EUROPEAN JOURNAL OF BIOMEDICAL AND PHARMACEUTICAL SCIENCES
http://www.ejbps.com

ISSN 2349-8870
Volume: 11
Issue: 4
257-269
Year: 2024

COMPARISON OF ACTIVE RELEASE TECHNIQUE VERSUS INSTRUMENT ASSISTED SOFT TISSUE MOBILIZATION ON PAIN AND FUNCTION IN SUBJECTS WITH PLANTAR FASCIITIS

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Article Received on 16/02/2024 **Article Revised on 07/03/2024** **Article Accepted on 27/03/2024**

ABSTRACT

Background and Objective: Plantar fasciitis is a common musculoskeletal, occupational or sport related repetitive strain injury and is one of the most common causes of heel pain. Despite its wide distribution in the sporting and general communities, there is a lack of reliable treatment outcomes. The objective of the study was to assess the effectiveness of Active Release Technique and Instrument Assisted Soft Tissue Mobilization on pain and function in subjects with plantar fasciitis and to compare them. **Methods:** Quasi experimental study design. In this study there were 72 subjects with an average age of over 30 years with a clinical diagnosis of plantar fasciitis and are divided into two groups randomly. The subjects in Group A (n= 36) received Active Release Technique, While in Group B (n =36) received Instrument Assisted Soft Tissue Mobilization. Intervention was given to participants thrice a week for four weeks. The VAS for pain and 17- Italian FFI scale for function were used to assess the interventions effectiveness. **Results:** An Independent 't' test was used to compare the mean significance difference between continuous variables. Paired 't' test was used to assess the statistical significance difference between pre and post scores. Statistical analysis of this data revealed that both groups were significantly improved in both parameters when compared within groups, but when compared between groups, the instrument assisted group improved better than the active release group. **Conclusion:** The findings of the study concluded that a 4 week intervention of both Active Release Technique and Instrument Assisted Soft Tissue Mobilization have shown statistical significance in reducing pain and improving function in subjects with plantar fasciitis. However instrument assisted soft tissue mobilization technique is more effective when compared with Active Release Technique.

KEYWORDS: Plantar fasciitis, Instrument assisted soft tissue mobilization, Active release technique, foot function index questionnaire.

INTRODUCTION

Plantar fasciitis is the non-inflammatory degenerative process of the plantar fascia. In the presence of aggravating factors like prolonged periods of standing, running, walking etc, there is tension along the fascia due to repeated strain, leading to micro tears and subsequent inflammation at its insertion, It is more likely to occur in women aged 40 to 60 years.[1]

The pain begins gradually and may become severe, continuous or intermittent in Plantar fasciitis is the most common cause of heel pain, affecting adults with both active and sedentary lifestyles.[2] The plantar fascia is a multilayered thick fibrous sheet of connective tissue originating on the plantar surface of the postero medial calcaneal tuberosity. It provides support to the longitudinal arch of the foot and acts as a dynamic shock absorber during foot strikes.[3] Plantar fasciitis affects between 10 to 16 percent of people with long standing type of work.[4] It frequently occurs in people who have significant internal foot rolling, which is found in flat feet, as well as extended weight bearing. It affects 10% of the general population, and of those who have it, 80% are working, active individuals between the ages of 25 to 65, most of them suffer from incapacitating pain.[5]

The main risk factors are occupations that require prolonged standing and walking, excessive running, sedentary lifestyle, excessive foot pronation (pes planus), high arch (pes cavus), leg length discrepancy, obesity, and tightness of the achilles tendon and intrinsic foot muscles heel pad thickness[6] the persistence of these risk factors inhibits the normal repair process leading to collagen degeneration and structural changes in the plantar fascia.

