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## Efficacy of Transverse Friction Massage versus Dry Cupping on Flexor Digitorum Brevis and Gastrocnemius in patients with *Plantar fasciitis*

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## **Efficacy of Transverse Friction Massage versus Dry Cupping on Flexor Digitorum Brevis and Gastrosoleus in Patients with *Planter fasciitis***

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### **Authors' Contributions**

<sup>1</sup>Muhammad Kamran and <sup>2</sup>Abdul Mateen was involve in conception and design <sup>3</sup>Tamkeen and <sup>4</sup>Syeda Amna Iqbal contributed to data collection and analysis <sup>5</sup>Kaiynat Shafique contributed to data interpretation, article drafting and formatting <sup>6</sup>Dr. Hanan Azfar and <sup>7</sup>Qasim Raza contributed to critical appraisal and proofreading.



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### **Abstract**

**Purpose:** Plantar fasciitis is a musculo-skeletal ailment prevalent in people of diverse ages and levels of physical activity. This condition causes pain in the medial side of heel, which is exacerbated by weight-bearing activities as well as in rest or non-weight bearing. The objective of the study was to compare the effects on transverse friction massage and dry cupping on pain, disability and activity limitations in patients with planter fasciitis.

**Methodology:** It was a quasi-experimental study with sample size of 32 and convenient sampling was used to recruit patients in study. Inclusion criteria of study were females and males of age 21 to 35 years, chronic pain in foot for more than 4 months and had positive windlass test. Study duration was 6 months. Out of 32 patients 16 were enrolled in group-A (baseline therapy and Transverse Friction Massage) and remaining 16 were enrolled in group-B (baseline therapy and Dry Cupping). Intensity of pain was assessed by NPRS before and after the treatment of 4 week and functional limitations was measure by Foot Function Index (FFI). Data was analyzed by software SPSS 24.0.

**Findings:** Out of 32 participants 37.5% were men and 62.5% were women. Results demonstrated that median of NPRS in group A before treatment was 6.50 and after

treatment it was 3.00. Median of NPRS in group B before treatment was 6.00 and after treatment it was 2.50. Pre-treatment mean of FFI in group A was 64.18±7.40 which reduced to 21.12±9.26 after the treatment of 4 weeks. Pre-treatment mean of FFI in group b was 63.18±7.70 and after treatment it was 23.12±8.24. A statistical significant difference was found in pre and post treatments of both groups  $p \leq 0.05$ ). Between group analysis of A and B showed no statistical significant difference ( $p > 0.05$ ). Transverse friction massage and dry cupping showed equal effects in reducing disability, activity limitations and pain in the patients of planter fasciitis.

**Recommendations:** Transverse Friction Massage and Dry Cupping demonstrate equivalent therapeutic benefits for plantar fasciitis patients. Clinicians are advised to consider both interventions, factoring in patient comfort and logistical constraints. It's imperative for policymakers to integrate these findings into clinical guidelines, while also promoting further research to elucidate the specific therapeutic mechanisms involved.

**Keywords:** *Dry Cupping, Flexor Digitorum Brevis, Gastrosoleus, Planter fasciitis, Transverse Friction Massage*

## 1.0 INTRODUCTION

Foot pathologies are common and have a detrimental influence on quality of life (1). Plantar fasciitis, in particular, is an orthopedic ailment that affects people of various ages and activity levels, and it is estimated that the condition accounts for over one million medical visits in the United States each year (2, 3). The medical disorder is particularly prevalent in runners, impacting up to 17.4 percent of the runners (4). Pain in the medial heel is a symptom of the condition, which is increased by weight bearing activities as well as in rest or non-weight bearing. The damage is frequently persistent, with symptoms typically lasting over a year (5, 6).

Risk factors include restricted ankle dorsiflexion, higher levels of BMI, and increased period of standing (7). In most cases, the only physical examination finding is pain to palpation of the plantar fascial at its insertion on antero-medial calcaneus. Ultrasonography is a fair and low-cost diagnostic method for individuals whose discomfort lasts longer than three months despite therapy. Stretching the plantar fascia, cold massage, and NSAIDs should be used to begin treatment. Many common therapies, such as night splints and orthoses, have failed to outperform placebo. Recalcitrant plantar fasciitis may be managed through injections, extracorporeal shock wave therapy, or surgical techniques, however the data is inconclusive. When nonsurgical treatment options have been tried and a person still experiences pain that limits mobility and function, endoscopic fasciotomy may be indicated (8).

