Giant cell tumour of the tendon sheath (GCT-TS) in the foot: A case report

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Abstract

Giant cell tumour of the tendon sheath (GCT-TS) has been described as the most common tumour of the hand following ganglion cysts. In contrast it is much rarer in the foot, with only 3–10% of GCT-TS being described in the foot. A PubMed and Medline search of the topic has revealed two case series and 12 case studies. It is therefore an uncommon condition, but should be considered as part of a differential diagnosis for a mass in the foot.

We present the case of a 42-year-old male who presented with a large painful mass in in the third web space of his left foot, which was 7 cm in length in vivo. It crossed the anatomical compartments of the forefoot and midfoot. Our case report showed the typical findings of a GCT-TS. Along with this we also present a review of the literature.

Key words: giant cell tumour of the tendon sheath, GCT-TS, benign tumours, foot tumours

Introduction

Giant cell tumour of the tendon sheath (GCT-TS) is a benign, solitary, proliferative tumour that arises from the complex of the tendon sheath of small joints in the hands and feet.[1] GCT-TS occurs most commonly in the fourth to fifth decades, but can occur between 10 and 60 years.[2] The female to male ratio is 3:2 and there is no racial preponderance.[2,3] GCT-TS has been described as the most common tumour of the hand after ganglion cysts.[2,4] In contrast it is much rarer in the foot, with only 3–10% of GCT-TS being described in the foot,[2] and is reported to make up 0.8% of foot and ankle masses.[5] This equates to a condition that is not rare, but is uncommon.

The case presented here shows the typical findings of GCT-TS, which grew to a considerable size due to its long history. It crossed the anatomically confined spaces of the forefoot and midfoot. We further present a review of the topic.

Case report

A 42-year-old male presented with a painful mass in the third web space of his left foot. It was a slow-growing mass, which was first noticed many years earlier. Approximately 12 years prior to presentation, a biopsy was performed from the dorsal aspect of the foot at a peripheral hospital. No clinical notes or histology results were available to us. At the time of presentation to our unit, the patient complained that the mass had increased in size considerably over the last year, and he felt as if he was walking on a stone. Despite the use of orthotics and shoe-wear modifications, he was experiencing a lot of pain on weight bearing and he complained of numbness in the third and fourth toes.

Examination of the foot revealed a healed surgical incision in the third web space. There was a fullness visible in the area on the dorsum and plantar aspects, and the third and fourth toes were splayed. Palpation revealed a large mass that was more prominent on the plantar aspect of the foot (*Figure 1*), and its full extent could not be felt. The mass was non-tender, but there was pain when the metatarsals were compressed to perform a Mulder's test. Sensation was altered in the third web space and on the third and fourth toes. He had an antalgic gait and he preferred heel walking because of the pain. His general examination was unremarkable and he was in good health. There were no lymph nodes palpable.

His X-rays showed a soft tissue mass in the third intermetatarsal space, with splaying of the adjacent rays. There were no bony erosions, and no calcifications in the mass. Serology was unremarkable. Our differential diagnosis at this point was giant cell tumour of the tendon sheath, synovial sarcoma and Morton's neuroma. We also considered tuberculosis and pigmented villonodular synovitis, but these were thought to be less likely.

An MRI scan of the lesion revealed a well circumscribed mass in the third intermetatarsal space, which extended into the plantar aspect. It was homogenous and showed a low intensity on the T1 and T2 images. It enhanced on the gadolinium images of the MRI. The proximal aspect of the mass could not be well visualised on the available films or on the computer, but was thought to be around the level of the tarsometatarsal joints. The size measured on MRI was 33 mm × 26 mm × 27 mm (*Figures 2 and 3*).

