Al-Qattan classified GCTTS into Type 1 (single tumour, round and multi...

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lobulated) and Type II (two or more distinct tumours, not joined together). Type II is more often related with recurrence as satellite lesions when microscopic excision is not done. The tumour can be partially or completely encapsulated and may have extensions and/or satellite lesions.

GCTTS is a relatively rare soft tissue tumour. An overall incidence is 1 in 50,000 individuals and usually affects people between 30 to 50 years and is more often seen in women. The female to male ratio is 3:2.10

Another study of 207 cases showed that 25 arose in the toes and ten in the ankle and large joints of the foot2. Gibbons at al. analysed, from 1982 to 1999. 13 of them were arising from the foot and four of them in the ankle3. GCTTS is an extra-articular localized mostly painless soft tissue mass. Patients usually present with painless swelling for several years.1 The intra-articular form of such tumour is commonly described as pigmented villonodular synovitis and they share similar histological characteristics.

If a tumour is preceded by trauma, the patients can have consistent pain at the injury site or gradually growing nodules at those sites. As it was said, the most frequent tumour location is the hand, especially the fingers and in many cases, it involves the volar surface of the fingers more often than the dorsal one. The tissue mass expands areas of least resistance.

They are mostly small in size (average tumour size, 2.0 cm), albeit lesions of greater size may be found in the large joints. They are usually well-circumscribed and typically lobulated. Due to pressure effects, this tumour can cause bone erosions. They have been observed in 9% to 25% of cases and they usually manifest as small cortical defects. According to Gholve et al. the spectrum of bony involvement may vary from extremely subtle to more obvious cases. All changes of the bone cortex can be shown by sonography. Tumour has been reported as both hypoechogenic and hyperechogenic by sonography. In most cases, they are hypervascular lesions.

Neurological symptoms are not a common feature of GCT-TS. So, if there is pain or neurogenic symptoms with a solitary lesion of the limb, a nerve-sheath tumour or soft-tissue sarcoma should be more suspected in the differential diagnosis.

Considering the fact that giant cell tumours are superficial lesions usually located within the first centimetre of the field of view, first method to diagnose GCTTS could be ultrasound due to its high resolution for small structures such as tendons and ligaments. It can detect whether tumour is solid or cystic and provide information about the tumour vascularity, size and its relation to the surrounding tissue. Close contact with the tendon sheath or joint does make this tumour a primary consideration when diagnosing a soft tissue mass near a tendon sheath or a joint.

Radiographs are not so important in making this diagnosis but it will tell us whether there is cortical compression, intraosseal involvement or soft tissue swelling. Magnetic resonance is of course the most precise procedure where GCTTS is seen as low signal intensity on both T1- and T2-weighted images and it can accurately assess the tumour size and degree of tumour extent which can affect the type of surgical approach.

Administration of the contrast agent, gadopentetate dimeglumine, enhance the T1-weighted image what help to differentiate GCTTS from other solid soft-tissue tumours of the limbs, such as nerve-sheath tumours, haemangioma & soft-tissue sarcoma. It is hard to distinguish between GCTTS and pigmented villonodular synovitis, angiomia, synovial chondroma, synovial sarcoma or for example medial plica syndrome by MRI, so histological examination is necessary for confirmation.

To reach a diagnosis preoperatively, fine needle aspiration biopsy is applied.1,9

In the differential diagnosis we should think about giant cell tumour of soft tissue and giant cell tumour of bone. These tumours may be differentiated by the presence of necrosis, metaplastic bone formation, and aneurysmal bone cyst-like areas and their typical location of back, thigh, and shoulder. One should also consider fibroma of tendon sheath and extraskeletal osteosarcoma. The mixed cell population of GCTTS should distinguish it from the fibroma and the presence of anaplasia, malignant spindle cell stroma, numerous atypical mitoses, and bone formation from the osteosarcoma.

Table 1: List of differential diagnoses of GCTTS 1.

