**Journal of Neonatal Surgery**
***ISSN(Online): 2226-0439***
***Vol. 14, Issue 27s (2025)***
*https://www.jneonatalsurg.com*

OPEN ACCESS

# Efficacy Of Added Effect Of Dry Needling Versus Dry Cupping On Calf Muscles With Conventional Therapy In The Treatment Of Plantar Fascitis

**Dr. Soumik Basu[1], Dr. Kiran Mulchandani[2], Dr. Tushar J Palekar[3], Dr. Vanshika Tandon [4], Dr. Rajesh S Kuber[5]**

[1]Associate Professor, Dr. D.Y Patil College of Physiotherapy, Pimpri, Pune

[2]Post Graduate Student, Dr. D.Y Patil College of Physiotherapy, Pimpri, Pune

[3]Dean and Principal, Dr. D.Y Patil College of Physiotherapy, Pimpri, Pune

[4]Post Graduate Student, Dr. D.Y Patil College of Physiotherapy, Pimpri, Pune

[5]Professor, Radiology Department Dr. D. Y. Patil Medical College, Hospital & Research Centre, Dr. D.Y Patil Vidyapeeth, Pimpri Pune – 411018

***Corresponding Author:**

Dr. Kiran Mulchandani (PT)

Email ID: kiranmulchandani17@gmail.com

Cite this paper as: Dr. Soumik Basu, Dr. Kiran Mulchandani, Dr. Tushar J Palekar, Dr. Vanshika Tandon , Dr. Rajesh S Kuber, (2025) Efficacy Of Added Effect Of Dry Needling Versus Dry Cupping On Calf Muscles With Conventional Therapy In The Treatment Of Plantar Fascitis. *Journal of Neonatal Surgery*, 14 (27s), 253-265.

**ABSTRACT**

**Background:** Plantar fasciitis (PF) is a common cause of heel pain resulting from inflammation and degeneration of the plantar fascia. While conventional treatments include stretching and orthotics, adjunct therapies like dry needling (DN) and dry cupping (DC) have shown potential benefits.

**Purpose:** This study compared the effects of DN and DC on calf muscles, alongside conventional therapy, in managing PF.

**Methodology:** Thirty participants with unilateral chronic PF were randomly divided into two groups: Group A (DN + conventional therapy) and Group B (DC + conventional therapy). Both groups received six sessions over two weeks. Outcome measures included plantar fascia thickness (via ultrasonography), pain threshold (pressure algometer), and functional mobility (Foot and Ankle Disability Index).

**Results:** Both groups showed significant improvements, with DN yielding greater pain relief and functional gains.

**Conclusion:** DN and DC are effective adjuncts for PF management, with DN offering superior functional outcomes.

***Keywords:** Plantar fasciitis, Dry Needling, Dry Cupping, Ultrasonography*

## 1. INTRODUCTION

Plantar fasciitis is a leading cause of heel pain and is among the most frequently observed foot conditions in clinical practice. It is characterized by both inflammation and degeneration of the plantar fascia, a thick, fibrous connective tissue located on the bottom of the foot.[1,2] This structure is vital for arch support and plays a key role in absorbing mechanical stress during weight-bearing activities. Anatomically, the plantar fascia originates from the calcaneal tuberosity at the heel and extends toward the toes. The medial process of the calcaneal tubercle, a significant bony landmark, functions as the anchoring point for the central portion of the fascia, along with several intrinsic foot muscles. Together, these structures contribute to foot stability and optimal biomechanics.[1,2,6]

Plantar fasciitis ache is typically felt in the lower inner part of the heel, though it can sometimes spread along the entire fascia of the plantar aspect. Symptoms usually develop gradually, with many individuals experiencing a sharp ache when taking their initial movements after waking up or prolonged inactivity. This "start-up pain" often improves with movement but tends to recur during tasks that require extended periods of standing, walking, or running.[2,3]

Plantar fasciitis frequently arises from repetitive strain or excessive mechanical pressure on the fascia of the plantar aspect. Continuous stress on these tissues may result in microtears, irritation, and structural changes, ultimately causing pain and discomfort. This is particularly evident in high-impact populations, such as runners and military personnel, who place significant stress on the plantar fascia through repetitive motion. Similarly, sedentary individuals with obesity (body mass index >30) and those whose occupations require prolonged standing are prone to the condition due to the added strain on the fascia. Variations in foot anatomy, conditions like low arches (pes planus), elevated arches (pes cavus), and differences in leg length notably raise the risk of developing PF. These anatomical variations alter the natural biomechanics of the foot, leading to an uneven distribution of pressure during weight-bearing activities. Flat feet, for instance, result in excessive tensioning of the fascia due to a lack of proper arch support, while high arches can cause excessive tension by reducing the foot's natural shock absorption. Similarly, leg length discrepancies create an imbalance in gait, forcing one foot to bear more strain than the other. These biomechanical disruptions place additional stress on the fascia, resulting in increased tension on the muscles of the foot, & achilles tendon. Over time, this excessive strain makes the fascia more vulnerable to microtears, irritation, and inflammation, contributing to the distress and mobility issues linked to PF. Addressing these structural issues through appropriate interventions, such as orthotic support, stretching exercises, and gait modifications, is essential in reducing the risk and managing symptoms effectively.[3,4,5]