The mass was excised in its entirety. This was achieved through a primary dorsal incision which spanned the intermetatarsal space (*Figure 4*). The distal end was blind-ending, and no flexor tendons were seen distally to the third and fourth toes. Proximally a second incision was needed on the plantar aspect. The mass was found to originate from the tendon, and a tenotomy was performed proximal to the mass through healthy tendon. A large, yellowish-tan, rubbery-hard mass was removed. It measured 7 cm in length in vivo, which was larger than that seen on MRI (*Figure 5*). Its length in situ appeared to be much longer, which is probably due to the elasticity of the tendon and mass. The wound was found to have no residual traces of the mass. Digital nerves were not seen in the intermetatarsal space. Closure was done on a Portavac drain, and compression dressings were applied in an attempt to close down the splaying of the rays.

Macroscopic examination of the specimen showed a lobulated mass with no areas of calcification, haemorrhage or necrosis. It had a yellowish-tan colour. Microscopic examination showed a spindle cell neoplasm arranged in fascicles. Interspersed between the spindle cells were osteoclast-like giant cells (*Figure 6*). There was a background chronic inflammation, and haemosiderin pigment was seen. Two mitoses were seen per 10 HPF. The periphery of the specimen was covered in adipose tissue and skeletal muscle. A final diagnosis of GCT-TS was made.

The post-operative period was uneventful and the patient did very well. He has no problems with weight bearing or footwear and the splaying has disappeared. He reports normal sensation and no pain. There are no signs of recurrence after 1 year of follow-up.

Discussion

A PubMed and Medline search of the topic for articles in the English language has revealed two case series, and 12 case studies. The first series of 17 patients was collected retrospectively over 17 years.[1] The second was also a retrospective study of 20 patients treated over 5 years.[6] This is in keeping with GCT-TS being an uncommon condition.

The post-operative period was uneventful and the patient has no problems with weight bearing or footwear and the splaying has disappeared.

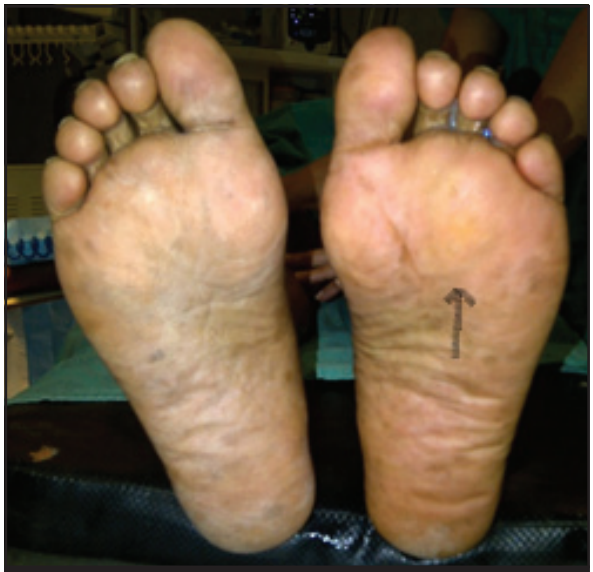

Figure 1. Visible mass on the dorsum of the left foot

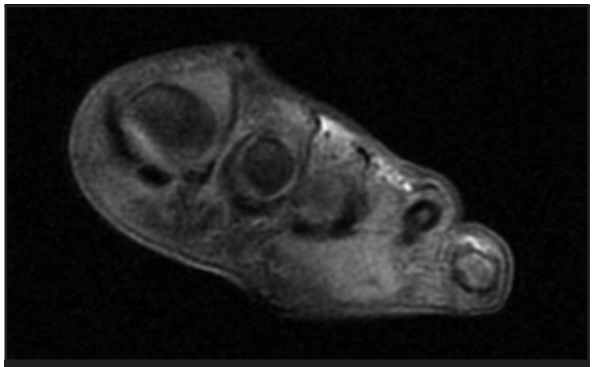

Figure 2. Homogenous mass in the third intermetatarsal space extending into the plantar aspect on coronal T1 image

