



**COMPARISON OF MYOFASCIAL RELEASE TECHNIQUE AND FOOT  
STRENGTHENING EXERCISE IN PLANTAR FASCITIS: ULTRASONOGRAPHIC  
EVALUATION**

\*<sup>1</sup>Sharmila Dhamotharan and <sup>2</sup>Uma

<sup>1</sup>Assistant Professor, VISTAS Chennai Tamilnadu India 603103.

<sup>2</sup>UG Student, VISTAS Chennai Tamilnadu India 603103.

\*Corresponding Author: Sharmila Dhamotharan

Assistant Professor, VISTAS Chennai Tamilnadu India 603103.

Article Received on 05/09/2022

Article Revised on 25/09/2022

Article Accepted on 15/10/2022

**ABSTRACT**

**Background:** plantar fasciitis is the most common cause of inferior heel pain. It is associated with the pes cavus, foot pronation, pes planus, obesity, increased running distance, wearing inappropriate footwear and tightness of Achilles tendon. Females are more commonly affected than men. **Aim and Objective:** To evaluate the effect of myofascial release technique versus foot strengthening exercise in plantar fasciitis. **Need of The Study:** The need of the study is to evaluate the effect of myofascial release and foot strengthening exercise through ultrasonography in patients of plantar fasciitis. **Methods:** Twenty subjects suffering from plantar fasciitis were separated into two groups. Ten subjects included in the experimental group were treated with myofascial release technique. Ten subjects included in the control group were treated with foot strengthening exercise. The outcome measure used were ultrasonographic evaluation and numerical pain rating scale (NPRS). **Result:** This study states that group A (myofascial release technique) significantly showed better improvement than group B (foot strengthening exercise). **Conclusion:** This study reveals that myofascial release technique is effective than foot strengthening exercise.

**KEYWORDS:** plantar fasciitis, Myofascial release, foot strengthening exercise, ultrasonography.

**INTRODUCTION**

Plantar fasciitis is a common musculoskeletal condition. It is an inflammation of the plantar fascia on the base of the foot that causes heel pain and disability. It is also referred to as plantar heel pain or painful heel syndrome.<sup>[4]</sup>

The plantar fascia starts from the calcaneal tubercle and extends towards the metatarsal bones.<sup>[5]</sup> The plantar fascia of the foot is acting as a tie rod and supports the arch of the foot, and when it bears weight it undergoes tension.<sup>[4]</sup> The stretch tension from the plantar fascia prevents the spreading of the calcaneus and the metatarsals, thus maintaining the medial longitudinal arch. It acts as a truss, maintaining the medial longitudinal arch of the foot, and assists during the gait cycle and facilitates shock absorption during weight bearing activities.<sup>[8]</sup>

Plantar fasciitis is very common in females than males. Plantar fasciitis has a prevalence of 11-15% and peak incidence occurring at the age group of 40-60 years. It represents around 80% of heel pain and about 8-10% of injuries due to running. Plantar fasciitis is more probably to take place in patients whose profession or lifestyle causes an irregular stretching of the plantar fascia. Because of the high prevalence in runners, it is assumed to be due to repetitive micro trauma.<sup>[6]</sup>

Plantar fasciitis is caused due to long-distance running. Tightness of the Achilles tendon leads to shortening of the plantar fascia, obesity, wearing inappropriate footwear, work-related activity and over exertion results in plantar fasciitis.<sup>[7]</sup> It is associated with biomechanical factors such as pes cavus, foot pronation, heel valgus, pes planus, equinus gastrocnemius (reduced dorsiflexion of ankle).<sup>[1]</sup>

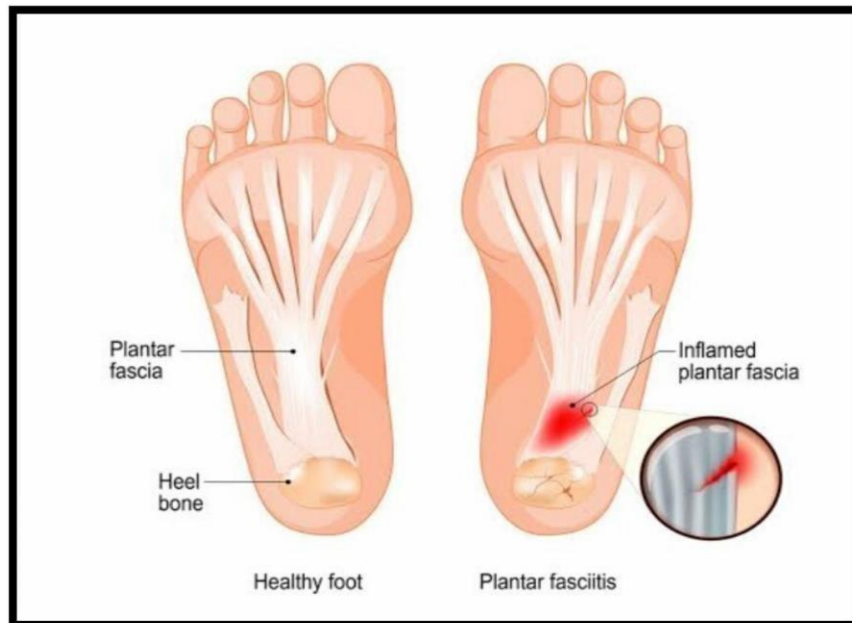
Plantar fasciitis is clinically diagnosed based on patient history and physical exam. The most commonly reported symptom of plantar fasciitis is described as 'First-step pain'. The pain or irritation at the heel rises after a period of non-weight bearing or inactivity. Such as rising from bed in the morning, standing up after work at the desk for several hours, or driving the car for a prolonged period.<sup>[1]</sup> The other characteristic features of plantar fasciitis include tenderness to the medial aspect of the heel, limited dorsiflexion of the ankle and it will provoke pain during climbing stairs, walking barefoot, even toe walking.<sup>[2]</sup>