Plantar fasciitis develops because of mix in inherent & other factors of the environment. Inherent causes include conditions such as obesity, restricted ankle mobility, and tight calf muscles. In contrast, environmental influences involve external elements like exercising on hard surfaces, walking barefoot, or sudden increases in physical activity. Managing these contributing factors is essential for effective treatment and prevention.[6,7]

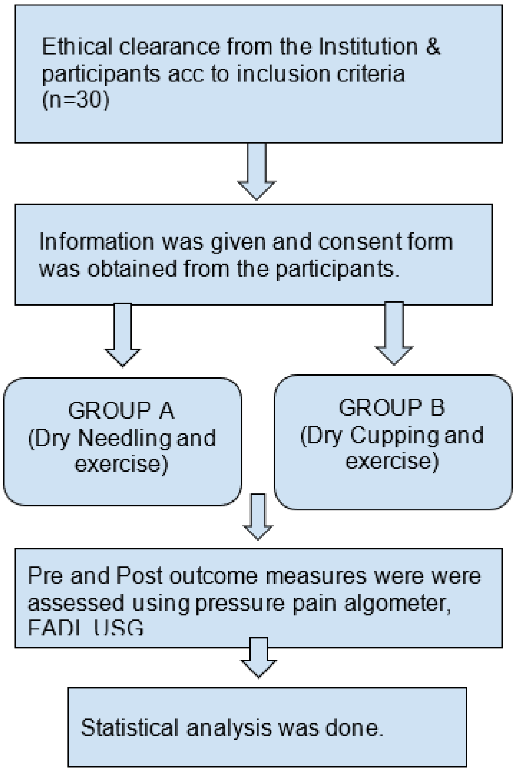
The plantar fascia also exhibits unique histological characteristics that contribute to its function and susceptibility to injury. The plantar fascia is comprised of a tightly packed extracellular matrix, predominantly consisting of collagen fibers. These fibers are structured in a crimped pattern, which enhances their tensile strength and resilience. These collagen fibers are synthesized by elongated fibrocytes, which are organized in longitudinal rows to preserve the fascia's structural integrity. However, repetitive stress, excessive loading, or biomechanical imbalances can disrupt this matrix, leading to degenerative changes. This degeneration, rather than inflammation alone, is now recognized as the primary driver of plantar fasciitis, with microtears and reduced collagen organization contributing to pain and functional limitations.[3,6]

## 2. METHODOLOGY

This experimental study was conducted at D.Y. Patil Physiotherapy OPD, Pimpri, with a sample of 30 participants diagnosed with unilateral chronic plantar fasciitis, selected through simple random sampling (15 in each group). Participants aged 20-60 years of both genders were included after providing informed consent. Exclusion criteria comprised fear of needles, metal allergies, concurrent treatments for plantar fasciitis, recent trauma, and systemic inflammatory disorders. Materials used included a cupping tool, dry sterile needles, a pressure pain algometer, an ice bottle, consent forms, and Foot & Ankle Disability Index (FADI) forms.

## 3. INTERVENTION

Ethical approval was obtained before recruiting 45 participants who met the inclusion criteria. After securing informed consent, subjects were randomly allocated into two groups using the chit method: Group A received dry needling with conventional therapy, while Group B received dry cupping with conventional therapy. Baseline assessments, including pain threshold (pressure pain algometer), functional limitations (FADI), and plantar fascia thickness (ultrasonography), were conducted on Day 1. Both groups followed a 14-day intervention, incorporating ice bottle rolling, stretching, and exercises. Participants performed self-stretching twice daily. Post-treatment assessments were conducted on Day 14 to evaluate improvements in pain, function, and fascia thickness.




**Procedure for Group A : (Dry Needling, Stretches & Icing):**

Participants were positioned in a prone posture, and the procedure was explained. Dry needling was applied to the soleus and gastrocnemius muscles, targeting Myofascial Trigger Points (MTrPs) identified using Travell and Simons' criteria. A 30-50mm, 0.6mm diameter needle was used, followed by 5 minutes of icing over the calf after needle removal. The treatment lasted four weeks, with three sessions per week.