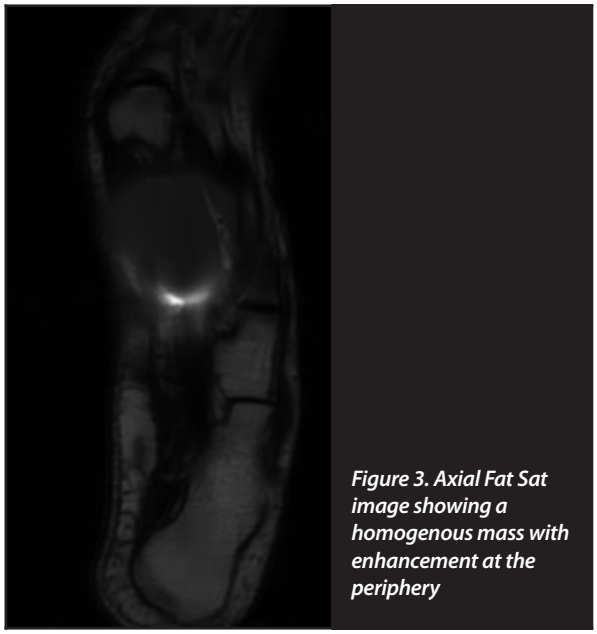

Figure 3. Axial Fat Sat image showing a homogenous mass with enhancement at the periphery

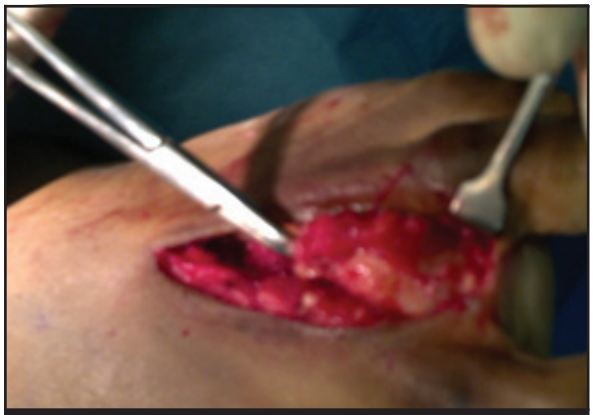

Figure 4. Mass dissection in the third intermetatarsal space

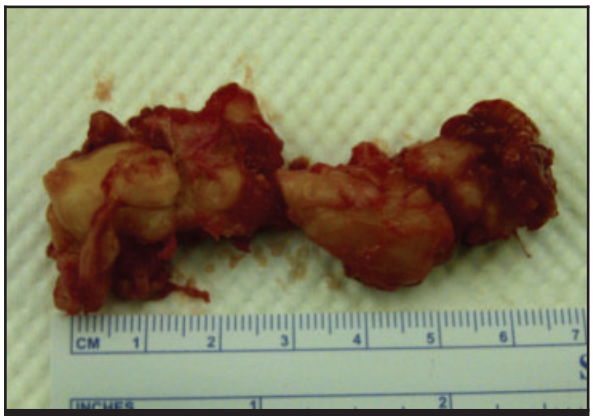

Figure 5. Lobulated mass measuring almost 7 cm in length

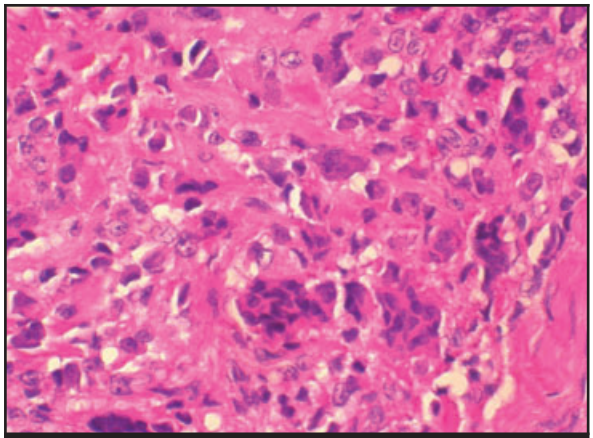

Figure 6. Histology slide showing spindle cells and osteoclast-like giant cells

Patients will generally present with a painless mass that gives discomfort on weight-bearing or difficulty with footwear

