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Megha Neb

*Asst. professor, MM Institute of
Physiotherapy & Rehabilitation,
MM University, Mullana,
Haryana, India.*

Manu Goyal

*Consultant Physiotherapist, Lohia
Mission Hospital, Sirhind,
Punjab, India.*

Nikhil Mahajan

*Consultant Physiotherapist/
Rehabilitation worker, NCD Cell –
NRHM, Ramanagar, Udhampur,
J&K, India.*

Correspondence

Megha Neb

*Asst. professor, MM Institute of
Physiotherapy & Rehabilitation,
MM University, Mullana,
Haryana, India.*

Association of Chronic Plantar Heel Pain with Foot Posture and Functional Limitation – A Correlation Study.

Megha Neb, Manu Goyal, Nikhil Mahajan

Abstract

The purpose of the study was to examine the relation between foot posture and chronic plantar heel pain leading to functional disability. A total of 45 patients both males and females with unilateral or bilateral pain were selected as subjects. All the subjects were examined for foot posture using Foot Posture Index (FPI) and disability using Foot Function Index (FFI). The results procured demonstrated the positive correlation between pain and functional disability ($p < 0.05$) but no correlation was found between pain and foot posture ($p > 0.05$). It was concluded that foot posture do not influence the functional limitation in chronic plantar heel pain.

Keywords: Plantar Fasciitis, Chronic pain, Foot Function, Foot Posture.

1. Introduction

Chronic plantar heel pain is one of the most common conditions affecting the foot and has been reported to account for 15% of all adult foot complaints requiring professional care [1, 2, 3]. The incidence reportedly peaks in people between the ages of 40-60 years in the general population and in younger people among runners [2]. There are various anatomical, biomechanical and occupational factors associated with the plantar fasciitis. Abnormal foot posture and motion specifically excessive or prolonged pronation of the foot in stance phase of gait have been linked to overuse injuries in the lower limb [5]. The application of Foot Posture Index includes studies of biomechanical risk factors for neuropathic ulceration in diabetes, identifying foot types and risk factors for sports and training injuries. The foot function index questionnaire provides the information about the foot pain association with the disability.

2. Materials and Methods

The 45 patients of chronic heel pain both males ($n=6$) and females ($n=39$) in the age range of 40 – 55 years were selected as subjects after obtaining their consent based on inclusion and exclusion criteria of the study. Verbal instructions explaining the procedure was explained to the patients. There after postural examination of foot by Foot Posture Index was done. Patient was told to be in their relaxed stance position with double limb support and instructed to stand still with their arms by side and looking straight ahead. Then was asked to take several steps, marching on the spot, and prior to settling into comfortable stance position. During the assessment it was ensured that the patient did not swivel. The patient then remained still for approximately 2 minutes in total and the assessment was conducted to posterior aspect of leg and foot [8]. Data was then taken on the basis of:

- a. Talar head palpation.
- b. Observation of curves above and below the lateral malleoli.
- c. Frontal plane alignment of the calcaneus.
- d. Prominence of the talonavicular joint.
- e. Congruence of medial longitudinal arch.
- f. Abduction or adduction of the forefoot on the rearfoot.

Each of these criteria are scored on a 5 point scale (ranging from -2 to +2) and the results combined, resulting in a summative score ranging from -12 (highly supinated) to +12.

The foot function was assessed using the Foot Function Index questionnaire.

A Correlation comparison was then done.

3. Results and Discussions

The mean age and BMI of the subjects was 47.28 ± 4.73 years, 28.73 ± 4.025 kg/m² respectively. Also in the study a total number of subjects with chronic plantar heel pain have the mean value of pain scores 34.82 ± 4.816 , mean disability scores 49.27 ± 13.967 and activity limitation score with the mean value of 2.60 ± 1.498 as measured by the subscales of Foot Function Index.

Total population of chronic plantar heel pain with mean BMI of 28.73 ± 4.025 has got mean score of foot posture by Foot Posture Index $+7.466 \pm 2.646$ representing that all the patients of chronic plantar heel pain are overweight and has pronated foot. (Table 4.1)

Table 4.1: Mean and standard deviations of Age, Body Mass Index, foot Posture Index of Foot Function Index.