Deep transverse friction massage (DTFM) entailed applying gentle pressure directly to the myo-tendinous junction (MTJ), which, when adequate, activated Golgi tendon organs while inhibiting muscle tension. According to the literature, DTFM on the MTJ enhanced muscular extensibility (9-11). In 2019, N Farooq et al. investigated the effectiveness of the calf stretching and transverse friction massage of Flexor digitorum brevis muscle in people suffering with plantar fasciitis. Study findings illustrated that transverse friction massage and calf muscle stretching had no statistically significant differences. However, significant results ( $p < 0.05$ ) were found in within analysis of FFI at different time intervals in both groups. Transverse friction massage of the Flexor digitorum brevis and Calf muscle stretching were shown to be equally beneficial in managing plantar fasciitis (12).

In addition to typical physical therapy techniques, a revolutionary approach known as dry cupping therapy has recently acquired popularity. Dry cupping pulls the skin into the cup with no scars and helps to improve blood circulation to the afflicted area, resulting in greater functioning and an acceptable range of motion (13). Dry cupping treatment improved pain intensity in patients of low backache in a research conducted by Singh and Ahmed (14). Khan et al. used dry cupping treatment on knee OA patients and found that it improved PF clinical results (15). In 2022, S Malik et al. published a study that explored the impact of dry cupping on dynamic stability, functional ability, and pain in recreational runners having plantar fasciitis. 30 female runners suffering from plantar fasciitis were assigned at random to either dry cupping or conventional treatment group. According to the findings, pain, dynamic stability, and functional ability all improved significantly ( $p < 0.05$ ). However, when dry cupping was added to the traditional managements, these gains were shown to be considerably higher ( $p < 0.05$ ) (16).

This study aimed to juxtapose two widely used treatment strategies including myofascial release and dry needling, on the Flexor Digitorum Brevis and calf muscle. The objective was to discern which method provides superior relief in pain and functional improvement. The significance stems from presenting enhanced therapeutic choices for patients. Despite the growing popularity of these treatments, the existing literature provides limited direct comparisons of their efficacy, representing a notable gap that this study seeks to bridge.

## 2.0 METHODOLOGY

### Study Design and Selection Criteria

It was a quasi-experimental study with sample size of 32 and convenient sampling was used to recruit patients in study. Sample size was calculated through Epitool software. Study duration was 6 months. Inclusion criteria of study were females and males of age 21 to 35 years, chronic pain in foot for more than 4 months and had positive windlass test. Exclusion criteria of the study were patients with any congenital deformity of lower limb, patient with history of trauma, fractures and surgery in lower limb, patients with neurological symptoms, patients with history of any metabolic disease, patients with any diagnosed psychological problem and participants not willing to sign the consent form for study.

Before participation, each patient was required to sign an informed consent form. Participants were assigned conveniently in 2 groups, each group with 16 subjects. Out of 32 patients 16 were enrolled in group-A (baseline therapy and Transverse Friction Massage) and remaining 16 were enrolled in group-B (baseline therapy and Dry Cupping). Both groups had received baseline treatment of moist hot pack for 10 to 20 minutes and stretching of calf muscle and planter fascia. Three sessions of interventions were given per week, for four weeks.

### Interventions

**Transverse Friction Massage:** Patient was lying in prone position. Transverse friction massage was given on flexor digitorum brevis, gastrocnemius and soleus muscles for 5 mins.

**Dry Cupping:** Patient was lying in prone position; four two-inch cups had been positioned on the gastrosoleus muscle in 4 quadrants for 90 seconds, along with two cups on the flexor digitorum brevis.

### Outcome measures

Intensity of pain was assessed by Numeric pain rating scale (NPRS) before and after the treatment of 4 week and disability & activity limitations was measure by Foot Function Index (FFI).

**NPRS:** In the NPRS, a segmental arithmetic version of the VAS, the patient chooses a number between 0 and 10 that best describes the level of pain they are experiencing (17). The Bland-Altman approach revealed that there was a strong positive link between the VAS and NRS ( $r = 0.92$ ,  $p 0.001$ ) (18).

**FFI:** It evaluates the impact of foot condition on function in terms of pain, disability, and activity limitation. The FFI questionnaire consists of 23 self-reported factors divided into 3 categories based on patient values as follows: pain, disability, and activity limitation. Internal consistency varies from 0.96 to 0.73, whereas FFI total and subscale dependability extends from 0.87 to 0.69 (19).