Hicks originally described the foot and its ligaments as an arch-like triangular structure or truss. As the calcaneus, midtarsal joint, and metatarsals (the medial longitudinal arch) forms the truss's arch. The plantar fascia acts as the tie-rod that ran from the calcaneus to the phalanges, this windlass mechanical model that provides a thorough explanation of these biomechanical factors and stresses, it describes the manner by which the plantar fascia supports the foot during weight-bearing activities and provides information regarding the biomechanical stresses placed on the plantar fascia.[7]

These Degenerative changes can cause acute and chronic inflammation and calcification at the origin of the plantar fascia and bony traction causes spur formation[8], the histologic analysis demonstrates marked thickening and fibrosis of the plantar fascia along with collagen necrosis and calcification. Although plantar fasciitis has been assumed to be primarily an inflammatory process, these findings suggest a principally degenerative mechanism, leading some authors to suggest that "plantar fasciosis" may be a more histologically accurate term,[9] PF usually develops due to the coexistence of many etiologic factors although the etiology is not clear, identifying the risk factors plays a role in the occurrence of plantar fasciitis it is crucial for both the identification of etiology and the successful management of preventable risk factors.[10]

The majority of patients complain of heel pain, which typically affects the medial region and creeps up into the medial arch of the foot. The pain is typically worst in the morning or after a period of rest, with the most discomfort being felt during the first few steps and gradually getting better as the individual walks, running is one example of a chronic overuse condition that can cause pain, Most patients medial heel or medial arch exhibit tenderness upon clinical examination.[11]

The Diagnosis is primarily based on history and physical examination patients may present with heel pain with their first steps in the morning or after prolonged sitting, and sharp pain with palpation of the medial plantar calcaneal region this discomfort in the proximal plantar fascia can be elicited by windlass test, described by Brown in a weight-bearing position this test employs forceful great-toe extension with the person standing, a positive test reproduces pain at the medial calcaneal tubercle.[12] Diagnostic imaging is rarely needed for the initial diagnosis of plantar fasciitis use of X ray, ultrasonography and magnetic resonance imaging is reserved for uncooperative cases or to rule out other heel pathology findings the increased plantar fascia thickness and abnormal tissue signals the diagnosis of plantar fasciitis.[13]

The differential diagnosis for plantar fasciitis are the calcaneal stress fracture, baxter nerve entrapment, Calcaneal stress fracture, Tarsal tunnel syndrome, heel pad atrophy.[14] Conservative treatment helps in reducing the pain Initially patient-directed treatments consisting of rest, activity modification, ice massage, oral analgesics, and stretching techniques, can be tried for several weeks, If heel pain persists, then physician-prescribed treatments such as physical therapy modalities, foot orthotics, night splinting and corticosteroid injections should be considered.[15] Patients with chronic plantar fasciitis can consider extracorporeal shock wave therapy, platelet rich plasma injections, botulinum injections, plantar fasciotomy,[16] the manual therapy techniques like positional release, active release techniques, myofascial release technique, instrument assisted soft tissue mobilization, strain counter strain techniques are being used to treat plantar fasciitis.[17]

Active release technique is developed and patented by Dr. P. Michael Leahy, DC, CCSP, a doctor of chiropractic medicine, it is a non- invasive hands-on technique used for treatment of soft tissue disorders in muscles, joints and connective tissue. It is designed to identify and treat scar tissue adhesions that are interfering with the normal function, The therapist locates areas of tension or adhesion in a specific tissue by palpation to make the tissue rehabilitative.[18] Active release technique is a very effective patented movement based massage technique to solve soft tissue issues in the body including the fascia, it helps the therapist to break up the restrictive adhesions and restores normal function it shows notable improvements in pain, functional disability and quality of life in musculoskeletal disorders.[19]

Grastron technique is an Instrument assisted soft tissue mobilization technique enables clinicians to detect and treat scar tissues and motion restriction that cause pain and adversely affect normal bodily function.[20] In fact, 87% of clinicians report using manual therapy on a daily basis Soft tissue mobilization is a massage-based therapy that can be administered by hands alone or with rigid devices.[21] Instrument-assisted soft tissue mobilization uses rigid devices that can be made of different materials (e.g. wood, stone, jade, stainless steel, ceramic, resin) to examine and treat the soft tissue regardless of the approach or instrument material or design, although Soft tissue mobilization including instrument assisted soft tissue mobilization has been used since ancient times, much remains to be understood about its mechanisms and outcomes.[22]

MATERIALS AND METHODS

Study Design: Quasi experimental study.