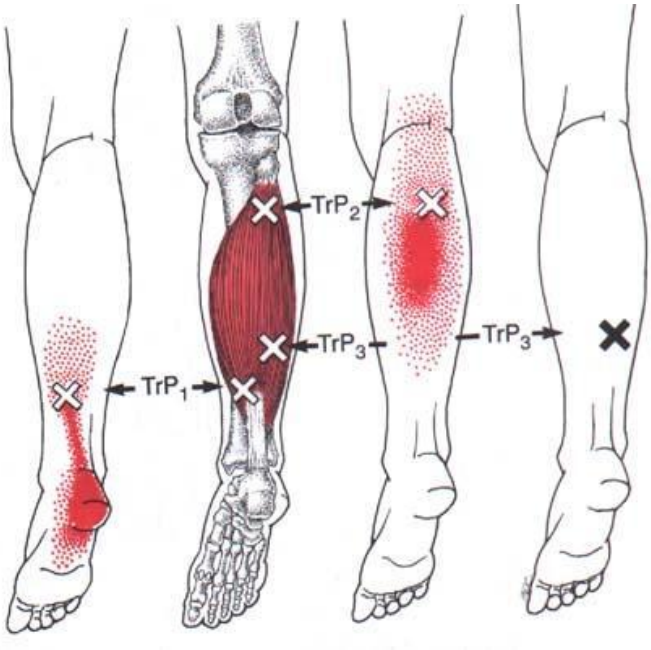



**Fig. no. 1 (shows trigger points for dry needling in calf muscles)**

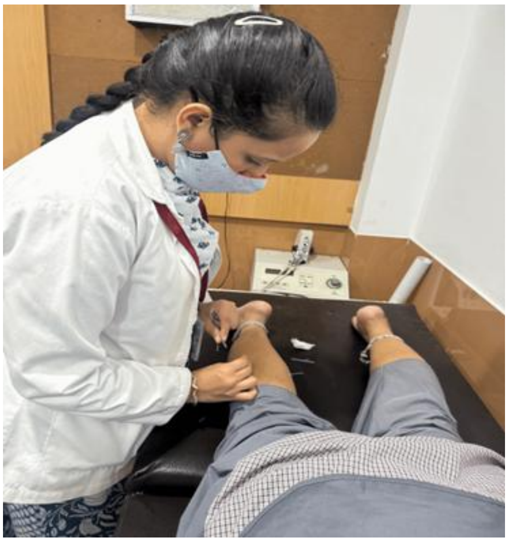


**Fig. no. 2 (Needling performed on trigger points in calf muscles of the subject)**

**Procedure for Group B (Dry Cupping, Icing & Stretches):**

Participants were placed in a prone position, and the procedure was explained, including suction sensation, possible bruising, and adverse effects. Cups were applied to painful areas and trigger points with a suction force of 300 millibar for 10 minutes, ensuring tissue elevation of 1.6 cm. After cup removal, icing was applied. The treatment lasted four weeks, with three sessions per week.

**Fig.no. 3 (Dry Cupping for calf muscles)**

**Fig. no. 4 (Dry Cupping performed in calf muscles of the subject)**

- **Conventional therapy ( Ice bottle rolling & exercises):** The participants were made to do exercises first that would consist of toe curling exercise with a towel, towel stretch, calf stretches, followed by 15 mins of Ice bottle rolling.

**1. Toe Curl Exercise with Towel:** The patient received instructions to:

**a.** Sit in a relaxed position on a chair with an affected foot placed on a flat towel.

**b.** Gradually curl the toes to gather the towel inward.

**c.** Reset the towel to its original position and repeat the exercise.

**d**. 10 repetitions X 2 sets.

**Fig. no. 5 (subject performing toe curl exercise with towel)**

**2. Towel Stretch For Plantar Fasciitis :** The patient was instructed to perform this exercise every morning before getting out of bed, as the towel stretch is particularly effective in alleviating morning pain when done beforehand.

Instructions Provided to the Patient:

1. Sit with the affected leg extended straight in front.
2. Wrap a towel around the foot and slowly pull it toward the body till a stretch is felt in the calf.

