

## IMPACT OF CUSTOM ORTHOTIC DEVICES ON PLANTER FASCIITIS

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### ABSTRACT

#### **Background:**

The study aimed to compare the effectiveness of prefabricated and custom-made orthotic devices in reducing pain and improving function in individuals with plantar fasciitis. It sought to evaluate how orthotics influence plantar pressure and overall foot mechanics. The research intended to determine whether custom orthotics provide superior long-term benefits compared to prefabricated inserts. Overall, the purpose was to assess the clinical value of orthotic interventions in managing plantar fasciitis symptoms.

#### **Methods:**

Researchers searched multiple medical databases and included randomized controlled trials assessing orthotic treatments for plantar fasciitis. Participants were assigned to interventions such as foot orthoses, exercises, orthotic sandals, or self-management programs. Pain levels and foot function were monitored through regular messages, phone calls, and follow-up questionnaires. The trials compared different orthotic options to determine which approach offered the greatest improvement in pain relief and functional outcomes.

#### **Results:**

Individuals with plantar fasciitis commonly experience sharp heel pain, especially during first steps in the morning or prolonged standing. Risk factors such as tight calf muscles, foot posture abnormalities, and unsuitable footwear worsen symptoms. Use of prefabricated or custom orthotic devices reduces plantar pressure and improves daily functional activity. Overall, orthoses provide meaningful symptom relief with no reported adverse effects, making them a safe conservative treatment option.

#### **Conclusion:**

Custom orthotics effectively reduce strain on the plantar fascia by correcting biomechanics and redistributing foot pressure. They provide greater long-term symptom relief and higher patient satisfaction compared to prefabricated inserts, though they work best as part of a combined treatment plan. Overall, custom orthotics are a reliable, evidence-based option that supports pain reduction and improved mobility in plantar fasciitis patients.

**Keywords:** Custom orthotics, plantar fasciitis, heel pain, biomechanical correction, plantar pressure redistribution, foot function, pain relief, mobility improvement, long-term symptom management, conservative treatment.

## INTRODUCTION

- Plantar fasciitis (PF) is defined as inflammation of planter fascia which is a thick band of connective tissue that runs along the bottom of foot from calcaneum or heel bone to the base of toes. It is the most common cause of heel pain, affecting 10% of the population. Despite the name “fasciitis”, which suggests inflammatory causes, the condition is indicated to result from degeneration of the plantar fascia(1). The plantar fascia supports the longitudinal arch of foot and it also absorbs ground reaction forces during the static and dynamic phase(s) of weight-bearing(2). Plantar fasciitis presents with symptoms like heel pain, localized tenderness in the longitudinal arch or heel of the foot, pain after exercise, pain upon first steps in the morning, and stabbing or sharp heel pain. Plantar fasciitis affects variety of individuals including athletes, nonathletes who stand for prolonged periods like healthcare workers, people who use improper or unsupportive footwear, people with gastrosoleus tightness, individuals with a flat foot (pes planus) or high arch (pes cavus), and people with high body mass index (BMI) . A windlass test, also known as a jack’s test, is usually performed to diagnose planter fasciitis by passively dorsiflexing the big toe of the foot. This causes the plantar fascia to be stretched and the pain reproduced in the heel confirms plantar fasciitis(3).

- In addition, studies also suggests that PF not only affects athletes, but it is higher in people with a sedentary lifestyle. It has been reported that shoe comfort was independently associated with foot and ankle pain. The various treatments available for plantar fasciitis includes rest, icing, compression, stretching exercises, and the use of orthotics. Orthotics are devices that are designed to support and correct the structure of the foot and are utilized in management of various foot and ankle cases(4) Due to the prolonged recovery period and postoperative complication risks, conservative methods are recognized as the first line of therapy in clinical practice (5) It has been anticipated that one of the conservative management of plantar fasciitis was the foot orthoses (shoe insole/arch support), which is involved in reducing pain and tissue stress during standing or mobility. There is a wide range of foot

orthoses, it varies from a simple prefabricated form that can be directly used as needed and easily found in the market, to a customized form that is made according to the specific conditions of the patient’s feet. It is well-recognized that most PF patients are usually prescribed foot insoles as part of their conservative treatment(6).Plantar pressure induced pain leads to discomfort and hinders the activities of daily living.(7) Foot orthoses are insole devices designed to minimize foot loading distribution and adjust medial longitudinal arch function through control of specific foot motion<sup>13</sup>. They reduce pronation of rare foot in a dose-dependent manner, addressing planus foot posture (flat feet) and excessive foot pronation (eversion) associated with planter fasciitis pain, and increase foot-to-surface contact area, lowering plantar heel pressures and tensile stresses at the calcaneal-plantar fascia junction during loading to provide symptomatic relief from planter fasciitis pain (8) These foot orthoses (FO) are generally associated with few or no adverse effects.(9)