Ethical Clearence And Informed Consent: This Study protocol was approved by the ethical committee of GSL medical college and general hospital (Annexure –I) The investigator explained the purpose of the study and given the patient information sheet.

The participants were requested to provide their consent to participate in the study (Annexure- II). All the participants signed the informed consents and the rights

of the included participants have been secured.

Study Population: Subjects clinically diagnosed as chronic plantar fasciitis by an Orthopaedician.

Study Setting: The study was conducted at department of physiotherapy, GSL General hospital, Rajamahendravaram, Andhra Pradesh.

Study Duration: The Study was conducted during the Period of one year.

Intervention Duration: 10 minutes 3 sessions per week for 4 weeks.

Sampling Method: Convenience sampling.

SAMPLE SIZE: A Total of 77 subjects with unilateral plantar fasciitis diagnosed by an orthopaedician were screened for eligibility, out of these 72 subjects both men and women who were willing to participate in the study were included in this study, all the recruited participants were explained about the purpose and relevance of the study. After obtaining informed consent form and meeting the inclusion criteria, all the eligible participants were randomized into two groups with 36 subjects in Active release group and 36 subjects in Instrument assisted soft tissue mobilization group.

Sr. No	Groups	No. Of Subjects	Treatment
1.	Group- A	36	Active release technique + conservative treatment
2.	Group- B	36	Instrument assisted soft tissue mobilization + conservative treatment

Materials Used

1. Examination couch
2. Emollient (Vaseline/coconut oil/gel)
3. Instrument assisted soft tissue mobilization tool
4. Cotton swabs
5. VAS score sheet
6. Foot function index questionnaire

CRITERIA FOR SAMPLE SELECTION

Inclusion Criteria

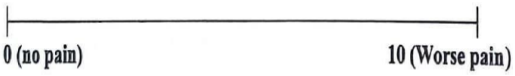
- Age 25 to 60 years.
- Presence of unilateral plantar fasciitis.
- Symptoms more than 6 weeks of duration diagnosed by orthopaedician.
- Reported pain with the first step out of the bed in the morning or with the first step after prolonged immobilization and presence of heel pain with prolonged standing on the medial calcaneal tubercle or plantar aponeurosis confirmed by palpation.
- Gender both male and female.

Exclusion Criteria

- Reported previous history of cancer, peripheral vascular diseases, lower extremity fractures Rheumatoid arthritis (or) osteoporosis.
- Had a trauma or history of surgery to the foot or ankle.
- Unwilling to participate and sign the informed consent.
- Diabetic neuropathy.
- People who have undergone steroid therapy, platelet rich plasma therapy in the past 3 months.

STUDY TOOLS AND OUTCOME MEASURES

Visual Analogue scale (VAS)[23]: This tool was used to measure the pain intensity was measured at baseline (pre-test) and at the conclusion of the fourth week (post-test) using the visual analogue scale (VAS). A valid, dependable, and widely used outcome measure for pain is the VAS scale. A horizontal line of 100 millimeters or 10 centimeters typically makes up a visual analog scale. "NO PAIN" is written on the left end of the line, and "WORST PAIN" is written on the right. On the line, patients were asked to mark the level of discomfort they were experiencing at the time of evaluation. Next, the patient's mark is measured as the distance from the left end that indicates "no pain." This figure, or VAS score, is used to indicate how severe the patient's pain is.



Foot Function Index: FFI-17 Italian version:[24] was found to be valid and reliable to measure foot pain disability and activity restriction its most frequently used scale in clinical practice. This self-questionnaire has 3 sections with 17 sub scores, the first section consists of patient details for the identification the second section consists pain and disability score over the past week it is represented by a line of 10 centimeters ranging from 0 (no pain) to 10 (worst pain) the baseline score and post intervention scores are calculated. The 17-FFI scale is in annexure – IV.