. **Fig. no. 6 (subject performing towel stretch for fascia )**

**3. STRETCH FOR CALF MUSCLES :**


**Fig. no. 7 (subject performing calf stretching exercise for calf)**

**4. GREAT TOE STRETCH FOR PF**

**Fig. no. 8 (subject performing great toe stretch for plantar fascia)**

**DATA ANALYSIS:**

**GRAPH 1 : COMPARISON BETWEEN PRE AND POST MEAN VALUES OF PLANTAR THICKNESS MEASURED BY USG FOR GROUP A :**

**TABLE 1 : COMPARISON BETWEEN PRE AND POST MEAN VALUES OF PLANTAR THICKNESS MEASURED BY USG FOR GROUP A :**

| | Type | Mean | Std. Deviation | Std. Error Mean | P Value |
|---|---|---|---|---|---|
| **PLANTAR THICKNESS** | **Pre** | 5.0 | 0.6 | 0.1 | <0.001 |
| | **Post** | 4.5 | 0.6 | 0.1 | |

**GRAPH 2 : COMPARISON BETWEEN PRE AND POST MEAN VALUES OF PRESSURE PAIN ALGOMETER FOR GROUP B :**

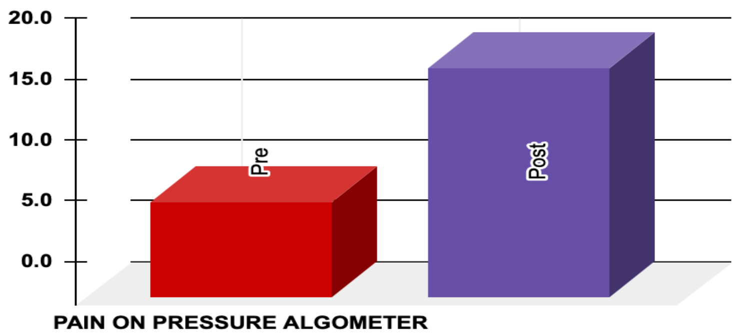



**TABLE 2 : COMPARISON BETWEEN PRE AND POST MEAN VALUES OF PRESSURE PAIN ALGOMETER FOR GROUP A :**

| | Type | Mean | Std. Deviation | Std. Error Deviation | P Value |
|---|---|---|---|---|---|
| **PAIN ON PRESSURE ALGOMETER** | **Pre** | 10.7 | 4.6 | 1.2 | <0.001 |
| | **Post** | 24.5 | 9.3 | 2.4 | |

**GRAPH 3 : COMPARISON BETWEEN PRE AND POST MEAN VALUES OF FOOT AND ANKLE DISABILITY INDEX FOR GROUP B :**

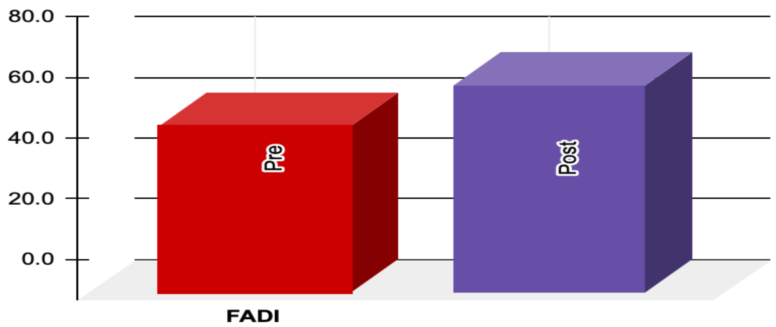


**TABLE 3 : COMPARISON BETWEEN PRE AND POST MEAN VALUES OF FOOT AND ANKLE DISABILITY INDEX FOR GROUP A :**

| | Type | Mean | Std. Deviation | Std. Error Deviation | P Value |
|---|---|---|---|---|---|
| **FADI** | **Pre** | 58.9 | 7.5 | 1.9 | <0.001 |
| | **Post** | 79.5 | 5.3 | 1.4 | |

**GRAPH 4 : COMPARISON BETWEEN PRE AND POST MEAN VALUES OF PLANTAR THICKNESS MEASURED BY USG FOR GROUP B :**


**TABLE 4 : COMPARISON BETWEEN PRE AND POST MEAN VALUES OF PLANTAR THICKNESS MEASURED BY USG FOR GROUP B :**

| | Type | Mean | Std. Deviation | Std. Error Mean | P Value |
|---|---|---|---|---|---|
| **PLANTAR THICKNESS** | **Pre** | 4.5 | 0.6 | 0.1 | <0.001 |
| | **Post** | 4.2 | 0.7 | 0.2 | |