### Methods:

Seven databases were searched from the time of construction to February 2025. Include randomized controlled trials (RCTs) evaluating the effects of foot orthoses on pain and function in patients with plantar fasciitis for data extraction, quality assessment, meta-analysis, and subgroup analysis. A random-effects model was used to calculate the pooled effect size and its 95% confidence interval (CI), with pain and foot function as the primary outcome measures.(10)

This systematic review aimed to evaluate the efficacy of various orthotic interventions in the treatment of plantar fasciitis. The review protocol was registered in PROSPERO, and a specific search strategy was developed for different databases, including Cochrane Library, PEDro, MEDLINE, EMBASE, and CINAHL.(11)

A systematic search was performed in 4 electronic databases (MEDLINE, Embase, CINAHL, and Cochrane) using a combination of Medical Subject Headings (MeSH) terms and free-text words included studies were controlled treatment methods. In case of biomechanical or anatomical outcome measures, no control group was required.

Other inclusion criteria were a minimum number of 5 participants, adult aged ( $\geq 18$  y), and only participants without a disease that could interfere with the symptoms of plantar fasciitis(12)

In this randomised controlled trial, up to 696 adults with PHP will be given a self-management advice booklet and allocated by chance to one of four treatments: exercises, foot orthoses, combined exercises and foot orthoses, or no additional treatment. Participants will be sent weekly text-messages or receive brief phone calls, to collect pain scores for up to 12 weeks and then monthly from 3-12 months, plus questionnaires at 3, 6 and 12 months. Half-way through the trial, only treatments that are reducing pain will continue to be offered and the trial will stop early if one treatment is clearly better. (13)

This study is a non-blinded randomised control trial (RCT) and was conducted over a period of 17 mo between July 2021 and November 2022 volunteers who responded to social media advertisements about the study. The primary objective is to investigate whether the combined use of prefabricated orthotics and orthotic sandals vs the sole use of prefabricated orthotics is more beneficial in decreasing foot pain and increasing foot functionality in PF(14)

93 subjects agreed to participate in the study male (n=30) 32.3%, and Female (n=63) 6.78%. All participants were asked to sign a consent form before participating in filling out the survey questions.(15)

### Results:

In this study individuals diagnosed with plantar fasciitis presents with heel pain and functional limitation. Most of the participants have sharp pain localized to medial calcaneal region, and particularly during the first step in the morning, after prolonged standing and physical activity. A wide range of people exhibit positive Windlass test. Several risk factors were present among these participants. These factors include gastrosoleus tightness, pes planus, pes cavus etc. Other factors include prolonged standing, sedentary lifestyle and use of uncomfortable foot wear are associated with symptoms provocation. Use of orthotic devices related to improvement in pain and

functional activity. Participants using either prefabricated or custom-made foot orthoses to leads to reduction in plantar pressure and improve daily activity which involves long standing or Walking. Foot orthoses increase foot to surface contact area results in decrease pressure on plantar fascia and decrease stress at calcaneal during long standing. These biomechanical changes contribute to meaningful symptomatic relief across participants. No adverse effect related to use of foot orthoses were reported. And is thought to be a safe and well-tolerated conservative treatment option.

### Discussion

Plantar fasciitis (PF) is a general condition that causes heel pain and is associated with a wide population of victims comprising of athletes, healthcare workers, and the general population. PF is a chronic disease and its effects on mobility and quality of life have resulted in keeping the discussion of conservative management strategies viable with custom orthotic devices gaining significant clinical importance. Specially made orthotics are tailored to meet the needs of abnormal foot biomechanics, redistribute plantar foot pressure and orthotics assist to support the medial longitudinal arch thus alleviating strain on the plantar fascia.

