Research Article

# Tight tendoachilles as etiological factor in plantar fasciitis

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## Abstract

**Introduction:** Plantar fasciitis is a commonly encountered problem and could be secondary to a plethora of causes. Among the various causes suggested, tight TA is one of the frequently implicated etiology in many previous studies. Our study was to test this hypothesis of tight tendoachilles in cases with Plantar fasciitis using a foot pressure plate analysis.Among the 33 patients clinically diagnosed as PF only 5 had Point of Maximum Pressure anteriorly suggesting the co existence of tight TA in these cases. However overall results showed no staitsically significant association of tight tendoachilles with plantar fasciitis.

**Keywords:** Plantar fasciitis, Tight tendoachilles.

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## INTRODUCTION

**P**lantar **f**asciitis (**PF**) is one of the commonest causes for posterior heel pain routinely encountered in day to day clinical practice. Though self limiting in most instances, symptoms being relieved by 10 months in most cases, this symptomatic interval becomes a frustrating experience for the patient and a challenge for the treating orthopaedician. Plantar fasciitis is a common clinical condition that can be defined as inflammation of the plantar fascia characterized by pain at the heel and medial arch of the foot[1]. Though it's a common problem arriving at a etiological diagnosis is always a difficulty in most cases and treatment is being directed at pain alleviating methods without truly understanding the pathomechanics of the disease. Some of the risk factors involved are unusual sport or physical exercise[2], being overweight[3], prolonged standing[4]. There have been a few studies that have linked tight **T**endo **A**chilles (**TA**) as a cause for plantar fasciitis with most of them being interpreted as some contracture of the posterior calf muscles in cases of PF. The main objective of this study was to determine if tight tendoachilles was consistently associated in cases of PF using foot pressure plate analysis.

## MATERIALS AND METHODS

This was a Retrospective study which was conducted at Father Muller Medical College, Kankanady mangalore between October 2012 to April 2013. Patients attending the outpatient department clinically diagnosed of having plantar fasciitis were analysed using the foot pressure plate study [Pedoscan(Diers®)]. Depending on the duration of symptoms patients were divided into three groups: <2 weeks, 2-4 weeks and more than 4 weeks. The graphical output of the Pedoscan was called the Pedobarograph that indicated the differential pressure at each part of the foot. The **P**oint of **M**aximum **P**ressure (**PMP**) was demarcated with a black dot while zones with red, orange, yellow, green and blue indicated areas of lesser pressure in the decreasing order. The area of the foot lying ahead of the **COG** (**C**entre **o**f **G**ravity) as depicted by the blue or red dot was called

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anterior/forefoot and that lying behind it were called posterior/hindfoot.

The two parameters that were studied in each case were:

- If the PMP was anterior(in the region of the forefoot) or posterior( in the region of hindfoot)
- If the PMP ($N/cm^2$) was posterior, wether it was comparable to the PMP of the unaffected foot (unaffected foot served as control in all in all cases).

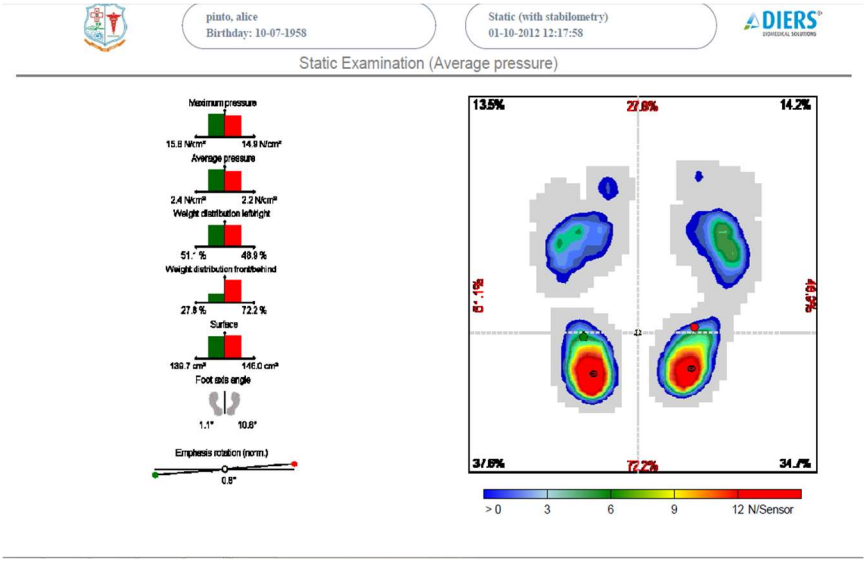
The point of maximum pressure indicated the relative tightness of the TA with relative equinus as evidenced by the PMP lying anterior to the COG in the area of forefoot. Patients satisfying the following criteria were selected for the study:

