



## Case Report

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# Plantar Fibroma: A Case Series of Conservative Management with Orthoses with the Aid of Ultrasonography

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## Abstract

Plantar fibroma is a benign but locally proliferative cause of heel pain with a high risk of recurrence with local recurrence and the risk of altering the mechanics of the foot. Various non-surgical management has been reported with varying efficacy and side effects. This article reports on a series of cases where the symptoms were controlled with the use of suitably modified orthotics aided by accurate siting of apertures with the use of ultrasonography scans of the lesions. Effective control of symptoms without side effects allowed the patients to return to their customary physical activity.

**Keywords:** Plantar fibromatosis, Non-invasive treatment, Orthotics.

## INTRODUCTION

Plantar fibromatosis is an uncommon cause of plantar pain in the feet. The estimated prevalence is not precisely known but is estimated to affect less than one in 20000 in the general population [1].

Patients might also present with palpable lumps in the plantar aponeurosis. While plantar fibroma is a benign condition, satellite lesions in the plantar aponeurosis and local recurrence after surgical excision has been reported. Hence, conservative management is often attempted before surgical excision [2]. Conversely, the superficial nature of the lesions lends themselves to diagnose with bedside ultrasound [3].

Plantar fibromatosis is a hyperproliferative disease of the plantar aponeurosis characterised by multiple slowly growing nodules on the medial longitudinal arch of the foot. Also known by its eponym of Ledderhose disease [4]. it is associated with hyper-proliferative conditions such as adhesive capsulitis, Dupuytren's disease (palmar fibromatosis) and Peyronie's disease (penile fibromatosis). Histological changes include multiple modules of plumb spindle cells with normal surrounding fibrous tissues in the proliferative phase, fibrous collagen Type III proliferation with fibroblasts cells in the active phase and a maturation phase in which contracture of the aponeurosis may occur [1].

The condition has a biphasic prevalence with a more aggressive juvenile form marked tendon infiltration while the adult form takes a more indolent course with a peak incidence at the six decade [5].

The aetiology is unknown and treatment is mainly aimed at providing symptomatic relief and preserving function. While the surgical management of plantar fibroma has been described in the literature, the conservative management has not been as well documented. In particular, the orthotic management of this condition and the biomechanical characteristics of patients that are suitable for this form of intervention has not been well documented.

## Clinical manifestation

The condition may be asymptomatic in the early stages when the nodules are small but become symptomatic as the nodules enlarge. Symptoms include pain on ambulation and discomfort due to pressure from footwear. In severe cases, the gait may be affected by contracture of the toes affecting the function of the foot.

On examination, firm nodules can be felt along the plantar aponeurosis with nodular thickening of the aponeurosis in the later stages. The overlying skin is typically spared. Examination should be directed to the exclusion of concurrent causes of foot pain, the assessment of altered biomechanics of the foot.

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The superficial location of the lesions lend themselves to ultrasonographic imaging. The lesions typically appear homogenous, hypoechoic and well circumscribed, and coalescence of lesions can cause thickening of the plantar aponeurosis. Hyperaemia may also be present on Doppler Mode [3].

Differential diagnoses for plantar fascial pain include calcaneum stress fracture, tarsal tunnel syndrome, and plantar fasciitis. Further imaging and biopsy might be considered to exclude other causes of lumps such as epithelioid sarcoma, leiomyoma, rhabdomyosarcoma and liposarcoma [6,7].

Treatment is directed at alleviating the symptoms and restoring normal gait. In view of the low morbidity of the condition, first line treatment is often non-surgical in nature. Repeated intra-lesion injections of steroids might be necessary to achieve adequate reduction in size of the lesions at the risk of causing fascial rupture. Verapamil has been shown to inhibit collagen production and increase collagenase activity and intra-lesion injections of Verapamil has been reported with indeterminate efficacy [8].

Extracorporeal Shockwave Therapy has been used in Peyronie's disease and Dupuytren's disease although there is little data on its efficacy on plantar fibromatosis. Improvement in pain and softening in the nodules have been reported [9,10].

Surgical excision can be considered for locally aggressive cases or those that are refractory to conservative treatment. However, high rates of local recurrence have been reported, with local excision although better results are reported with wide excision and partial fasciectomy [4-11].