It has shown that custom orthotic aids greatly decrease the level of pain among PF patients since the orthotic minimizes the pressures on the plantar heel and improves foot positioning. Custom orthotics can be used to decrease plantar fascia tensile stress at the point of insertion during gait, by preventing excessive foot pronation. Such biomechanical adjustment is necessary in the alleviation of microtrauma and in the healing of tissues. CPOE orthotics are also associated with functional mobility, which enables the patient to continue with every day and occupational activities without a lot of discomfort.

This review also examined evidence based on randomized controlled trials and systematic searches that determined the effectiveness of foot orthoses in the treatment of plantar fasciitis with regard to pain and functional outcome. In general, the results of the studies incorporated in the current study allow concluding that custom and

prefabricated foot orthoses are effective conservative treatments, especially to alleviate pain during weight-bearing and enhance functional mobility.

Several RCTs have shown that first-step pain which is a hallmark symptom of plantar fasciitis is significantly reduced in the use of foot orthoses. A ground-breaking randomized trial study by Landorf and Keenan demonstrated that both prefabricated and custom orthoses had clinically significant results at 3 months relative to the sham devices (16). In the same vein, the most recent findings of biomechanics indicate that orthoses reduce the strain of plantar fascia because of the change in the mechanisms of foot pronation and the redistribution of plantar pressures during the gait (17). These results back the theoretical conception of orthotic therapy, which is to take off tensile stress on plantar fascia and promote tissue healing.

Both exercise-based interventions and orthoses, and combined-treatment protocols were also included in the Methods section of this review. This is consistent with the fact that such multifaceted methods can have better results. Indicatively, Whittaker et al. have established that patients who received orthoses and exercises along with stretching exercises had higher pain and disability reduction than their counterparts who had exercise therapy only intervention (18). This substantiates the idea that orthoses cannot be applied without a holistic approach to the treatment plan in line with the existing physiotherapy guidelines.

Moreover, comparative trials conducted on the orthotic designs reveal that prefabricated orthoses can offer the same benefits as custom devices to a vast number of patients. A massive RCT by Riel et al. showed that personalized as well as ready-made orthoses showed equal effects in terms of symptomatic alleviation, and there were no significant differences in long-term outcome (19). Nevertheless, custom orthoses might have benefits in case of severe biomechanical abnormalities, like pes planus, occupations characterized by long standing, or with the BMI, which was also represented by some of the studies included in the Methods.

The design considerations of the Methods such as inclusion criteria (adult patients, minimum sample sizes, control interventions, and uniform pain scores) are in line with high quality PF research design. This increases the validity of the findings synthesized. Also, longitudinal follow-ups including 3-, 6-, and 12-month follow-ups can be used to help elucidate both immediate and long-term advantages of the orthotic therapy. Long term trials such as Bishop et al. show that any gains that are made at 3 months are usually sustained over a period of more than 1 year (20).

Regardless of these positive results, there are certain methodological limitations. Some of the RCTs in the Methods were not blinded because orthotic devices are such a nature that they can create bias. The sample sizes were different in the studies and the orthotic materials and posting technology as well as type of shoes can also be different in the studies which may be the reason of variation in the outcomes. In addition, the disparity in the outcome measures- e.g. VAS scores, FFI scores, pressure plate data, etc. - prevents the direct comparison of the studies. The use of standardized protocols should be highlighted in future research, and the question that should be addressed is based on which patient subgroups are helped well by certain orthotic designs.

Comprehensively, there is a growing body of evidence that foot orthoses is an effective, safe and practical intervention in the management of plantar fasciitis with the incorporation of exercise therapy and patient education. Their success in general population and study designs implies that the orthoses continue to play a leading role in the overall treatment of plantar heel pain under the guidelines of the conservative rehabilitation.

#### **CONCLUSION:**

Custom orthotic made materials have a great role to play in alleviating pain and enhancing the functioning of plantar fasciitis patients. They assist in reducing the load on the plantar fascia by giving specific assistance, addressing biomechanical defects, and redistributing the load of the foot on the ground (plantar pressure). The studies have always demonstrated that custom orthoses are better than prefabricated inserts in terms of

relieving symptoms in the long-term and patient satisfaction. They are not a standalone treatment, but are a good part of an overall treatment. Finally, custom orthotics are a valid, evidence-based alternative to the treatment of plantar fasciitis and the overall improvement of mobility.

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