Scoring Instructions

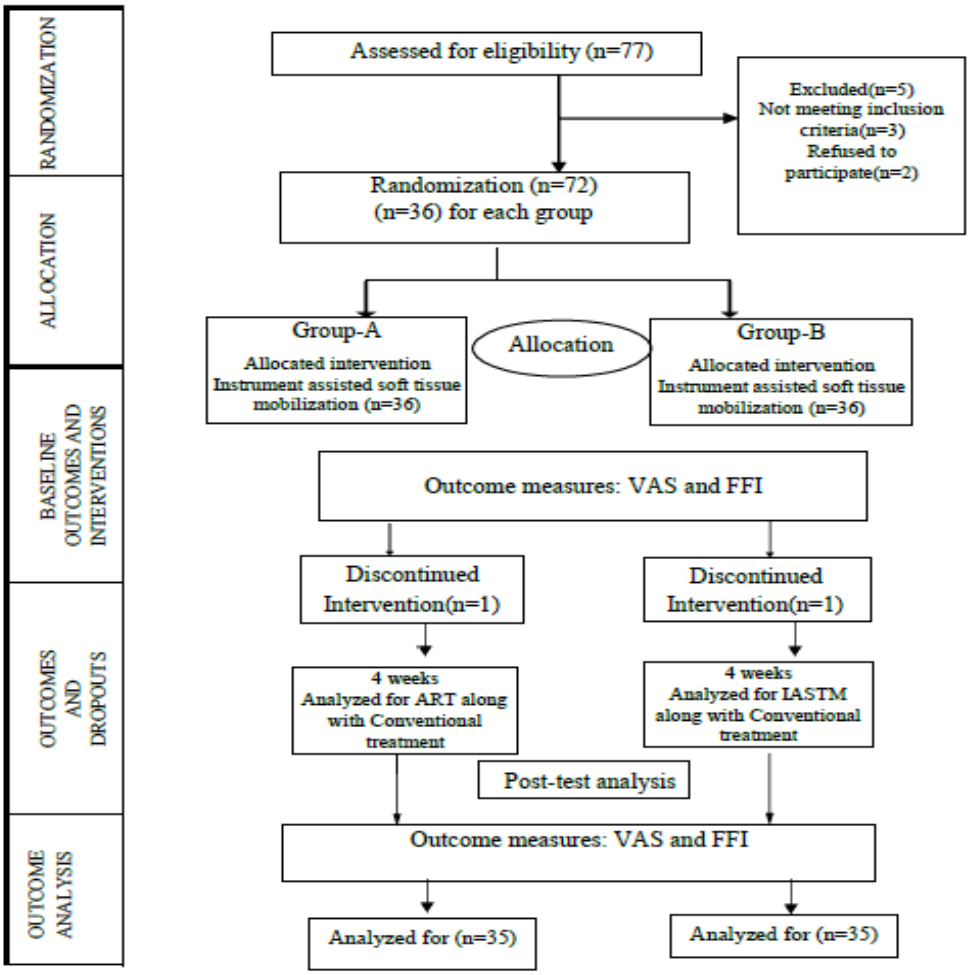
The participants have to read the questionnaire and should answer to the sections based on the questions being asked in each section and should rate the values from 0 to 10 all the scores of each question are summed up and it is divided by the total possible score 170 and then its multiplied by 100

Score: /170 x 100 =_% points

Example: lets assume the summed up score is 145

145/170 x100 = 85.29%.

Flow chart



Intervention

This is a 4 week study which includes Active Release Technique for Group A and Instrument Assisted Soft Tissue Mobilization for Group B along with conventional therapy to both the groups, The outcomes were measured by Visual Analogue scale (VAS) and Foot Function Index (FFI) for pain and function, All the subjects who were eligible for the criteria were randomly allocated in to Group A and Group B.