### Statistical Analysis

The collected data was analyzed and interpreted by using SPSS software of version 24.0. The normality of the data was evaluated through Shapiro-wilk test. For within group analysis of NPRS, Wilcoxon signed-rank test and for between group analysis Mann-Whitney U test were used. For within group analysis of FFI, paired t test and for the between group analysis Independent samples t-test was used. The 0.05 was considered as the level of significance. Data was presented in form of tables.

### Ethical Consideration

All ethical considerations were taken into account. Prior to the trial, individuals signed a consent form. The safety of the research subjects was assured. Participants' dignity was emphasized. All personal information was kept private.

### 3.0 FINDINGS

Table 1 shows that out of 32 participants 37.5% were men and 62.5% were women. Age was separated into three distinct categories. 34.4% patients were of age between 21 - 25 years, 31.3% were of age between 26 - 30 years and 34.4% were of age between 31 - 35 years.

**Table 1: Demographic Statistics**

Demographic statistics		f(%)
Gender	Male	12(37.5)
	Female	20(62.5)
Age	21-25	11(34.4)
	26-30	10(31.3)
	31-35	11(34.4)
<b>Total</b>		32(100)

Table 2 shows the test of normality. Normality of data as assessed by Shapiro wilks test and when looking at the data, it can be seen that the NPRS is violating the assumptions of normal distribution so, for the analysis of data of NPRS non-parametric tests i.e., for within group analysis Wilcoxon signed-rank test and for between group analysis Mann-Whitney U test were used, the FFI was found to following the normal distribution so, for the analysis of data of FFI, parametric tests i.e., for within group paired t test and for the between group analysis Independent samples t-test was used. The 0.05 was considered as the level of significance.

**Table 2: Test of Normality**

Shapiro-Wilk			
	Statistic	df	Sig.
<b>NPRS pre</b>	.914	32	.015
<b>FFI pre</b>	.944	32	.100

#### NPRS within group analysis

Table 3 shows the within-group analysis of NPRS. Wilcoxon Signed-Rank Test demonstrates that median of group A before treatment was 6.50 and after treatment it was 3.00. Median of group B before treatment was 6.00 and after treatment it was 2.50. A statistical significant difference ( $p < 0.001$ ) was found between pre and post treatments of both groups.

**Table 3: NPRS within Group Analysis**

Wilcoxon Signed-Rank Test						
		N	Mean & SD	Median	Standardized Test Statistics	Asymp. Sig. (2-tailed)
Group A- Transverse friction massage	NPRS-pre	16	6.31±1.13	6.50	-3.62	0.000
	NPRS-post	16	2.87±1.08	3.00		
Group B- Dry cupping	NPRS-pre	16	6.00±1.26	6.00	-3.61	0.000
	NPRS-post	16	2.5±1.30	2.50		

**NPRS between Group Analysis**

Table 4 shows the results of Mann-Whitney U test results. Between group analysis of A and B showed no statistical significant difference ( $p>0.05$ ). Transverse friction massage and dry cupping showed equal effects in alleviating the pain in the patients of planter fasciitis.

Table 4: NPRS between group analysis

Test Statistics	
Mann-Whitney U	124.500
Wilcoxon W	260.500
Z	-.136
Asymp. Sig. (2-tailed)	.892
Exact Sig. [2*(1-tailed Sig.)]	.897

**Within-Group Analysis FFI**

Table 5 shows the results of paired-t test. Pre-treatment mean of FFI in group A was  $64.18\pm7.40$  which reduced to  $21.12\pm9.26$  after the treatment of 4 weeks. Pre-treatment mean of FFI in group b was  $63.18\pm7.70$  and after treatment it was  $23.12\pm8.24$ . A statistical significant difference was found in pre and post treatments of both groups ( $p<0.001$ ).

**Table 5: Within-Group Analysis FFI**

<b>Paired T Test</b>					
		N	Mean±SD	t	Asymp. Sig. (2-tailed)
Group A- Transverse friction massage	FFI pre-treatment	16	64.18±7.40	16.58	0.000
	NPRS post-treatment	16	21.12±9.26		
Group B- Dry cupping	FFI pre-treatment	16	63.18±7.70	24.63	0.000
	FFI post-treatment	16	23.12±8.24		

**FFI between Group Analysis**

Table 6 shows the results of independent t test. Between group analysis of A and B showed no statistical significant difference ( $p>0.05$ ). Transverse friction massage and dry cupping showed equal effects in reducing disability and functional impairments in the patients of planter fasciitis.

