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Iliotibial Band Trigger Points and Plantar Heel Pain: A Cross-Sectional Study

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SUMMARY

Background. Plantar heel pain (PHP) is a degenerative plantar fascia syndrome that causes irritation under the heel and a functional deformity during weight bearing. Myofascial involvement, along with biomechanical changes due to tight fibrous connections, seems to contribute to this condition. As there is a fascial connection between plantar fascia, and iliotibial band, trigger points in the myofascial chain including iliotibial band can interfere with biomechanical modifications and aberrant lower limb functioning. The study aimed at establishing the associating iliotibial band (ITB) trigger points in plantar heel pain patients.

Methods. The study included 30 individuals with plantar heel pain of both genders. They were assessed by foot posture index (FPI) for the foot type and manually palpated for trigger points along the Iliotibial band on both the affected and unaffected side.

Results. The results revealed 73% prevalence of iliotibial band trigger points in plantar heel pain patients. And there was a significant association was found between trigger points and plantar heel pain ($p < 0.001$).

Conclusions. The current investigation found an association between the existence of iliotibial band trigger points and plantar heel pain. So, addressing the iliotibial band trigger points may help in reducing pain and discomfort in plantar heel pain individuals.

KEY WORDS

Fascia; foot; heel pain; IT band; trigger points.

INTRODUCTION

Plantar heel pain (PHP) is a degenerative disease of the plantar fascia caused by calcaneus trauma. It frequently radiates from the heel pad's center or the calcaneum medial tubercle and might extend through the plantar fascia into the medial longitudinal arch of the foot. Although the actual origin of PHP is uncertain, persons who have had excessive plantar fascia extension or micro-injuries have reported degenerative changes in the plantar fascia, with or without fibroblastic proliferation and without acute inflammation (1).

In contrast, the anatomical-histological characteristics of the PF, which has been considered merely an aponeurosis, have received scant research. According to some researchers, the embryological genesis of the PF involves its union with the Achilles tendon, and this union consists of a layer of periosteal fibers whose elasticity diminishes with age. The plantar fascia may perceive both the position of the foot and the state of contraction of the foot's intrinsic muscles. If these muscles contract excessively, the PF (which includes nerve endings) may be overstretched. The PF has also been examined extensively from a biomechanical standpoint. It plays a crucial function in the biomechanics of the foot by maintaining its medial longitudinal arch during gait or other loading circumstances. And it was also noticed that in individuals with pronated feet type the foot kinematic can get alter due to shortening of the iliotibial band (2).

Abnormal pronation at the subtalar joint may result in excessive internal rotation of the entire lower leg during weight-bearing, putting additional strain on the kinetic chain (1, 3). Excessive pronation increases ground response

force on the medial aspect of the foot and the medial longitudinal arch. From acceleration until mid-swing, the ITB functions more efficiently to prevent tibial external rotation, causing ITB contraction and increased tension, resulting in ITB tightness (4, 5). This increased tension to the muscle fibers, or any muscle strain might cause the formation of trigger points.

A trigger point can be defined as a hyperirritable site in a perceptible taut band of skeletal muscle that, when compressed, causes referred discomfort and motor dysfunction (6-8). It has been argued that fascial limitations in one region of the body cause unnecessary tension in other parts of the body due to fascial continuity. This may put a strain on any structures encased, divided, or supported by fascia. As per the evidences, the plantar fascia, lateral leg muscles, and the iliotibial band all have single fascial interaction (9, 10).

According to the etiological perspective, there are multiple factors that contribute to plantar heel pain, and current research indicates that myofascial structural alterations are a major source of this pain (4, 6, 7, 9). Numerous studies sought to establish a connection between myofascial trigger points of leg and foot muscles and plantar heel pain, but despite of having the facial and biomechanical linkage none of those investigations have highlighted the significance of the iliotibial band in plantar heel pain. Therefore, the purpose of the present study was to examine the relationship between iliotibial band trigger points and plantar heel pain. The authors hypothesize that IT band trigger points would be positively associated with plantar heel pain.

MATERIALS AND METHODS

A cross-sectional study on 30 subjects with plantar heel pain was conducted after approval from the Institutional Ethical Committee of Srinivas College of Physiotherapy & Research Centre – Date of approval: April 09, 2019. All subjects provided written informed consent prior to participation. Subjects were chosen based on their ability to meet the criteria for selection and their willingness to participate.

The inclusion criteria were:

- Participants of both the genders with age between 20 to 50 years.
- Having unilateral or bilateral heel pain.
- Patients fulfilling diagnostic criteria for plantar fasciopathy (4, 6, 10).

The exclusion criteria were:

- Any previous history of knee and back pain.
- History of lower limb fracture, or ankle ligament damage in the previous 6 months.
- Impair sensation and/or pain perception related to diabetes, peripheral vascular disease, local infection, rheumatoid arthritis, and gout.
- Subjects undertaken any physical therapy sessions in the past three months.
- Complaining of acute fractures and sprains.
- Acute stage PIVD with intermittent claudication (4, 6, 10, 11).