Group A

Active Release Technique[25]

ART is a very effective and new non-invasive hands-on technique, patented movement based massage technique to solve soft tissue issues in the body including the fascia, muscle and nerve it is designed to identify and treat adhesions of scar tissue that interfere with the normal function of the body.

Procedure[26]

The subject will be in a long sitting position. The therapist will be in front of the patient utilizes her hands to assess muscles or fascia texture, tightness Abnormal tissues are treated precisely by combining direct tension with very particular patient movements. The therapist will first start by shortening the affected limb muscle or fascia and then apply very specific hand pressure over the tissue from origin to insertion of the fascia the therapist instructs the patient to lengthen the shortened limb by doing the dorsiflexion of foot. Each treatment session last for approximately ten minutes thrice a week for four weeks,[27] along with conventional treatment.

Fig 1: Performing scanning for adhesions.

Fig 2: Shortening the limb and applying deep pressure.

Fig 3: Active movement while performing deep friction massage.

Group B

Instrument Assisted Soft Tissue Mobilization[28]

The Instrument-Assisted Soft Tissue Mobilization is a deep tissue friction massage technique which involves scanning and treating the tissue from origin to insertion which helps to improve the tissue flexibility and prevent the scar tissue formation and local inflammatory response. The fascia is an important and often overlooked tissue that often contributes to musculoskeletal pain. IASTM is performed using specially designed instruments that detect and treat fascial restrictions, rapid localization and effectively treat areas exhibiting soft tissue fibrosis, chronic inflammation or degeneration.

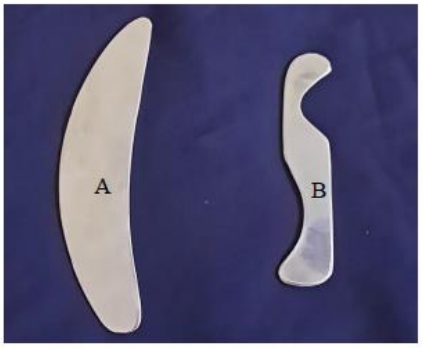


Fig 4: Scanning using A- IASTM 4 AND Treating using B- IASTM 6.

Procedure[29]

The patient should be in prone lying position while the therapist will be facing towards the foot end of the patient, all the required materials like emollient, the tools IASTM 4 and IASTM 6 tools, cotton swabs the materials going to be used should be checked and the tools should be sterilized before every use. The Graston technique is used which included application of an emollient like Vaseline or aquasonic gel or coconut oil to the plantar foot from the Heel to the toes to reduce friction on the skin, The Graston tools were then used to mobilize the tissues of the plantar foot by passing the tools along the foot.

A two-hand hold grip was used to ensure that the instrument require 30-60° angle to the treatment surface, Plantar fascia Soft tissue dysfunctions in the foot was detected using scanner and treated when manually applied brush strokes to the affected area and proceeded to use 2 cycles of 15-20 series of strokes one cycle of stokes in proximal to distal direction and vice versa over the area of lesion using Seahorse instrument The two strokes employed were those of Sweeping and Fanning: Sweeping stroke - characterized by the instrument contact points moving in one direction at the same rate in a linear or curvilinear path. Fanning stroke – instrument contact points move at different rates in an arched path.

Fig 5: Scanning with IASTM 4 group B.

Fig 6: Treating with IASTM 6 group B.

During application one end of the instrument was stabilized, serving as a fulcrum of motion while the other end is moving, with the resistance at the end of the instrument that is moving. Force was directed deep enough to detect increased tissue restriction, more aggressive IASTM treatment was applied using increased force and shorter strokes over the areas of restriction, the Subjects were instructed to put an ice pack on the area if they felt any burning sensations after the session, each treatment session for this group lasted approximately 10 mins thrice a week for 4 weeks, along with conventional treatment.