There is little published data of the use of insoles to alleviate the symptoms in plantar fibroma. We present three cases of plantar fibroma that have been symptomatically managed with orthotics, with particular focus on the biomechanical adjustments through the use of accurately sited accommodative apertures.

## CASE STUDIES

### Case 1

TQM was a 49 Chinese female who worked as an administrator with prior history of left sole pain for two years of left sole pain 6-8 on the 10-point visual analogue scale, which was worse during brisk walking. The pain had improved with 3 sessions of radial extracorporeal shockwave therapy.

She subsequently developed pain over the medial longitudinal arch right heel 4 years later, which she rated 4 -6 on the 10-point visual analogue scale depending on the duration of the walking. Of note was localised tenderness over the medial calcaneum tubercle and the plantar aponeurosis anterior to the insertion. Ultrasound showed hypoechoic nodule on the medial plantar aponeurosis of dimensions 9.7mm by 2.9mm by 2mm without hyperaemia on the Doppler scan at the location of tenderness.

Biomechanical assessment findings demonstrated a subtle pes cavus foot type with a score of -1 on the foot posture index [12]. Rearfoot inversion in stance position which was fully correctible on Coleman block test, plantar flexed first ray and medial rearfoot 'peek- a- boo' sign [13].

The position and dimensions of the fibromas were marked with the aid of ultrasound and the patient was fitted with a pair of modified pre-fabricated EVA orthoses which included a forefoot valgus posting and apertures to accommodate the fibroma. In the following review, the orthotics were modified with bevelling of aperture edges and reducing the medial arch lift to improve comfort.

Upon review two months later, the patient reported that the pain on

the right foot had halved, although there was discomfort from direct pressure from the orthotics on both feet. This was relieved by modifications to adjust the size of the original apertures. The symptom on the right foot was mild on review 9 months later while the left foot was asymptomatic.

### Case 2

CHH was a 58 Chinese female retiree who walked regularly on the treadmill. She had experienced bilateral intermittent heel pain for the last 4 years. The severity ranged from 6-8 on the ten-point visual analogue scale on the left side and 6 on the right.

Clinical examination showed two well circumscribed tender nodules consistent with plantar fibromas on the left and one on the right. Ultrasound examination showed two fibromas of dimensions 19 mm by 11mm by 10mm and 3mm by 5mm by 2mm on the left and one fibroma of dimensions 14mm by 5mm by 12mm on the right.

A discussion of therapeutic options was made including the option of extracorporeal shockwave therapy for pain management. In view of the paucity of evidence of ESWT on reducing the size of the lesions, she opted for podiatric management of the pain.

Biomechanical assessment findings from the podiatrist demonstrated a flexible mild pes planus with a score of +7 on the foot posture index [12]. There was increased range of motion in both the subtalar and midtarsal joints, symmetrically plantar flexed first rays and decreased ankle dorsiflexion range of a muscular origin (positive Silfverskiold test).

The position and dimensions of the fibromas were marked with the aid of ultrasound and the patient was cast and fitted for a pair of customised orthoses where corresponding accommodative apertures were made in the polypropylene shell. Other modifications include casting the patient's feet in a slightly inverted position, rearfoot varus postings and a shock-absorbent top cover.

Upon review nine months later, her symptoms ascribed to the plantar fibroma has resolved and she can engage in her usual exercises asymptotically. No significant interval change of the fibroma were seen on ultrasound and she was given an open date.

### Case 3

CML is an 56 Chinese female who works as a school attendant and plays badminton. She presented with pain along the right medial plantar arch for two weeks, which was worse on getting out of bed and improved with calf stretches.

Physical examination showed bilateral calf tightness, neutral foot posture, positive Silfverskiold tests and tenderness along the right medial plantar aponeurosis anterior to the medial calcaneal tuberosity. Ultrasound examination showed bilateral plantar fascia thickening due to plantar fibroma 9.5mm by 5.2 mm by 18.4mm.

Biomechanical assessment findings from the podiatrist demonstrated a neutral foot type with a score of +3 on the foot posture index [12]. This was observed through a vertical rearfoot observed on stance, with a neutral forefoot-rearfoot relationship. Bilateral plantarflexed first ray was also observed.