Procedure

Subjects with plantar heel pain were screened using inclusion and exclusion criteria. The windlass test and the foot posture index (FPI) were used to measure the foot posture of all participants, and data was gathered (12). The demographic information was then acquired from all of the chosen respondents, and the data was analyzed.

ITB was evaluated manually and MTrPs were identified, while adhering to standard examination position and technique. Both the affected and unaffected sides of patients with plantar heel pain were palpated for comparison. The patient was positioned in side lying, with the examined side placed above the other for ITB. The therapist stands behind the limb being evaluated. The affected extremity should be draped appropriately and placed facing upwards, with knees slightly bent and pillows placed between the legs to relax the muscles. From the ASIS to the lateral femoral condyle, the IT band was palpated. By taking three finger breaths anterior to the greater trochanter of the femur, the trigger point was assessed using flat palpation (**figures 1, 2, 3**). The taut band and trigger point across the ITB were palpated

Figure 1. ITB trigger point palpation proximal part.

Figure 2. ITB trigger point palpation middle part.

Figure 3. ITB trigger point palpation distal part.

for jump signs, discomfort, twitch reaction, and transferred pain (8, 10, 11). Trigger points on both the affected and unaffected sides were palpated.

Statistical analysis

The data were analyzed using Windows-based SPSS 26 (Statistical Package for Social Sciences) software. The Kolmogrov-Smirnov test was used to find out the normality. The descriptive data were reported in mean and standard deviation of all variables. For inferential analysis, the Chi-Square test was used to find out the association of FPI, plantar heel pain, and ITB TrPs. The degree of association between the variables were rated using Phi Cramer's V criteria.

The level of significant value set as ($p < 0.05$). there was a significant association between IT band trigger points and plantar heel pain (Cramer's V 0.60) ($p < 0.05$) and similarly, there was even more a strong association was found between IT band trigger points and individuals with both plantar heel pain and pronated foot. (Cramer's V 0.82) ($p < 0.05$).

RESULTS

The current study included 30 people with plantar heel pain. There were an equal number of male and female participants. **Table I** shows the demographic information for the participants. The frequency distribution of their trigger point and foot features is shown in **table II**. According to FPI, 56% of PHP individuals had normal foot posture. Similarly, 33% of people had pronated feet. In addition, 73% of individuals had IT band trigger points. The study's findings demonstrated a strong relationship (Cramer's V 0.60) between IT band

Table I. Descriptive statistics for demographic data.

Variables	Values
Subjects (n)	30
Male/Female	15 (50%)/15 (50%)
Age (years)	34.4 (6.8)
Height (meters)	5.26 (0.4)
Weight (kg)	55.07 (5.8)
BMI kg/m^2	21.4 (4.3)

BMI: Body Mass Index; value reported as Mean (SD).

Table II. Frequency and percentage (%) of measurement variables.

Variables	Frequencies	Percentage (%)
Plantar heel pain (vas)		
5	5	16.1
6	8	25.8
7	12	38.7
8	4	12.9
9	1	3.2
FPI score		
Normal	17	56.7
Pronated	10	33.3
Supinated	3	10.0
Total	**30**	**100**
ITB TrPs (present/absent) in patient with PHP		
Absent	8	26.7
Present	22	73.3
Total	**30**	**100**

PHP: plantar heel pain; ITB TrPs: iliotibial band trigger points.

Table III. Interferential statistics for plantar heel pain and ITB TrPs.

Variables	Cramer's V	P-value
PHP-ITB TrPS	0.600	0.001
FPI-PHP-ITB TrPS	0.820	0.001

FPI: foot posture index; PHP: plantar heel pain; ITB TrPs: iliotibial band trigger points.

trigger point and plantar heel discomfort. Furthermore, an excellent relationship (Cramer's V 0.82) was discovered between IT band and participants with both plantar heel pain and pronated foot (**table III**,) showing that patients with plantar heel pain are more likely to have ITB TrPs.

DISCUSSION

PHP is frequently caused by tight or deconditioned trigger points in the leg muscles as a result of prolonged rest, a sudden increase in muscular activity, repeated micro-trauma to the muscle, and muscular injury caused by abrupt concentric/eccentric contractions. The association between ITB trigger points and plantar heel pain was investigated in a cross-sectional study of 30 participants. This study provides preliminary evidence for the role of the IT band in heel pain. People with plantar heel pain and pronated feet are more likely to have IT band trigger points. According to the study's findings, IT band trigger points were significantly associated with PHP (Cramer's V 0.60) ($p < 0.05$) and with both PHP and pronated feet (Cramer's V 0.82) ($p < 0.05$).

Previous research discovered that TrPs in the leg and foot musculature replicated pain feelings in persons with chronic plantar heel pain, and that the greater the number of trigger points, the greater the intensity of plantar heel pain. As a result, it suggests that TrPs may be a contributing factor to the severity of symptoms experienced by patients suffering from plantar heel pain. And the pain or discomfort are primarily because of diminution or loss of fascial sliding ability corresponds to the thickening and densification (7, 10, 11, 13).