The location of the pain in the heel region can be varied with patients often reporting pain over medial, lateral and lower posterior aspect of the calcaneus and the inferior heel region. On occasion the patient may also complain of pain over the central band of the plantar fascia in the region of the medial longitudinal arch.<sup>[8]</sup>

In general, pain is most significant during weight bearing activities and in most cases there has been a change in the amount or intensity of physical activity by the patient before the onset of either symptoms.

plantar fasciitis patient typically presents with inferior heel pain on weight bearing and the pain often persist for months or even years together. Pain associated with

plantar fasciitis may be throbbing, severe or piercing especially with the first few steps in the morning or after long periods of inactivity. The patient feels discomfort after few steps and it becomes worse with continued activity, walking with bare foot, walking on toes and walking upstairs which increases the pain.



**Fig 1: Inflammation of plantar fascia.**

Many treatment options have been applied for the management of plantar fasciitis which includes rest, physiotherapy, shoe modification, anti inflammatory agents and surgery. Physical therapy intervention for plantar fasciitis is available such as ultrasound, iontophoresis, mobilization/manipulation, soft tissue release techniques and therapeutic exercise.<sup>[2]</sup> Conservative management is reportedly very successful. Recently published clinical practice guidelines reported that manual therapy is effective in the management of heel pain.<sup>[9]</sup>

The main objective of this study is a comparison of myofascial release and foot strengthening exercise in plantar fasciitis by using ultrasonographic evaluation. Myofascial release is a very effective hands on technique which applies gentle sustained pressure into myofascial connective tissue restrictions to eliminate pain and restore motion. Foot strengthening exercise improves the flexibility of the foot muscle. It also reduces muscle strain. It will allow your muscles to provide better support and protection for your foot as a whole.

#### **AIM OF THE STUDY**

To evaluate the effect of myofascial release technique versus foot strengthening exercise in plantar fasciitis.

#### **OBJECTIVES OF THE STUDY**

- To evaluate effectiveness of myofascial release technique in patients with plantar fasciitis on reducing pain and improving range of motion.
- To evaluate the effectiveness of foot strengthening exercise in patients with plantar fasciitis on reducing pain and improving range of motion.
- To compare the myofascial release technique and foot strengthening exercise in patients with plantar fasciitis on reducing pain and improving range of motion.

#### **METHODOLOGY**

STUDY TYPE: Comparative Study

STUDY DURATION: 6 Weeks

STUDY SETTING: IsariVelan Mission Hospital, Thalambur

STUDY SIZE: 20 Samples

#### **SAMPLE SELECTION**

##### **INCLUSION CRITERIA**

- Age group between 40 - 60 Years.
- Both gender.
- History of heel pain for more than 6 months.
- Patients having heel pain when first stand on his or her feet after rest or prolonged walking.

**EXCLUSION CRITERIA**

- Calcaneal Fracture
- Tumor
- Surgery in and around ankle joint and foot.
- Infective condition of foot.
- Foot deformities.

**OUTCOME MEASURE****1. Ultrasonographic Evaluation**

Through ultrasonographic evaluation to find out the thickness of fascia, and by using Numerical Pain Rating Scale (NPRS) the score were recorded. Measurement of plantar fascia thickness where analysis through fascia crosses the anterior most aspect of inferior border of the calcaneum. The vertical thickness of plantar fascia was measured with confirmation that all participants had a thickness >4.0mm.

Ultrasonography can be relatively simple and reliable method for the measurement of plantar fascia thickness.



**Fig 2: Frozen Can.**



**Fig 3: Towel.**

In previous study, it was concluded that there were no statistically significant differences between the ultrasound measurement and the MRI and CT measurements, which indicates that the ultrasound measurement of the plantar fascia thickness were accurate. Therefore, the measurement of the thickness of the plantar fascia with ultrasound have a high degree of confidence and may provide evidence-based recommendations to patients with plantar fasciitis.<sup>[5]</sup>

**2. Numerical pain rating scale (NPRS)**

Numerical pain rating scale involves asking patients to rate the pain from 0 to 10 (an 11 point scale) with the understanding that 0 represents no pain and 10 represent extreme pain.