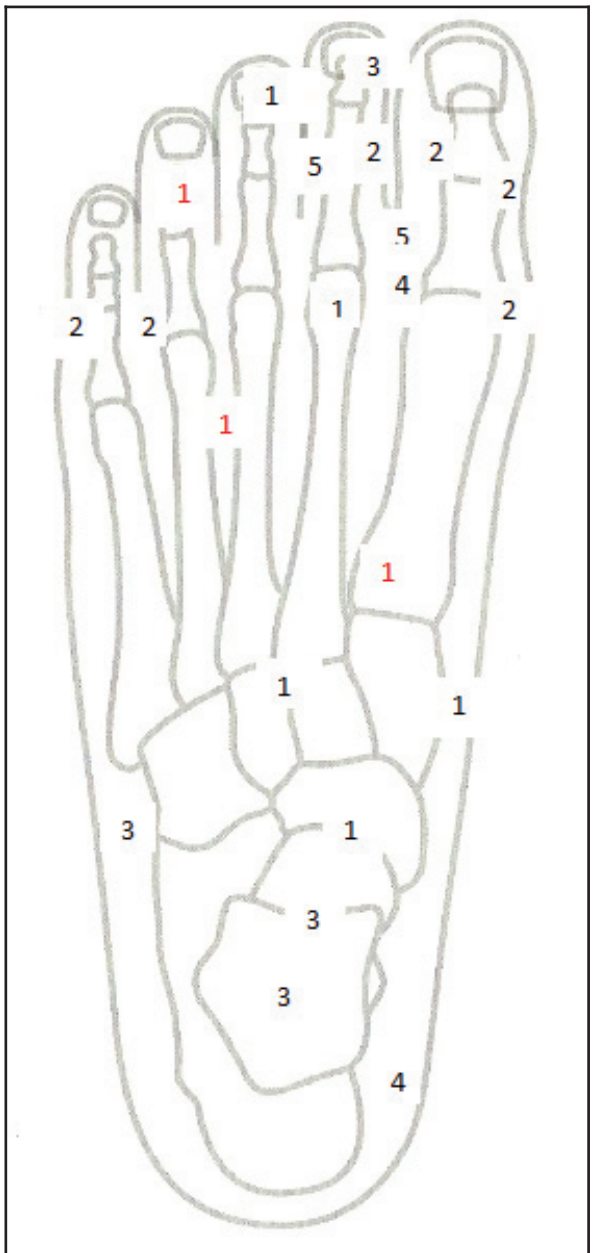

Figure 7. Anatomical sites of origin of GCT-TS (the figures in red show large tumours that usually cross anatomical boundaries of the foot)

The most common site of occurrence was originally described as the great toe.[2] Wang *et al* however presented a group of 30 patients presenting for ultrasound of GCT-TS, of which seven (23.3%) were foot cases. Most of these occurred in the forefoot.[4] A review of the articles in the orthopaedic literature gave us 49 cases to evaluate the anatomic site of origin[1,3,4,7,8-15] (*Figure 7*). The forefoot had 32 cases (65%), of which 81% occurred on the medial side. The midfoot had four cases (8%) and the hindfoot 11 cases (22%). There were a further two cases that crossed anatomical boundaries. The first is our case which involved the flexor digitorum longus tendon and crossed the forefoot and midfoot with a 12-year history. The second case involved a longstanding large tumour reported in the extensor digitorum longus tendon which crossed anatomical boundaries of the hindfoot, midfoot and forefoot.[9]

Table I: Differential diagnosis of foot and ankle masses

Tissue precursor	Lesion
1. Adipose	Lipoma Spindle lipoma
2. Cartilage/bone	Chondroma Subungual exostosis Osteophyte Osteoid osteoma
3. Fibrous	Plantar fibromatosis Fibroma Fibrin fibrous tissue
4. Fibrohistiocytic	Plexiform fibrohistiocytic Fibrous histiocytoma
5. Neural	Neuroma Neurofibroma Schwannoma
6. Smooth muscle	Angioleiomyoma
7. Vascular	Haemangioma
8. Synovial	Fibrovascular tissue Giant cell tumour
9. Miscellaneous	Ganglion cyst Adventitious bursa Gouty tophus Calcific tendonitis Connective tissue histiocytic reaction
10. Tumour-like	Benign intradermal naevus Rheumatoid nodule Mucoid cyst Epidermal inclusion cyst Viral wart Keratinous horn
11. Infectious	Tuberculous granulomas