Variables	N	Mean	S.D	Min	Max
Age	45	47.28	4.73	40.00	50.00
BMI	45	28.73	4.025	22.2	39.5
FPI	45	+7.466	2.464	3.00	12

In 15.6% of total population of chronic plantar heel pain with mean BMI 27.671, found the score of 0 to +4 which represents normal score for foot posture as per Foot Posture Index. 60% of the total population with mean BMI of 27.922 with scores of +5 to +9 which is showing that these subjects of chronic plantar heel pain has more pronated foot and 24.4 % of population with mean BMI of 31.409 get scored 10+ to 12+, represents over pronated foot posture (Table 4.2).

Table 4.2: Frequency distribution of subjects with scores of FPI with mean values of BMI.

Scores of FPI	Frequency of subjects	No of subjects Percentage (%)	Mean BMI
0 to +5	7	15.6	27.671
+6 to +9	27	60.0	27.922
+10 to +12	11	24.4	31.409
Total	45	100.0	28.736

After doing the correlation observation it was found that there is significant correlation between pain and disability (p-value=0.001), between pain and activity restriction (p-value=0.023), between disability and activity restriction (p-value=0.023), so in all cases p-value < 0.05 (Table 4.3, 4.4, 4.5).

Table 4.3: Correlation between Pain, Disability and Activity limitation.

Pain		Disability	Activity limitation
	Pearson correlation Coefficient	0.493	0.412
	p value (sig. 2 tailed)	0.001	.005
	N	45	45

Table 4.4: Correlation between Disability and Activity limitation.

Disability		Activity limitation
	Pearson correlation Coefficient	.338
	p value (sig. 2 tailed)	.023
	N	45

Table 4.5: Correlation between Foot Posture Index, Body Mass Index and Pain.

FPI		BMI	PAIN
	Pearson correlation Coefficient(r value)	0.352	0.268
	p value (sig. 2 tailed)	0.018	0.763
	N	45	45

In this present study the primary observation was that pain intensity in subjects with chronic plantar heel pain as per pain subscale of Foot Function Index is highly correlated with disability (p<0.05) and significant correlation with activity limitation (p<0.05).

It was found that there is a significant correlation of Foot Posture Index and Body Mass Index (p<0.05). Obesity and prolonged weight bearing may increase the risk of plantar heel pain [3].

In the study a significant effect of obesity were noted on 16 of the 26 anthropometric variables in obese children of [age =8.8+2.0 years; body mass index (BMI) = 25.8+3.8 kg/m²] and non obese children [age=8.9+2.0 years; body mass index (BMI) = 16.8+2.0 kg/m²], who were matched to the obese children for age, height and gender, to characterize the external shape of these children's feet. It was found that these changes in foot structure may develop into symptoms if excessive weight gain were to continue and, in turn, hinder participation in physical activity in either childhood or adulthood [9].

However, it was also seen that there is no significant correlation found between the scores of Foot Posture Index and scores of pain as per by pain subscale of Foot Function Index (p>0.05), although supported by Wearing et al who described that neither abnormal shape nor movement of the arch are associated with chronic plantar fasciitis. However arch mechanics may influence the severity of plantar fasciitis once the condition is present [4, 6]. Although 43% of subjects demonstrating excessive pronation reported previous lower extremity injuries, the remaining 57% with similar pronatory patterns experienced no difficulties.

These researches concluded that excessive pronators were no more likely to be injured than those without excessive pronation [11]. Whereas, over pronation contributes to excessive foot mobility which can increase the level of stresses applied to musculofascial pain and soft tissue structures through plantar fascial elongation and increased tissue stress [12, 13, 14].

All these observations for general foot health in terms of disability, activity and pain needed to be considered as a significant indicator of treatment success [10].

4. Conclusion

It was concluded that there exists a correlation between pain and disability, pain and activity restriction, and these three are interdependent foot posture and body mass index and no significant correlation was found between the pain and foot posture.

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