**MATERIALS REQUIRED**

- Frozen can
- Towel

**PROCEDURE**

20 samples who fulfilled the inclusion and exclusion criteria were selected, in that 10 subjects with plantar fasciitis were included in group A (experimental group) who receive Myofascial Release Technique and 10 subjects with plantar fasciitis were included in group B (control group) who receive Foot Strengthening Exercise.

The outcome measure were Ultrasonographic evaluation and Numerical Pain Rating Scale (NPRS). Pre test was done before the intervention and post test was done after the intervention for the evaluation of outcome measures.

The procedure was explained to the subjects who participating in the study and made signed on informed consent form.

The total period of exercise will be for 6 weeks (3days per week).

**GROUP -A****Myofascial Release Technique (15 Minutes) – Experimental Group**

**PATIENT POSITION:** Prone lying on a couch with feet out of the couch and a pillow should be under the shin for support and patient comfort.

**EXAMINER POSITION:** The examiner was at end of the couch and facing towards the patient.

**TECHNIQUE:** The examiner should evaluate the area of pain. Sustained gentle pressure was given in line with the fibers of plantar fascia from calcaneum towards the toes by using thumb and knuckles of hand.



**Fig 4: MYOFASCIAL RELEASE TECHNIQUE.**

### GROUP -B FOOT STRENGTHENING EXERCISE

#### 1. TOE CURLS

- The patient position is walk stance
- Lay a towel on the floor in front of the patient, so the short end is at patient feet.
- Put the toes of one foot on the end of the towel and scrunch the toes and pull the towel towards patient. Hold for 15 seconds and relax for 15 seconds and repeat it for 3 times. (fig 5)

#### 2. TOWEL STRETCH

- The patient position is long sitting on the floor.
- Loop a towel around the ball of the foot and grasp the end of the towel in hands.
- Keep the legs straight and pull the towel towards the patient. Hold for 15 seconds and relax for 15 seconds and repeat it for 3 times.(fig 6)

#### 3. FROZEN CAN ROLL

- The patient position is standing.

- Place the frozen water can on the top of the towel.
- Slowly roll the foot over the can. Pressing gently into the can to massage the plantar fascia.
- As the patient roll the can to the ball of the foot, lift the heel and give the inner sole a good, long stretch. Repeat it for 3 times.(fig 7)

#### 4. CALF/ ACHILLES TENDON STRETCH

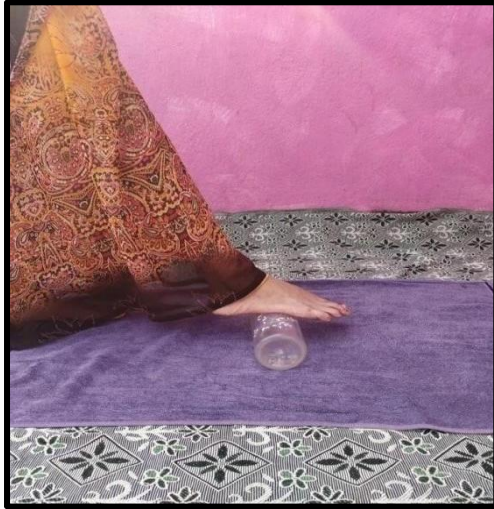
- Place the hands on the wall and put the hands at the eye level.
- The patient has to step the leg as they want to stretch behind.
- Bend the other knee towards the wall, keeping the back leg straight.
- Lean towards the wall until the patient feel a gentle stretch. Hold for 15 seconds and relax for 15 seconds and repeat it for 3 times.(fig 8)



**Fig 5: TOE CURLS**



**Fig 6: TOWEL STRETCH**



**Fig 7: FROZEN CAN ROLL**



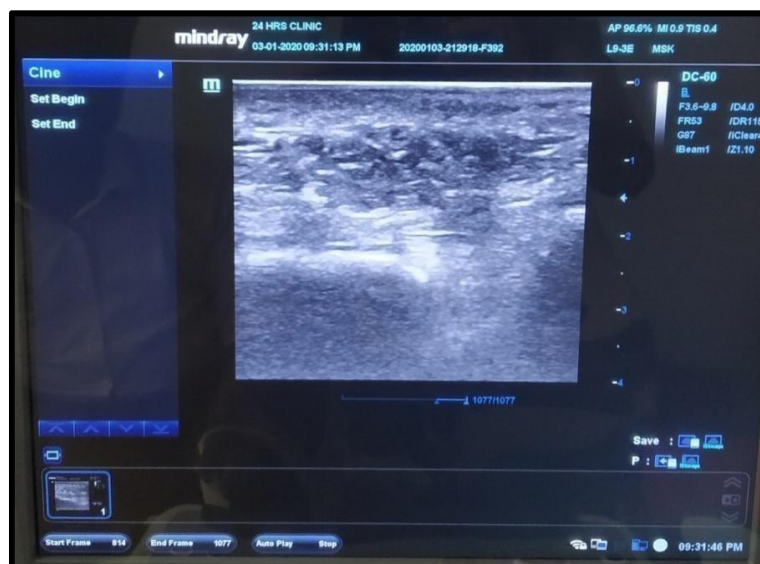
**Fig 8: CALF/ACHILLES TENDON STRETCH**

### ULTRASONOGRAPHIC EVALUATION

Diagnosis is primarily based on history and physical examination. The pain typically starts in the morning upon stepping on the ground and diminishes as the patient walks. On physical examination, the medial plantar part of the heel is achy. Researchers who conducted studies of patients with clinically diagnosed plantar fasciitis have reported that the fascia exhibits thickening. The fact that there are many causes for heel pain and that some patients with plantar fasciitis do not exhibit typical clinical symptoms raises difficulties in diagnosing plantar fasciitis. Therefore, the identification of plantar fascia thickness may become suggestive in diagnosing these patients. Ultrasonography, whose accuracy in detecting the thickness has been demonstrated, is a practical method for identifying plantar fascia thickness.