Table 6: FFI between group analysis

<b>Independent Samples Test</b>				
		N	Mean±SD	Sig. (2-tailed)
FFI between-Group A and B	Transverse friction massage- Group A	16	21.12±9.26	.524
	Dry cupping- Group B	16	23.12±8.24	

**Discussion**

Plantar fasciitis, in particular, is a prevalent orthopaedic disorder which impacts individuals of various ages and levels of exercise. This condition causes pain in the medial side of heel, which is exacerbated by activities that require weight bearing as well as non-weight bearing. The injury is typically long-lasting, with typical symptoms persisting for more than a year (5, 6). The objective of the study was to see the comparative effects of Transverse Friction Massage and Dry Cupping on pain, disability and activity limitations in planter fasciitis.

In present study, median of group A before treatment was 6.50 and after treatment it was 3.00. Median of group B before treatment was 6.00 and after treatment it was 2.50. Pre-treatment mean of FFI in group A was 64.18±7.40 which reduced to 21.12±9.26 after the treatment of 4 weeks. Pre-treatment mean of FFI in group b was 63.18±7.70 and after treatment it was 23.12±8.24. A statistical significant difference was found in pre and post treatments of both groups ( $p<0.001$ ). In 2019, N Farooq evaluated the effectiveness of calf muscle stretching and transverse friction massage of the Flexor digitorum brevis in subjects

with plantar fasciitis. Transverse friction massage of the Flexor digitorum brevis and calf muscle stretching were found to be equally effective in relieving plantar fasciitis (12). According to the research results of a study conducted by S Malik et al., combining dry cupping with standard treatment resulted in a significantly greater improvement in discomfort, stability, and functioning in recreational runners suffering from chronic plantar fasciitis (16).

In current study, between group analysis of A and B showed no statistical significant difference ( $p>0.05$ ). Transverse friction massage and dry cupping showed equal effects in alleviating the pain and reducing disability and activity limitations in the patients of planter fasciitis. In line with this, M Islam et al. studied the effectiveness of dry cupping versus prolonged and soft massage in the treatment of knee OA in 2021. The study revealed that both treatment option are safe, efficacious, and almost equivalent in terms of effectiveness for the treatment of osteoarthritis of knee (20).

Hassan et al. did a study in the past on the impact of transverse friction massage vs stretching of wrist extensor muscles for the management of tennis Elbow. The 1<sup>st</sup> group received transverse friction massage, whereas the 2<sup>nd</sup> group received stretching exercises and ultrasonic therapy for six weeks. It was found that stretching exercise had a better impact than transverse friction massage (21). But in current study when transverse friction massage was compared to dry cupping, equal improvements were seen in both groups. In contrast to this, P Diorio et al. studied the effects of Instrument Assisted Soft Tissue Mobilisation and Dry Cupping on passive ROM in 2020 to see how effective they are in musculoskeletal rehabilitation. According to the findings of the study, both approaches were helpful in enhancing passive range of motion. IASTM produced somewhat better results than dry cupping (22).

#### **4.0 CONCLUSION AND RECOMMENDATIONS**

##### **Conclusion**

In conclusion a statistical significant difference ( $p<0.001$ ) was found between pre and post treatments of both groups. Between group analysis of A and B showed no statistical significant difference ( $p>0.05$ ) in NPRS and FFI. Transverse friction massage and dry cupping showed equal effects in reducing pain, disability and activity restriction in the patients of planter fasciitis

##### **Limitations**

- A sample size of 32 might be considered small for drawing generalized conclusions.
- There was a lack of Control Group. Without a control group receiving just the baseline therapy, it's challenging to determine the true effects of Transverse Friction Massage and Dry Cupping over the baseline therapy.
- Allocation to group-A or group-B wasn't randomized, this could introduce selection bias.
- Study duration of 4 weeks for treatment might not capture the long-term effects and sustainability of the benefits from the interventions.

##### **Recommendations**

Recommendations for future research and clinical practice are as follows:

- A longer follow-up duration after the end of treatment might give a better understanding of the sustainability of the benefits from each intervention.
- Introducing a third group that combines both Transverse Friction Massage and Dry Cupping might provide insights into synergistic effects, if any.



- Since plantar fasciitis affects a broad age range, future studies could include older age groups to understand age-related variations in treatment efficacy.
- Incorporating other evaluation metrics, such as gait analysis or pressure distribution analysis, can give a holistic view of the treatment's effectiveness.

**Conflict of Interest**

None

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