<table>
<thead>
<tr>
<th>Vascular</th>
<th>- Haemangiomia</th>
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<tbody>
<tr>
<td>- Glomus tumour</td>
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<td>Osseous</td>
<td>- Enchondroma</td>
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<td>- Osteoid osteoma</td>
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<td>- Osteoblastoma</td>
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<td>- Giant cell tumours of bone</td>
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<td>- Periosteal chondroma</td>
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<td>- Synovial chondromatosis</td>
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<td>Neurological</td>
<td>- Schwannoma or neurilemmoma</td>
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<td>- Fibropliomatus hamartoma</td>
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<td>- Neurofibromas</td>
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<td>Cutaneous lesions</td>
<td>- Mucous cysts</td>
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<td>- Nodular fascitits</td>
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<td>- Pyogenic granuloma</td>
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<td>- Scar tissue</td>
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<td>- Circumscribed fibromatosis</td>
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<td>Soft tissue lesions</td>
<td>- Ganglion</td>
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<td>- Giant cell tumour of the tendon sheath</td>
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<tr>
<td>- Lipoma</td>
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<td>- Fibroma of tendon sheath</td>
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<tr>
<td>- Foreign body granuloma</td>
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<td>- Tophaceous gout</td>
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blood flow with colour Doppler. Desmoid tumours may be well-defined or poorly defined but generally, extra-abdominal desmoid tumours occur in deeper limb tissue and have no obvious contact with the tendon sheath or joint capsule². The list of all diagnosis that are considered in differential diagnosis are shown in table 1. There is no certain treatment protocol but complete local excision with or without radiotherapy is the treatment of choice. The tumour should be dissected gently without allowing any seeding. In order to achieve that, removing of a cuff of the tendon sheath, part of a capsule, periosteum or even part of a tendon can be done. Local recurrence after excision is approximately 10% to 20% and according to some authors even 45%, especially in the hand. The known risk factors associated with the high recurrence rate are proximity to the arthritic joint, proximity to the distal interphalangeal joints of the fingers, proximity to the interphalangeal joint of the thumb, presence of degenerative joint disease, incompletely excision and radiological osseous erosions⁸,¹⁹.

In case of possible incomplete excision, presence of mitotic figures and bone involvement, Kotwal et al. recommended postoperative radiotherapy of 20 Gy in divided daily doses of 2Gy. In their study, recurrence rate was 0% (0 out of 14 patients)¹⁴,²⁰.

Monaghan et al. in their study found a mean count of 5 mitoses/10 HPF (range, 1–21/10 HPF) and mitotic figures were found in all lesions. Wright et al. found mitoses in only 50% of lesions and Rao and Vigorita found three or more mitotic figures in each 10 HPF in over 10% of their cases. Wright et al. noted that recurrences occurred in highly cellular lesions with an increased number of mitoses, and Rao and Vigorita also assumed that the three or more mitotic figures in each 10 HPF might suggest an actively growing lesion, which was more likely to recur. On the other hand there are authors that think how cellularity and mitosis does not seem to affect the prognosis of cancer ²¹.

A gene present in normal cells that is responsible for infiltration - nm23 can be used as a prognostic marker for the risk of recurrence. Grover et al. has found that mutation of gene nm23 is associated with increased rate of recurrence. Even though these authors described nm23 as an independent prognostic factor, report by Lorea et al. in 2004 found no correlation between nm23 expression and recurrence.⁴,⁵,²². There are also some other complications of treatment such as numbness, joint stiffness, painful scar and skin necrosis.¹¹,¹⁴,²³,²⁴.

Conclusion
GCTTs is a rare benign soft tissue lesion that arises from the tendon sheath and that is situated extraarticular. It should be considered as a differential diagnosis if the mass is found next to the joint. The most helpful diagnostic procedure is MRI, but to make definite diagnosis histopathological examination is required. Complete excision is the treatment of choice, but the tumour has quite high recurrence around 10-20%.

References
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