The position and dimensions of the fibromas were marked with the aid of ultrasound and the patient was fitted with a pair of modified pre-fabricated EVA orthoses which included rearfoot varus postings and apertures to accommodate the fibroma.

On the next review, she only felt pain after prolonged walking. However, she experienced right sided medial arch pain on prolonged walking, which the patient felt was different from her previous complain.

Examination of the orthotics showed an impingement of the right plantar fibroma at the margin of the aperture of the right insole while the left one was centred over the aperture. The aperture on the right side was adjusted to a more medial and distal position was made. Despite the repositioning of the apertures, the patient reports persistent medial arch pain.

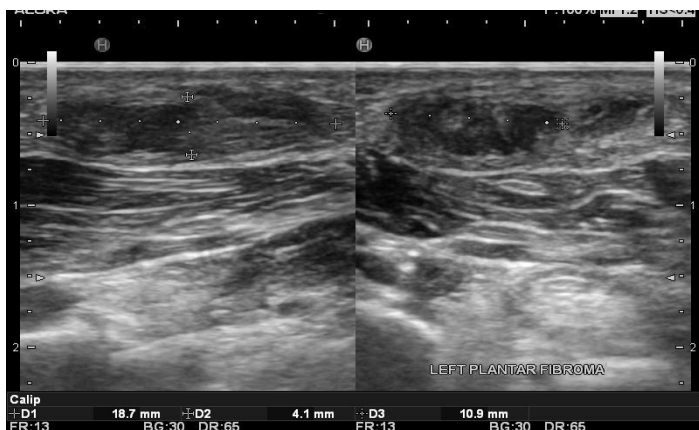
A review with podiatrist concluded that the medial arch pain was attributable to the prominence of the arch support. Bilateral plantar fascia groove was fitted in the orthotics which relieved her symptoms, and she was able to return to badminton.

## DISCUSSION

The plantar fascia is a thick fibrous aponeurosis that originates from the medial tubercle of the calcaneus and insert into the deep, short transverse ligaments of the metatarsal heads and form the fibrous flexor sheathes the toes.

It performs a pivotal role in supporting the medial longitudinal arch [14,15], and an important propulsive function as a mechanism for storage of elastic energy [6,7]. This subjects the plantar fascia to significant tension which in the presence of fibroma can cause pain. Histologically, the presence of nerve endings, Ruffinic and Pacini corpuscles, suggest the proprioceptive role of the fascia but also the potential of the fibroma as a pain generator. In the absence of significant inflammation, addressing the mechanical factors may be adequate to alleviate the symptoms.

The therapeutic aim is to minimise tension on the plantar fascia through control of pronatory forces and avoid direct impingement of the fibroma through the addition of an aperture without compromising the control of pronatory forces. The orthoses serves to reduce tensile loading at the fascia during ambulation, while the aperture relieves the fibroma from direct impingement. Accurate situation and sizing of the aperture with the help of ultrasonographic guidance reduces the chance of impingement on the fibroma while minimising the size of the aperture, so that the control of the orthotics might not be compromised. In each case, the fibromas are localised on ultrasound and palpated to reproduce the patient's symptoms. The dimensions and long and transverse axis of each is measured (Fig. 1) and a line of best fit to create a regular shape (usually an ellipsoid) was marked on the sole with an allowance of 5mm (Fig 2).



**Figure 1:** Ultrasound scan of a plantar fibroma showing the typical well circumscribed hypo-echoic lesions in the substance of the plantar aponeurosis.



**Figure 2:** Siting and sizing of aperture: irregular outline of the fibroma outline in the cross hatched area with the regular ellipsoid dashed line border outlining the site of the aperture.

Control of pronatory forces in a pes planus foot due to siting of an aperture at the peak medial arch may necessitate control of the rear foot. In the presence of medially deviated subtalar axis, controlling pronatory forces would necessitate control of rear foot motion. Should a large fibroma necessitate a large aperture, stiffer materials would be used to maintain control. If a deeper aperture is necessary, a shell fashioned from a softer material allows a cut out to be made instead of a depression. Should a flexible cavus foot require forefoot control, the use of a softer complaint material may improve the balance between sufficient compliance to allow some pronation while achieving sufficient control to minimise pressure on the fibroma.

## Conflicts of interest

None declared.

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