**GRAPH 5 : COMPARISON BETWEEN PRE AND POST MEAN VALUES OF PRESSURE PAIN ALGOMETER FOR GROUP A :**

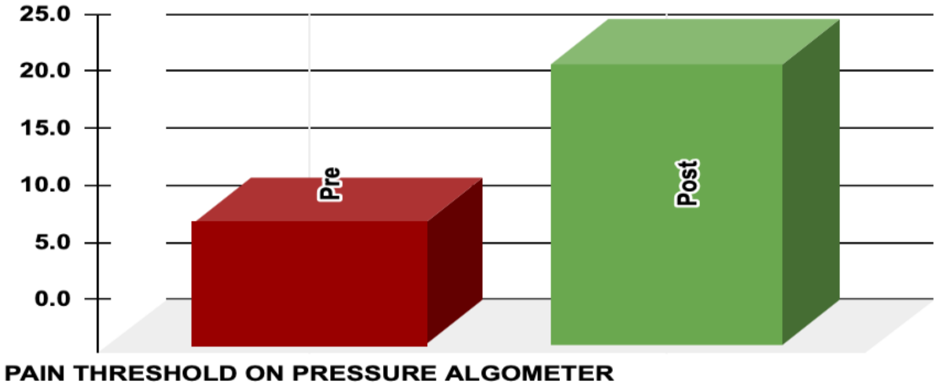
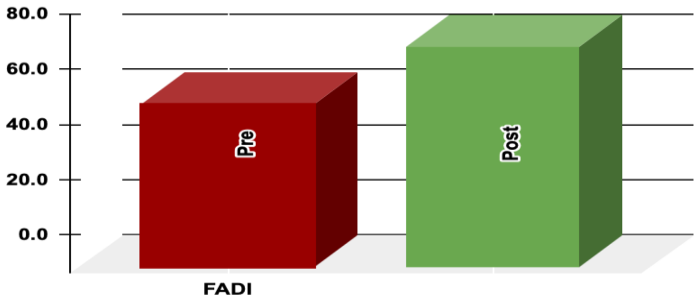


**TABLE 5 : COMPARISON BETWEEN PRE AND POST MEAN VALUES OF PRESSURE PAIN ALGOMETER FOR GROUP B :**

| | Type | Mean | Std. deviation | Std. Error Mean | P Value |
|---|---|---|---|---|---|
| PAIN ON PRESSURE ALGOMETER | Pre | 7.9 | 3.1 | 0.8 | <0.001 |
| | Post | 18.9 | 6.7 | 1.7 | |

**GRAPH 6 : COMPARISON BETWEEN PRE AND POST MEAN VALUES OF FOOT AND ANKLE DISABILITY INDEX FOR GROUP B :**




**<u>TABLE 6</u> : COMPARISON BETWEEN PRE AND POST MEAN VALUES OF FOOT AND ANKLE DISABILITY INDEX FOR GROUP B :**

| | Type | Mean | Std. Deviation | Std. Error Deviation | P Value |
|---|---|---|---|---|---|
| FADI | Pre | 54.8 | 8.2 | 2.1 | <0.001 |
| | Post | 68.2 | 6.2 | 1.6 | |

**GRAPH 7 : COMPARISON BETWEEN PRE AND POST MEAN VALUES OF PLANTAR THICKNESS FOR GROUP A AND GROUP B:**

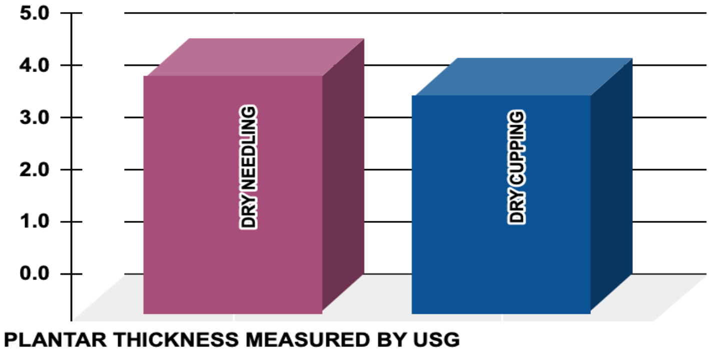


**TABLE 7 : COMPARISON BETWEEN PRE AND POST MEAN VALUES OF PLANTAR THICKNESS FOR GROUP A AND GROUP B:**

| Group | Mean | Std. Deviation | Std. Error Mean | P Value |
|---|---|---|---|---|
| DRY CUPPING | 4.2 | 0.7 | 0.2 | 0.126 |
| DRY NEEDLING | 4.5 | 0.6 | 0.1 | |

**GRAPH 8 : COMPARISON BETWEEN PRE AND POST MEAN VALUES OF PRESSURE PAIN ALGOMETER FOR GROUP A AND GROUP B :**

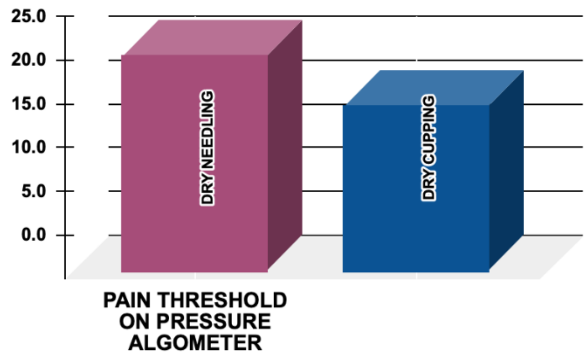



**TABLE 8 : COMPARISON BETWEEN PRE AND POST MEAN VALUES OF PRESSURE PAIN ALGOMETER FOR GROUP A AND GROUP B :**

| GROUP | Mean | Std. Deviation | Std. Error Mean | P Value |
|---|---|---|---|---|
| DRY CUPPING | 18.9 | 6.7 | 1.7 | 0.066 |
| DRY NEEDLING | 24.5 | 9.3 | 2.4 | |