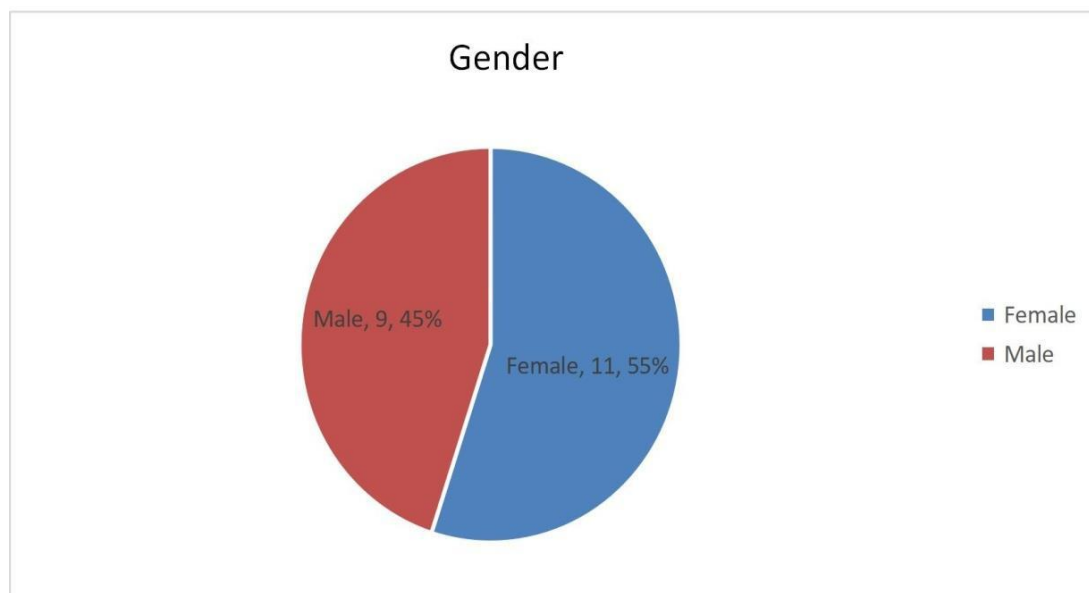
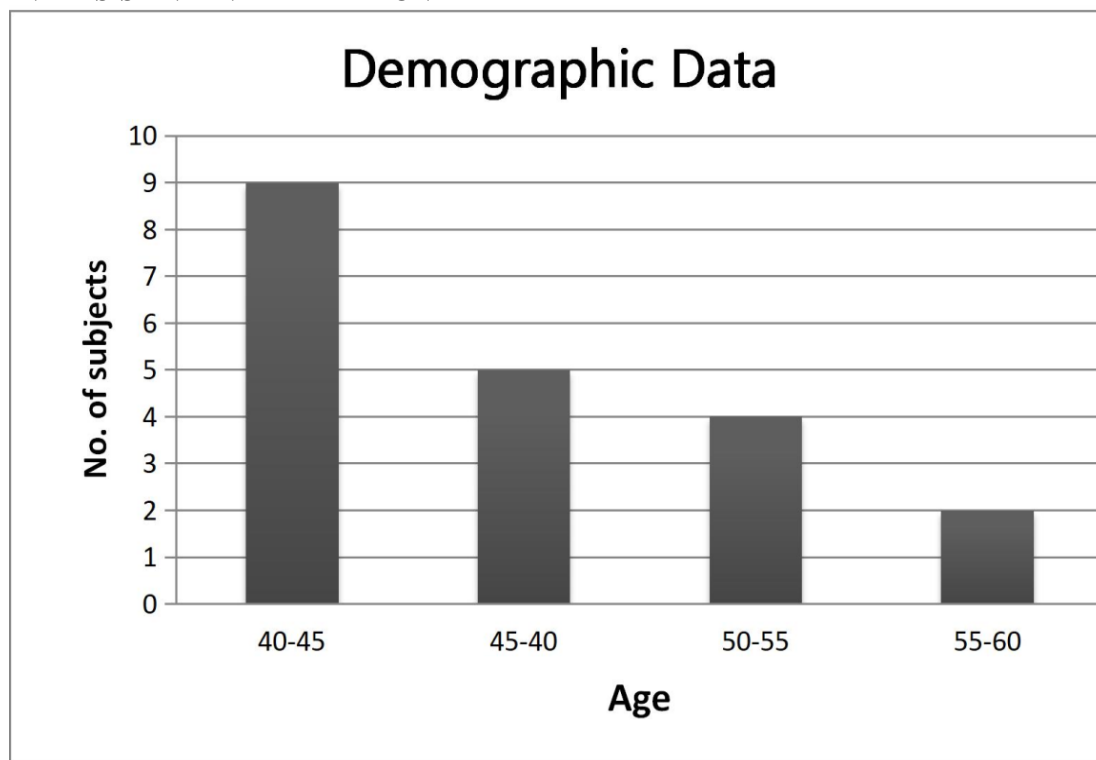
The measurements were conducted while the patient was in the prone position on a stretcher, the hips and knees were in extension, and the ankles were in plantarflexion and slight inversion in a way that allows the patient to get comfortable.