## Inclusion Criteria

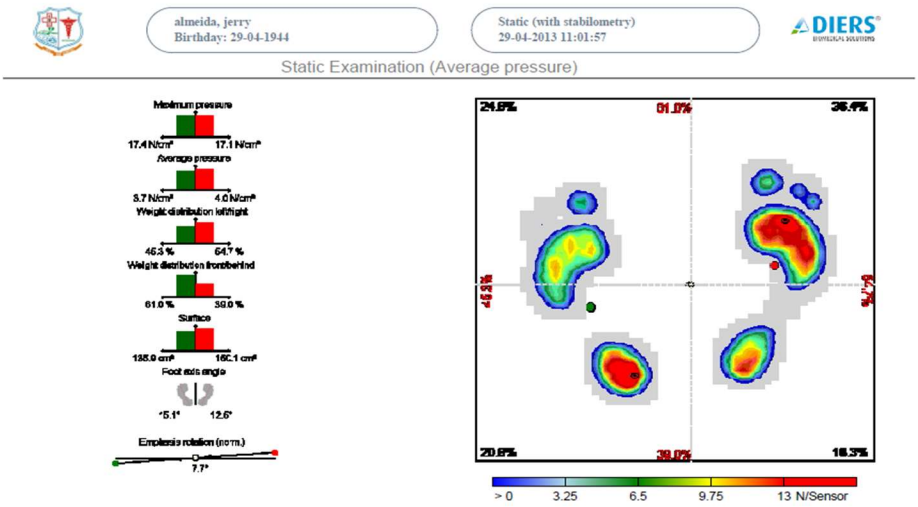
- Sharp heel pain and stiffness in the morning with the first steps out of bed that gradually eases as the day progresses.
- Tenderness at the localized tenderness at the medial process of the calcaneal tuberosity
- Unilateral cases

## Exclusion Criteria

- Patients diagnosed and treated previously for plantar fasciitis
- History of previous trauma around ankle or heel
- Patients with diabetes mellitus
- Patients with associated motor/sensory disturbances over the foot or previously diagnosed cases of tarsal tunnel syndrome.




Pedobarograph of a patient with PMP being posterior(Black Dot) in both feet, right foot being symptomatic with PMP measuring 14.9N/cm2 and Left foot PMP measuring 15.8N/cm2




Pedobarograph of a patient with duration of presenting symptoms more than 4 weeks with PMP being anterior(Black circle)on the right foot

## RESULTS

Thirty two patients were included in the study who fulfilled the inclusion criteria.

### Age

The age in the study population ranged from 20-60 years with a mean age of 38.47±10.922.

| | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|
| Age | 32 | 20 | 60 | 38.47 | 10.922 |

### Gender

Majority of the study population comprised of males(75%)(n=24) with only 8 females(25%) which was comparable with the previous studies.

| | Frequency | Percent |
|---|---|---|
| F | 8 | 25.0 |
| M | 24 | 75.0 |
| **Total** | **32** | **100.0** |

### Duration of presenting symptoms

Majority of the patients had symptoms for less than 2 weeks (46%) (n=15) while the remainder 28.1% (n=9) and 25.1% (n=8) patients had symptoms for 2-4 weeks and > 4 weeks respectively.

| | Frequency | Percent |
|---|---|---|
| < 2weeks | 15 | 46.9 |
| 2 - 4weeks | 9 | 28.1 |
| > 4weeks | 8 | 25.0 |
| **Total** | **32** | **100.0** |

### PMP(Point of Maximum Pressure)

Based on the pedoscan findings all patients with symptom duration <2 weeks and between 2-4 weeks had the PMP at the hindfoot while 5 out of 8 patients with symptom duration > 4 weeks had PMP in the forefoot while the rest 3 had the PMP in the hindfoot like previous cases.