Conventional Treatment:[30]

Here the both group patients Received the following treatments

- Ultra sound therapy: Ultrasound with the output of 1W/cm² for 7 minutes using a pulsed mode 1:1 ratio with frequency of 1MHz was given every alternate day for four weeks.
- Stretching exercises: Plantar fascia stretching - 10 seconds hold for 10 repetitions along with tendo Achilles stretching (10 seconds hold for 10 repetitions) thrice a day for 4 weeks."
- Strengthening exercises: Exercises for intrinsic muscles strengthening towel curls up and lifting pebbles with the toes for 10 repetitions 3 sets in a day for 4 weeks.
- MCR foot wear is advised.

Fig 7: Performing ultra sound therapy.

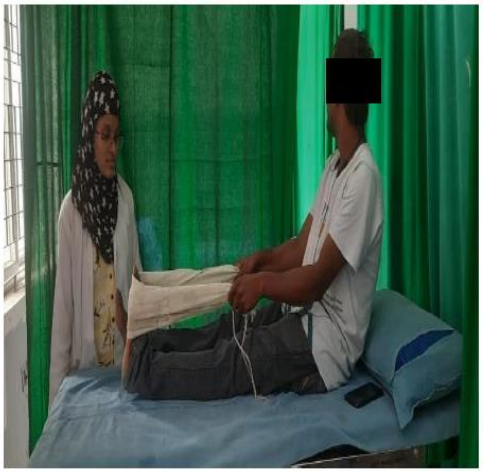


Fig- 8 Patient performing tendo achilles stretch along with plantar fascia stretch.

Fig- 9: Performing pebble lifting with toes.

RESULTS AND DISCUSSION

Results

The results of this study were analyzed in terms of reduction of pain on visual analogue scale and improved function on foot function index scale. The consort flow chart of the study showed the study organization in terms

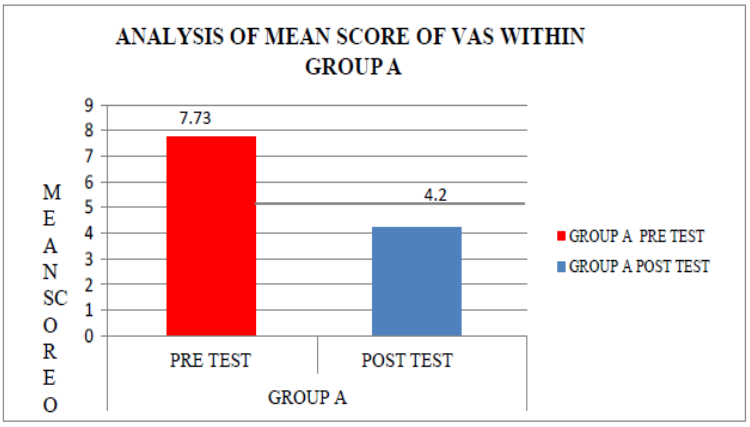
of subjects screening, random allocations and analysis of the following the intervention.

A total 77 subjects with plantar fasciitis were screened as for the eligibility and who met inclusion criteria have undergone the baseline assessment and included 72 subjects were randomized into two equal groups consisting 36 in each group, 2 subjects have discontinued the study only 35 people were analyzed in each group.

Comparison was done within the group as well as in between the two groups, so as to evaluate the intra group and inter group effectiveness of active release group and instrument assisted soft tissue mobilization group are under consideration in the present study.

Analysis of Mean Score of VAS Within Group A.
Table 1.