Through ultrasonographic evaluation to find out the thickness of fascia, and by using Numerical Pain Rating Scale (NPRS) the score were recorded. Measurement of plantar fascia thickness where analysis through fascia crosses the anterior most aspect of inferior border of the calcaneum. Pre test was evaluated where the vertical thickness of plantar fascia was measured with confirmation that all participants had a thickness  $>4.0\text{mm}$ . Post test was examined after six weeks of intervention program where the thickness of plantar fascia was reduced.



**Fig 9: Ultrasonography of plantar fasciitis.**

## DATA ANALYSIS AND INTERPRETAION



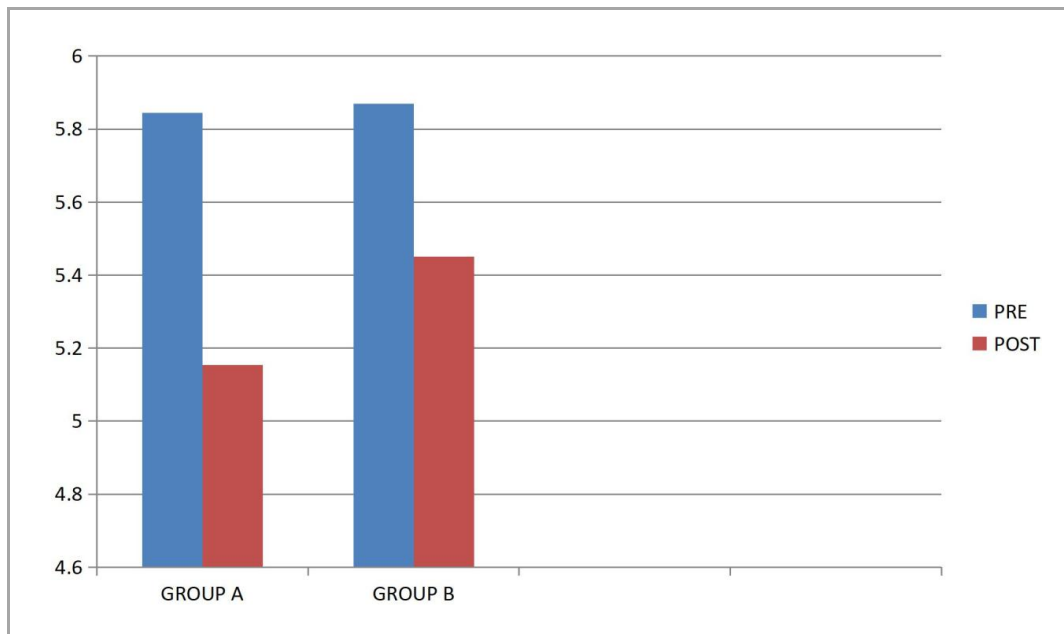
## 1. ULTRASONOGRAPHY

**Table 1:** Shows the comparison of group A and group B pre test and post test values of ultrasonography (Right and Left)

	MEAN		STANDARD DEVIATION		t-VALUE	p- VALUE
	PRE TEST	POST TEST	PRE TEST	POST TEST		
GROUP A	5.845	5.154	0.282	0.286	22.292	0.000
GROUP B	5.869	5.451	0.224	0.282	11.173	0.000

From the above given table it has been arrived to the descriptive statistics, mean, standard deviation, the post mean values of group A – 5.154 and group B- 5.451, it is calculated with paired t test. The study also arrived highly significant differences ( $p=0.000$ ) for group A –

Myofascial Release Technique and group B who received Foot strengthening exercise. Both the groups were statistically significant for evaluating ultrasonography.