Figure 7 also shows a case of a tumour in the fourth toe. This was a case report of a large tumour in the form of a macrodactyly after an 11-year history.[11]

Table I presents a comprehensive differential diagnosis for foot and ankle masses and GCT-TS. As is usual with such long lists, most conditions will be excluded by clinical presentation, including site of the lesion.[5,16] The few remaining conditions are usually difficult to exclude, even after radiology, and a diagnosis has to be made histologically. Pre-operative diagnostic accuracy in the two case series was 20% and 17.6%, which highlights the difficulty clinicians have with making a diagnosis.[1,4]

Patients will generally present with a painless mass that gives discomfort on weight-bearing or difficulty with footwear.[1] Occasionally there is an associated sensory deficit secondary to compression of the digital nerves. There are also two reports of patients with GCT-TS presenting with hallux valgus deformities.[8,12] Plain radiology may show a soft tissue mass or swelling which may cause splaying and erosion of the adjacent bone.[3] However to make a diagnosis using radiology, an ultrasound or MRI is needed.

GCT-TS is seen as a hypo-echoic nodule with ultrasonography. The mass could have either homogenous or heterogenous echogenicity. Under Doppler imaging, 71% of lesions also show substantial flow, while the rest show minimal flow. A finding of hypervascularity is typical of GCT-TS; however, it is not specific. This hypervascularity has led to a misdiagnosis of haemangioma.[1] It will however exclude ganglions, which are typically avascular or anechoic.[4,17]

MRI is considered an important diagnostic tool, and has very typical features. GCT-TS has a low intensity signal on T1 and T2 weighted images, and has homogenous enhancement on gadolinium-enhanced images.[6,18] These findings, although typical, are not absolute or specific. Most lesions are said to be hypointense as compared to muscle; however, some are isointense. These low signal images also occur in pigmented villonodular synovitis, densely mineralised tumours and tumours with large amounts of fibrous tissue. A gradient-echo sequence is helpful to be able to differentiate haemosiderin from fibrous tissue.[6,17,18]

A definitive diagnosis however can only be made on tissue samples. This is routinely done by histology. Stromal cells can either be spindle-shaped or polygonal. The nuclei of stromal cells are a source of much debate in microbiology, but are now said to be of variable morphology. Giant cells which resemble osteoclasts are also seen. Mitoses vary considerably from 0–9 per 10 HPF. Lastly, xanthomatous change is present and haemosiderin-laden macrophages can be seen. Fine-needle aspiration can also be considered, with Venkateswaran *et al* stating that cytodiagnosis is now possible. Cytology findings generally mirror the features on histology as he found in a 20-case series.[19]

Treatment takes the form of a marginal excision. Recurrence rates are quoted as 0% at 85 months and 20% at 5 years in the two available case series.[1,6] None of the case studies reported any recurrences, and complete local excision is stated as the only method of preventing recurrence.[1,3,4,7-9,20] Recurrence is treated by marginal excision in the case of the localised forms that occur in GCT-TS of the foot. Radiotherapy is used as an adjunct in other forms of the disease outside the hand and foot.[20] There was no mention of any malignant transformation in any of the literature for masses appearing in the foot and ankle.

Conclusion

GCT-TS is an uncommon condition in the foot and ankle, with most orthopaedic surgeons seeing only one case in a career. It presents as a mass in the foot and ankle, and making a definitive diagnosis is difficult without histology. Clinical features are usually of a slow-growing mass that causes compressive symptoms. Findings on MRI are typically of low signal intensity on T1 and T2 images. Our case report showed the typical features. However, because of the longstanding nature of the case, our patient presented with an unusually large mass, which crossed the confined anatomical spaces of the forefoot and midfoot.

The content of this article is the sole work of the authors, and no benefit of any form has been received or will be received from any commercial party.

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