| | Max Prsre Affected | | Total |
|---|---|---|---|
| | Anterior | Posterior | |
| Duration <2weeks | 0 | 15 | 15 |
| | 0.0% | 100.0% | 100.0% |
| | 0.0% | 55.6% | 46.9% |
| 2-4 weeks | 0 | 9 | 9 |
| | 0.0% | 100.0% | 100.0% |
| | 0.0% | 33.3% | 28.1% |
| > 4weeks | 5 | 3 | 8 |
| | 62.5% | 37.5% | 100.0% |
| | 100.0% | 11.1% | 25.0% |
| **Total** | **5** | **27** | **32** |
| | **15.6%** | **84.4%** | **100.0%** |
| | **100.0%** | **100.0%** | **100.0%** |

Fishers exact test p=.000<0.001, HS

Though there were about 5 cases where the PMP was anterior in the affected feet on comparison to the normal feet, still overall analysis showed that the PMP was still posterior in the affected feet in statistically significant number of cases.

### Pressure distribution between two feet

The Pressure distribution between two feet with PMP($N/cm^2$) between the affected feet and the unaffected feet was similar especially in cases less than 4 weeks negating the role of tight tendoachilles which would atleast marginally alter the pressure distribution in the affected side.

| Duration | Mean | Std. Deviation | Paired t test p value | |
|---|---|---|---|---|
| <2 weeks Affected | 13.720 | 2.0365 | .892 | NS |
| Unaffected | 13.680 | 2.1746 | . | |
| 2-4 weeks Affected | 15.344 | 4.3670 | 649 | NS |
| Unaffected | 16.033 | 6.9532 | | |
| > 4 weeks Affected | 13.350 | 3.4289 | .419 | NS |
| Unaffected | 14.138 | 2.6731 | | |

## DISCUSSION

Tight tendoachilles is one of the implicated causes for plantar fasciitis. Theory of causation is linked to the 'Windlass-Mechanism'. During the toe-off pahse of the gait cycle, when the great toe dorsiflexes, plantar fascia tightens acting as a stabilising tie rod for the medial longitudinal arch. This creates an abnormal stress in the plantar fascia remains subclinical unless additional stressors such as as running, obesity, sudden increase in activity, inadequate shows or prolonged walking or standing occur simulatneously. If this repetitive microtrauma is severe enough, clinical symptoms occur. Evidences from previous studies state that tight tendoachilles as evidenced by decreased ankle dorsiflexion or equinus contracture are seen in significant number of cases. Riddle *et al*[6] observed significant differences (P < .001) in the limitation of ankle dorsiflexion in a PF group compared with a control group. Patel and Digiovanni *et al*[7] examined 254 patients with PF and found that 83% had limited ankle dorsiflexion, 57% had an isolated contracture of the gastrocnemius, 26% had a contracture of the gastrocnemius-soleus complex, and 17% did not have a dorsiflexion limitation. These authors observed an equinus contracture in 83% of acute cases and 82% of chronic cases. However there are very few studies with foot pressure plate analysis for proving tight tendoachilles as a causative factor for plantar fasciitis. Our study suggests a novel way of employing the foot pressure plate analysis for studying the variation of pressure points in plantar fasciitis. Our hypothesis was that equinus contracture would cause shift of the PMP anterior to the COG in the region of forefoot or atleast result in a decrease in the magnitude of point of maximum pressure if it was at the hindfoot as compared to the control (unaffected opposite foot). In contradiction to the previous studies our study suggests that there is no statistically significant evidence to prove the co existence of tight tendoachilles with plantar fasciitis as evidenced by no sigiificant difference of PMP between the affected and unaffected feet.

## CONCLUSION

Plantar fasciitis is one among the routinely encountered problems in patients attending the out-patient department. Once suspected to be plantar fasciitis, this diagnosis can be confirmed using the foot pressure plate analysis especially in tertiary centres. This investigation would relatively differentiate the etiologies into those where plantar fasciitis is due to tight TA or others secondary to a wide variety of causes. As our study points out majority of patients may not have a co existing tight TA where gastrocsoleus stretching exercises may not be of much use. Compliant patients who do not improve should be evaluated for any other underlying cause causing PF before resuming with a blanket therapy of conservative trial irrespective of the underlying cause.

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