**GRAPH 9: COMPARISON BETWEEN PRE AND POST MEAN VALUES OF FOOT AND ANKLE DISABILITY INDEX FOR GROUP A AND GROUP B :**

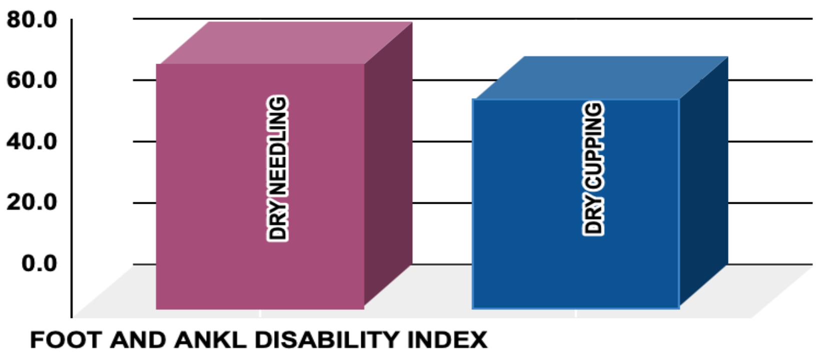


**TABLE 9 : COMPARISON BETWEEN PRE AND POST MEAN VALUES OF FOOT AND ANKLE DISABILITY INDEX FOR GROUP A AND GROUP B :**

| Group | Mean | Std. Deviation | Std. Error Mean | P Value |
|---|---|---|---|---|
| DRY CUPPING | 68.2 | 6.2 | 1.6 | <0.001 |
| DRY NEEDLING | 79.5 | 5.3 | 1.4 | |

## 4. RESULTS

In Group A (Dry Needling + Conventional Therapy), the initial plantar fascia thickness averaged 5.0 mm (SD = 0.6 mm) and significantly decreased to 4.5 mm post-treatment ($p < 0.001$), indicating structural improvement due to reduced inflammation and mechanical stress. The pain threshold, measured via a pressure pain algometer, increased from 10.7 units (SD = 4.6) to 24.5 units (SD = 9.3, $p < 0.001$), reflecting a notable improvement in pain tolerance. The FADI score improved significantly from 58.9 (SD = 7.5) to 79.5 (SD = 5.3, $p < 0.001$), suggesting enhanced functional mobility and reduced disability.

In Group B (Dry Cupping + Conventional Therapy), the initial plantar thickness was 4.5 mm (SD = 0.6 mm), reducing to 4.2 mm (SD = 0.7 mm, $p < 0.001$), demonstrating treatment effectiveness. Pain threshold values increased from 7.9 units (SD = 3.1) to 18.9 units (SD = 6.7, $p < 0.001$), signifying pain reduction. The FADI score improved from 54.8 (SD = 8.2) to 68.2 (SD = 6.2, $p < 0.001$), indicating better function.

Comparative Analysis: While both interventions significantly improved plantar fascia thickness, pain threshold, and functional ability, dry needling demonstrated a greater impact on pain reduction and functional mobility. The difference in plantar thickness reduction between groups was not statistically significant ($p = 0.126$), and the improvement in pain threshold showed a trend favoring dry needling but did not reach statistical significance ($p = 0.066$). However, the improvement in FADI scores was significantly greater in the dry needling group ($p < 0.001$), suggesting a superior effect on functional mobility compared to dry cupping. This highlights that while both techniques are effective, dry needling may provide a greater benefit in restoring functional ability in individuals with plantar fasciitis.

## 5. DISCUSSION

This study examined the supplementary effects of dry needling (DN) and dry cupping (DC) alongside conventional therapy for plantar fasciitis (PF), demonstrating significant improvements in plantar fascia thickness, pain threshold, and functional mobility.[39,40]

### Plantar Fascia Thickness

Group A (DN) showed a reduction from 5.0 mm to 4.5 mm ($p < 0.001$), while Group B (DC) decreased from 4.5 mm to 4.2 mm ($p < 0.001$). The intergroup difference was not statistically significant ($p = 0.126$), suggesting both techniques effectively reduced inflammation and tissue stress.