**GRAPH 1:** Shows the comparison of group A and group B pre test and post test values of ultrasonography.

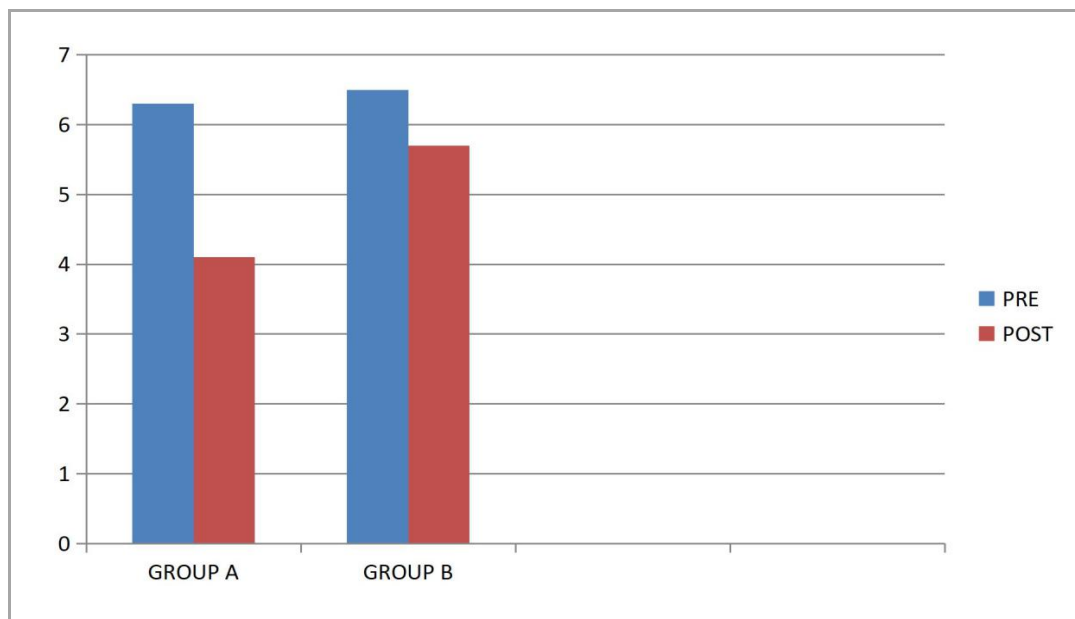
**2. NPRS**

**Table 2:** Shows the comparison of group A and group B pre test and post test values of Numerical Pain Rating Scale(NPRS)

	MEAN		STANDARD DEVIATION		t-VALUE	p-VALUE
	PRE TEST	POST TEST	PRE TEST	POST TEST		
GROUP A	6.30	4.10	1.418	1.370	16.500	0.000
GROUP B	6.50	5.70	1.269	0.948	6.000	0.000

From the above given table it has been arrived to the descriptive statistics, mean, standard deviation, the post mean values of group A – 4.10 and group B- 5.70, it is calculated with paired t test. The study also arrived highly significant differences (p=0.000) for group A –

Myofascial Release Technique and group B who received Foot strengthening exercise. Both the groups were statistically significant for evaluating Numerical Pain Rating Scale(NPRS).



**GRAPH 2:** Shows the comparison of group A and group B pre test and post test values of Numerical Pain Rating Scale(NPRS)

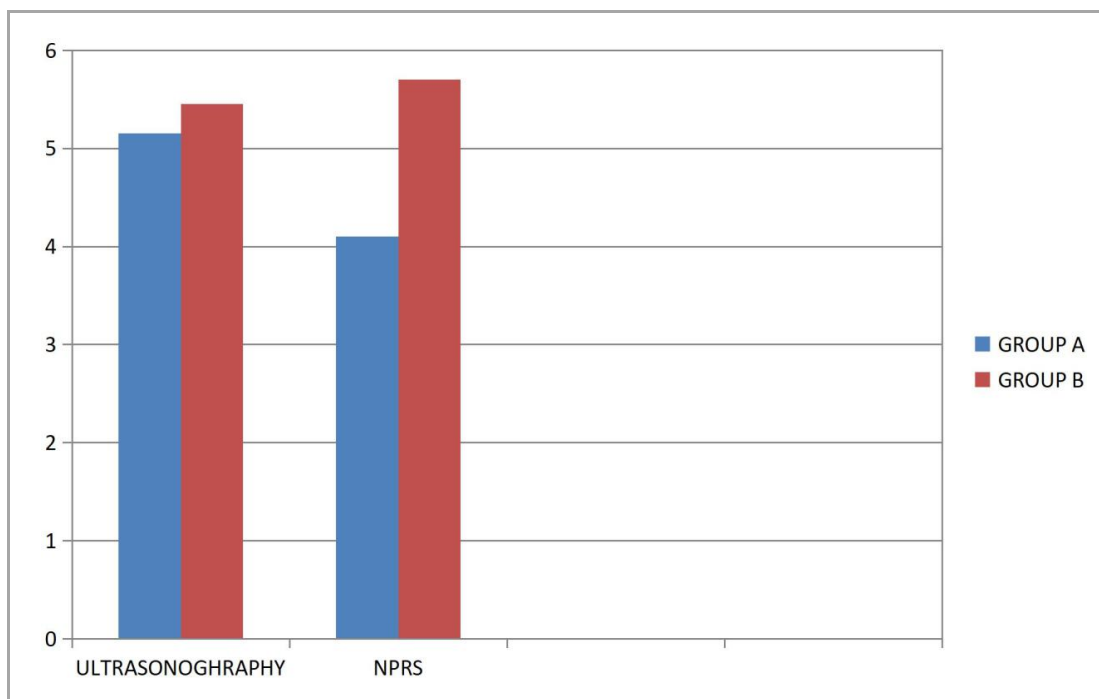
## COMPARISON OF POST VALUES OUTCOME MEASURES