According to the preceding statement, it is widely accepted that fasciae play a significant role in tissue preservation and repair via force transfer, facilitating mobility, stability, and proprioceptive communication throughout the body. If connective tissue is lost or its density is altered, the deep fascia and underlying muscle act abnormally. In many circumstances, this could be the cause of myofascial pain. Hyaluronic acid appears to be a significant factor in fascia density (2, 13).

It was found the hyaluronic acid has distinct responsibilities, including space filling, lubrication of joints, and water homeostasis, and it offers a substrate for the smooth gliding of different motor units between and within muscles. And hyaluronic acid production appears to be strongly associated with myofascial pain and mobility (13).

The authors propose that taut bands associated with TrPs may enhance muscular stiffness in the leg and foot, resulting in increased stress on the plantar fascia. It is also possible that motor disturbances associated with TrPs, such as muscular fatigue and faster fatigability, contributed to the reported muscle issues in these patients. All of these possibilities are consistent with previous research indicating that TrP treatment may be effective for alleviating plantar heel pain (10, 11, 14).

Evidence also suggests that people with generalized hypermobility, flat feet or ligamentous laxity of the feet prevent the symmetrical distribution of load on the soles of the feet, which causes a weight shift inward (due to the collapse of the medial arch) and an overload of the midfoot - modified foot biomechanics when walking in the push phase (15).

The different length-tension relationship of intrinsic and extrinsic foot muscles, such as a shorter hallucis and peroneus group and a longer peroneal group of muscles when compared to people with normal feet, causing some extra tension on the knee kinematics, including the IT band. Increased tibial and femoral internal rotation is also associated with increased foot pronation, resulting in an internal rotation moment at the knee. Internal knee rotation may cause the ITB and other structures surrounding the knee to stretch (14, 16). Furthermore, as revealed by recent studies, foot pronation can change hip kinematics, exerting load on the ITB via its proximal attachment. Stress, biomechanics, work ergonomics, posture, and exercise routines have all been implicated with PHP, according to several research (16).

According to the author's hypothesis, the disturbed foot muscle kinetics and concurrent internal rotation of the tibia and femur caused by pronated feet place an excessive amount of demand on the proximal frontal plane kinetics, leading to internal rotation torque at the knee and IT band and thus the development of the trigger points.

A retrospective research revealed that patients with ITBS and IT band trigger points have decreased knee flexion and extensor torque. The study found that individuals with ITB triggers had poorer hip abductor strength. In order to control the coronal movement during the stance phase, sustained hip abductor torque is necessary via gluteus medius and, to a lesser extent, TFL. Weakness in the gluteus medius and TFL leads to poorer control of thigh abduction, and external rotation leads to increased internal rotation torque of the thigh, which increases tension in the IT band and puts greater strain on the fascial linings of the plantar fascia (4, 10, 12).

Other theories, such as fascial kinetics, contend that muscles influence tissues across the body via fascia-based

links, regardless of what they accomplish individually. According to this view, the iliotibial band, which is the major structure in the lateral fascial chain, is physically and directly associated with the plantar fascia via its distal attachments. Similarly, the spiral chain fascial system, like this, has a direct connection between the iliotibial band and the plantar fascia through the peroneus longus muscle, and tightness of these structures can cause restricted ankle mobility (8, 9).

Because most trigger points were discovered when the ITB was palpated, it may be presumed that the majority of trigger points in PHP patients are located in the medial and distal ITB. According to previous research, there is a link between plantar heel discomfort and trigger points in the calf and foot muscle. The current study found a strong association between PHP trigger locations and ITB trigger locations. According to the study, few patients had ipsilateral TrPs and none had contralateral TrPs.

The study had a few drawbacks, the first being that the presence of ITB trigger points may also be associated with asymptomatic or impaired hip or knee motor control. As ITB control is closely associated with both proximal and distal kinematics and joint positions. In addition, the association between the ITB trigger point and the other types of foot postures as defined by the foot posture index (FPI) tool could not be established outside of the pronated group. Therefore, the authors urge that future research concentrate on evaluating uncontrolled proximal kinetics and determining the relationship between the trigger points and the various foot postures according to the FPI.

CONCLUSIONS

In the participants with plantar heel pain, the current investigation demonstrated a substantial association between the existence of iliotibial band trigger points. The Iliotibial Band Trigger Points and Foot Posture Index, however, did not associate well. Therefore, it is concluded that the clinical diagnosis of plantar heel pain can be extended to include the presence of iliotibial band trigger points as well.

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None.

DATA AVAILABILITY

Data are available under reasonable request to the corresponding author.

CONTRIBUTIONS

SSW: data curation, investigation, methodology, resources, validation, visualization, writing – original draft. DKP: conceptualization, formal analysis, project administration, software, writing – review & editing. PV: validation, writing – original draft, writing – review & editing. KS: resources, writing – review & editing.

CONFLICT OF INTERESTS

The authors declare that they have no conflict of interests.

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