### Pain Threshold:

Pain threshold improved significantly in DN (10.7 to 24.5 units) and DC (7.9 to 18.9 units). Though DN showed greater improvement, the intergroup difference ($p = 0.066$) was not statistically significant. DN's deeper penetration may account for its superior pain modulation compared to DC's decompressive effects.

### Functional Mobility (FADI Score)

FADI scores improved in DN (58.9 to 79.5, $p < 0.001$) and DC (54.8 to 68.2, $p < 0.001$), with a significant intergroup difference favoring DN ($p < 0.001$). DN's deeper neuromuscular effects likely contributed to better functional outcomes.

### Therapeutic Considerations

Both DN and DC effectively reduced pain and improved function, though DN showed superior benefits in pain relief and mobility enhancement. DN may be preferable for patients with high pain thresholds and myofascial dysfunction, while DC offers a less invasive alternative. Integrating these techniques into rehabilitation may optimize PF management, though further studies are needed to explore combined approaches.

### Clinical Observations & Patient Feedback:

Both interventions were well-tolerated, but patients reported faster and more lasting relief with DN, likely due to its direct effect on myofascial trigger points. These findings support the integration of DN and DC as adjuncts to conventional PF treatment, enhancing recovery and functional outcomes.

## 6. CONCLUSION

This research highlights dry needling and dry cupping as effective adjuncts for plantar fasciitis, improving pain, mobility, and plantar fascia thickness. Dry needling targets trigger points to enhance pain tolerance, while dry cupping reduces pain through decompression and circulation. Though neither is superior, their combined use with conventional therapy optimizes recovery.

Integrating these techniques into physiotherapy may accelerate rehabilitation, but further research is needed on long-term effects, optimal use, and synergy with other treatments. As evidence grows, physiotherapists can refine these interventions to enhance patient outcomes.

## REFERENCES


[1] Hedrick MR. The Plantar Aponeurosis. Foot & Ankle International. 1996;17(10):646-649. doi:10.1177/107110079601701012

[2] Roxas M. Plantar fasciitis: diagnosis and therapeutic considerations. Alternative medicine review. 2005 Jun 1;10(2).

[3] Latt LD, Jaffe DE, Tang Y, Taljanovic MS. Evaluation and Treatment of Chronic Plantar Fasciitis. Foot & Ankle Orthopaedics. 2020;5(1). doi:10.1177/2473011419896763.

[4] Abbassian A, Kohls-Gatzoulis J, Solan MC. Proximal medial gastrocnemius release in the treatment of recalcitrant plantar fasciitis. Foot & ankle international. 2012 Jan;33(1):14-9.

[5] Boyle RA, Slater GL. Endoscopic plantar fascia release: a case series. Foot & ankle international. 2003 Feb;24(2):176-9.

[6] Neufeld SK, Cerrato R. Plantar fasciitis: evaluation and treatment. JAAOS-Journal of the American Academy of Orthopaedic Surgeons. 2008 Jun 1;16(6):338-46.

[7] Riddle DL, Pulisic M, Pidcoe P, Johnson RE. Risk factors for plantar fasciitis: a matched case-control study. JBJS. 2003 May 1;85(5):872-7.

[8] Zhang J, Nie D, Rocha JL, Hogan MV, Wang JH. Characterization of the structure, cells, and cellular mechanobiological response of human plantar fascia. Journal of tissue engineering. 2018 Sep;9:2041731418801103.

[9] Alshami AM, Babri AS, Souvlis T, Coppieters MW. Biomechanical evaluation of two clinical tests for plantar heel pain: the dorsiflexion-eversion test for tarsal tunnel syndrome and the windlass test for plantar fasciitis. Foot & ankle international. 2007 Apr;28(4):499-505.

[10] Lemont H, Ammirati KM, Usen N. Plantar fasciitis: a degenerative process (fasciosis) without inflammation. Journal of the American Podiatric Medical Association. 2003 May 1;93(3):234-7.

[11] Cole C, Seto C, Gazewood J. Plantar fasciitis: evidence-based review of diagnosis and therapy. American family physician. 2005 Dec 1;72(11):2237-42.

[12] Wong MS. Pocket orthopaedics: Evidence-based survival guide. Jones & Bartlett Publishers; 2009 Oct 20.

[13] De Garceau D, Dean D, Requejo SM, Thordarson DB. The Association between Diagnosis of Plantar Fasciitis and Windlass Test Results. Foot & Ankle International. 2003;24(3):251-255. doi:10.1177/107110070302400309.