**Table 3: Shows the comparison of group A and group B post test values of Ultrasonography and Numerical Pain Rating Scale(NPRS)**

	MEAN		STANDARD DEVIATION		t-VALUE	p-VALUE
	GROUP-A	GROUP-B	GROUP-A	GROUP-B		
ULTRASONOGRAPHY	5.1540	5.4510	0.28667	0.28211	-2.335	0.031
NPRS	4.1000	5.7000	1.37032	0.94868	-3.036	0.008

From the above given table it has been arrived to the descriptive statistics, mean, standard deviation, the post mean values of ultrasonography group A – 5.154, group B- 5.451 and Numerical Pain Rating Scale group A-

4.10, group B- 5.70, it is calculated with paired t test. The study also arrived significant differences of ultrasonography(p=0.031) and Numerical Pain Rating scale(p=0.008).

**GRAPH 3: Shows the comparison of group A and group B post test values of ultrasonography and Numerical Pain Rating Scale (NPRS)****RESULT**

The mean value of ultrasonography [GROUP-A = 5.154, GROUP-B = 5.451] and NPRS [GROUP-A = 4.100, GROUP-B = 5.700] were significantly high in myofascial release technique [GROUP-A] than foot strengthening exercise [GROUP-B] among plantar fasciitis patients, the 'p' value obtained is <0.05. Therefore, the alternate hypothesis is accepted.

**DISCUSSION**<sup>[1,3,4]</sup>

The aim of this study was to evaluate the effectiveness of myofascial release technique(MRT) over foot strengthening exercise on plantar fasciitis.

The result of this study demonstrates that there is significant difference in myofascial release technique versus foot strengthening exercise in reducing heel pain, plantar fasciitis patients.

The samples in this study with plantar fasciitis was evaluated with ultrasonographic evaluation for

measuring the inflammation of the plantar fascia and analysed as done in the study by Yu- Chi Huang et al, 2004.

According to the result in the present study, both the groups are significantly improved thus showed better improvement in the GROUP-A values than GROUP-B values. GROUP-A mean values: ultrasonography (5.154) and NPRS (4.100) and GROUP-B mean values (5.451) and NPRS (5.700).

Yu-chi Huang demonstrated the relationship between flexible flat foot and plantar fasciitis through ultrasonographic evaluation. In his study reported significantly higher incidence of plantar fasciitis in the flexible flatfoot subjects.

Adeela Arif reported that myofascial release technique improved the physical activity and pain as it reduces the tension over calf muscles and it also improves dorsiflexion range.



Kwangsun Do, in his study analysed the immediate effect of applying self – myofascial release (SMR) to the plantar fascia using a foam roller on hamstring and lumbar spine superficial back line.

Danilo H. Kamonseki stated that effect of stretching and strengthening in plantar fasciitis and strengthening exercise includes the important role of the intrinsic and extrinsic muscles the feet as well as the abductors and lateral rotators of the hips in the stabilization of plantar arches and postural control of the lower limbs and showed greater improvement in pain and function compared to strengthening.

Myofascial release technique reduces the tension over plantar fascia and improves the ankle joint range. Myofascial release technique improved the physical activity and pain as compared to those received foot strengthening exercise.

Strengthening exercise improves flexibility and reduce foot and ankle pain, reduce muscle soreness, improves overall foot strength. It also improves the range of motion. But showed minimum improvement compared to myofascial release technique.

The Numerical Pain Rating Scale (NPRS) is an 11 point scale from 0-10, 0 is no pain, 10 is the most intense pain. The subject marked a value on the scale with the intensity of pain that they had experienced. The Numerical Pain Rating Scale (NPRS) has a validity and reliability reported by Shashwat Prakash *et al*, 2014 and in this study the level of pain was evaluated with Numerical Pain Rating Scale and the improvement was found to more in group A (Myofascial Release Technique) than group B (Foot Strengthening exercise).

Through ultrasonographic evaluation to find out the thickness of fascia. Measurement of plantar fascia thickness where analysis through fascia crosses the anterior most aspect of inferior border of the calcaneum and the patient position is prone lying. The vertical thickness of plantar fascia was measured with confirmation that all participants had a thickness >4.0mm reported by Kadir Abdul *et al*, 2017 and in this study the thickness of plantar fascia was evaluated with ultrasonography and the improvement was found to more in group A (Myofascial Release Technique) than group B (Foot strengthening exercise)

Hence it is concluded that myofascial release technique showed better improvement than foot strengthening exercise through ultrasonographic evaluation.

## CONCLUSION

The study concluded that Myofascial Release Technique can show significant improvement in individuals with plantar fasciitis. Although both groups shows that there is significant difference by giving treatment for two groups of plantar fasciitis. As per the statistical analysis

significantly in group A and group B the pain is reduced. However group A, who received myofascial release technique: ultrasonographic evaluation- (0.000), Numerical Pain Rating Scale (NPRS) – (0.000) had a better reduction in pain when compared with group B participants treated with foot strengthening exercise: ultrasonographic evaluation – (0.000), Numerical Pain Rating Scale (NPRS) – (0.000).

## LIMITATIONS

- The study was done on a small sample size.
- No follow-up could be done to see the long term effects.
- This study was limited to age group 40-60 years.
- This study was limited to assess only the pain intensity by using NPRS.

## RECOMMENDATION

- As this study was done only with plantar fasciitis, further studies are also suggested to detect the progress in patients with other foot problems.
- Further studies should be conducted in larger sample size.
- As this study was done only for a short period, a long term study should be conducted with long term follow up sessions to know the effectiveness of the treatment.

## REFERENCES

1. 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; 27(6): 443-8.
2. Khan M, Ali SS, Soomro RR. Role of Tissue Specific Plantar Fascia Stretching Exercises Versus Myofascial Released Technique in Chronic plantar fasciitis. *Journal of Basic and Applied Sciences*, 2014 Apr 4; 10: 91-5.
3. Kamonseki DH, Gonçalves GA, Liu CY, Júnior IL. Effect of stretching with and without muscle strengthening exercises for the foot and hip in patients with plantar fasciitis: a randomized controlled single-blind clinical trial. *Manual therapy*, 2016 Jun 1; 23: 76-82.
4. Arif A, Afzal MF, Shahzadi T, Nawaz F, Amjad I. Effects of myofascial trigger point release in plantar fasciitis for pain management. *Journal Of Medical Sciences*, 2018 Jun 17; 26(2): 128-31.
5. Wu J, Zhang YZ, Gao Y, Luo TY. Assessment the reliability of ultrasonography in the imaging of the plantar fascia: a comparative study. *BMC medical imaging*, 2019 Dec; 19(1): 1-7.v
6. Goweda R, Alfalogy E, Filfilan R, Hariri G. Prevalence and Risk Factors of plantar fasciitis among Patients with Heel Pain Attending Primary Health Care Centers of Makkah, Kingdom of Saudi Arabia. *Journal of High Institute of Public Health*, 2015 Oct 1; 45(2): 71-5.
7. Attar SM. plantar fasciitis. *Saudi Journal of Internal*

- Medicine, 2012 Jun 30; 2(1): 13-7.
8. Shahane S. the effect of myofascial release technique and stretching versus myofascial release technique and taping in patients with chronic plantar fasciitis.-a comparative study (doctoral dissertation).
  9. Prakash S, Misra A. Effect of manual therapy versus conventional therapy in patients with plantar fasciitis—a comparative study. *Int J Physiother Res.*, 2014; 2(1): 378-82.
  10. Ajimsha MS, Binsu D, Chithra S. Effectiveness of myofascial release in the management of plantar heel pain: a randomized controlled trial. *The Foot.*, 2014 Jun 1; 24(2): 66-71.
  11. AM H, Kage Vijay B, Basavaraj C. Comparison of myofascial release and positional release therapy in plantar fasciitis—A clinical trial. *Physiotherapy and Occupational Therapy*, 2010 Oct; 4(4): 8.
  12. Al-Toriri N. Comparative Study of plantar fasciitis Management by Ultrasound with Exercises and Exercises Alone. *International Journal of Health Sciences and Research (IJHSR)*, 2016; 6(6): 218-24.
  13. Shrestha S, Rai S, Limbu H, Bajracharya S. Comparative study of functional outcome between plantar fascia stretching and achilles tendon stretching exercises in choronic plantar fasciitis. *Nepal Journal of Medical Sciences*, 2014; 3(2): 84-8.
  14. Ahn JH, Lee CW, Park C, Kim YC. Ultrasonographic examination of plantar fasciitis: a comparison of patient positions during examination. *Journal of foot and ankle research*, 2016 Dec; 9(1): 38.
  15. Abul K, Ozer D, Sakizlioglu SS, Buyuk AF, Kaygusuz MA. Detection of normal plantar fascia thickness in adults via the ultrasonographic method. *Journal of the American Podiatric Medical Association*, 2015 Jan; 105(1): 8-13.
  16. Do K, Kim J, Yim J. Acute effect of self-myofascial release using a foam roller on the plantar fascia on hamstring and lumbar spine superficial back line flexibility. *Physical Therapy Rehabilitation Science*, 2018 Mar 30; 7(1): 35-40.
  17. Tsai WC, Chiu MF, Wang CL, Tang FT, Wong MK. Ultrasound evaluation of plantar fasciitis. *Scandinavian journal of rheumatology*, 2000 Jan 1; 29(4): 255-9.
  18. Wall JR, Harkness MA, Crawford A. Ultrasound diagnosis of plantar fasciitis. *Foot & ankle*, 1993 Oct; 14(8): 465-70.
  19. Kiritsi O, Tsitas K, Malliaropoulos N, Mikroulis G. Ultrasonographic evaluation of plantar fasciitis after low-level laser therapy: results of a double-blind, randomized, placebo- controlled trial. *Lasers in medical science*, 2010 Mar 1; 25(2): 275-81.
  20. Draghi F, Gitto S, Bortolotto C, Draghi AG, Belometti GO. Imaging of plantar fascia disorders: findings on plain radiography, ultrasound and magnetic resonance imaging. *Insights into imaging*, 2017 Feb 1; 8(1): 69-78.