[14] Carlson RE, Fleming LL, Hutton WC. The Biomechanical Relationship Between The Tendoachilles, Plantar Fascia and Metatarsophalangeal Joint Dorsiflexion Angle. Foot & Ankle International. 2000;21(1):18-25. doi:10.1177/107110070002100104

[15] Huang YC, Wang LY, Wang HC, Chang KL, Leong CP. The relationship between the flexible flatfoot and plantar fasciitis: ultrasonographic evaluation. Chang Gung medical journal. 2004 Jun 1;27(6):443-8.

[16] Bartold SJ. Plantar heel pain syndrome: overview and management. Journal of Bodywork and movement Therapies. 2004;8(1):214-26.

[17] DeMaio M, Paine R, Mangine RE, Drez D. Plantar fasciitis. Orthopedics. 1993 Oct 1;16(10):1153-63.

[18] TANZ SS. 16 Heel Pain. Clinical Orthopaedics and Related Research (1976-2007). 1963 Jan 1;28:169-80.

[19] Lim AT, How CH, Tan B. Management of plantar fasciitis in the outpatient setting. Singapore medical journal. 2016 Apr;57(4):168.

[20] Daly PJ, Kitaoka HB, Chao EY. Plantar fasciotomy for intractable plantar fasciitis: clinical results and biomechanical evaluation. Foot & ankle. 1992 May;13(4):188-95.

[21] Sellman JR. Plantar fascia rupture associated with corticosteroid injection. Foot & ankle international. 1994 Jul;15(7):376-81.

[22] Leach RE, Seavey MS, Salter DK. Results of surgery in athletes with plantar fasciitis. Foot & Ankle. 1986 Dec;7(3):156-61.

[23] Kier R. Magnetic resonance imaging of plantar fasciitis and other causes of heel pain. Magnetic resonance imaging clinics of North America. 1994 Feb 1;2(1):97-107.

[24] Cotchett MP, Munteanu SE, Landorf KB. Effectiveness of trigger point dry needling for plantar heel pain: a randomized controlled trial. Physical therapy. 2014 Aug 1;94(8):1083-94.

[25] Eftekharsadat B, Babaei-Ghazani A, Zeinolabedinzadeh V. Dry needling in patients with chronic heel pain due to plantar fasciitis: a single-blinded randomized clinical trial. Medical journal of the Islamic Republic of Iran. 2016;30:401

[26] Kietrys DM, Palombaro KM, Azzaretto E, Hubler R, Schaller B, Schlussel JM, Tucker M. Effectiveness of dry needling for upper-quarter myofascial pain: a systematic review and meta-analysis. journal of orthopaedic & sports physical therapy. 2013 Sep;43(9):620-34.

[27] Cao H, Han M, Li X, Dong S, Shang Y, Wang Q, Xu S, Liu J. Clinical research evidence of cupping therapy in China: a systematic literature review. BMC complementary and alternative medicine. 2010 Dec;10:1-0.

[28] Ge W, Leson C, Vukovic C. Dry cupping for plantar fasciitis: a randomized controlled trial. Journal of physical therapy science. 2017;29(5):859-62.

[29] Al-Boloushi Z, Gómez-Trullén EM, Arian M, Fernández D, Herrero P, Bellosta-López P. Comparing two dry needling interventions for plantar heel pain: a randomised controlled trial. BMJ open. 2020 Aug 1;10(8):e038033.

[30] Hammons D, McCullough M. The Effect of Dry Cupping on Gastrocnemius Muscle Stiffness, Range of Motion and Pain Perception After Delayed Onset Muscle Soreness. Alternative Therapies in Health & Medicine. 2022 Oct 1;28(7).

[31] Kinser AM, Sands WA, Stone MH. Reliability and validity of a pressure algometer. The Journal of Strength & Conditioning Research. 2009 Jan 1;23(1):312-4.

[32] Hale SA, Hertel J. Reliability and sensitivity of the Foot and Ankle Disability Index in subjects with chronic ankle instability. Journal of athletic training. 2005 Jan;40(1):35.

[33] Aradhya S, Tiwari V, Bakde AM, Dwidmuthe S, Roy M, MATH SA. Ultrasonographic Assessment of Indian Patients With Plantar Fasciitis and Its Clinical Correlation: A Prospective Observational Study. Cureus. 2023 Mar 4;15(3).

[34] Bolívar YA, Munuera PV, Padillo JP. Relationship between tightness of the posterior muscles of the lower limb and plantar fasciitis. Foot & ankle international. 2013 Jan;34(1):42-8.

[35] Khan JA, Qais MD, Ahmad S, Farooqui S, Khan MS. COMPARING THE EFFECT OF DRY CUPPING TO THE MANUAL THERAPY FOR PLANTAR FASCIITIS: A RANDOMIZED CONTROLLED TRIAL. Cuestiones de Fisioterapia. 2025 Feb 3;54(3):411-28.