Group A		Mean	SD	P Value	Inference
Vas	Pre test	7.73	0.75	0.001	Highly significant
	Post test	4.2	0.72		

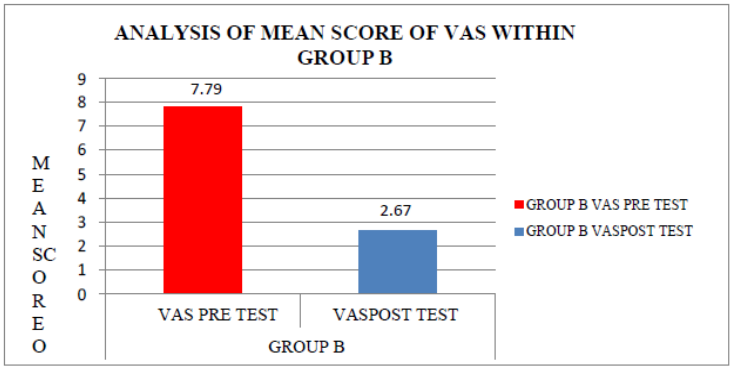


Graph-1.

Result: The above table and graph shows that the mean score of VAS changes from pre- test values within group A were found to be statistically highly significant ($p<0.005$).

Analysis Of Mean Score Of VAS Within Group B.
Table-2

Group A		Mean	SD	P Value	Inference
Vas	Pre test	7.79	0.72	0.001	Highly significant
	Post test	2.67	0.84		

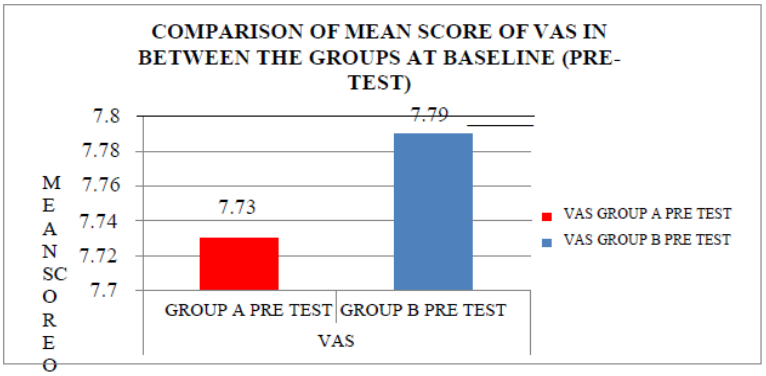


Graph-2

Result: The above table and graph shows that the mean score of VAS changes from pre-test to post-test values within group B were found to be statistically highly significant ($p<0.005$).

Comparison Of Mean Score Of VAS In Between The Groups At Base Line (Pre-Test).
Table-3.

VAS		Mean	SD	P Value	Inference
Pretest	Group A	7.73	0.75	0.7443	Insignificant
	Group B	7.79	0.72		

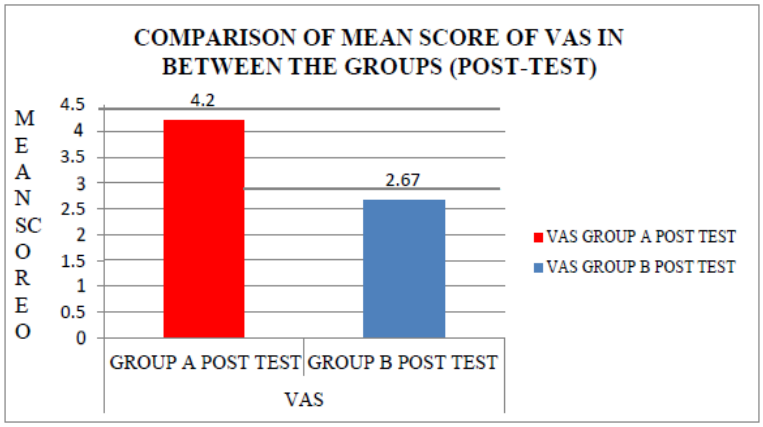


Graph-3

Results: The above table and graph shows the baseline measurement of VAS mean score in between the groups. VAS mean score in group A is 7.73, group B is 7.79 which were found to be statistically insignificant.

COMPARISON OF MEAN SCORE OF VAS IN BETWEEN THE GROUPS (POST-TEST)
Table-4

VAS		Mean	SD	P Value	Inference
POSTTest	Group A	4.2	0.72	0.001	Highly significant
	Group B	2. 67	0.84		

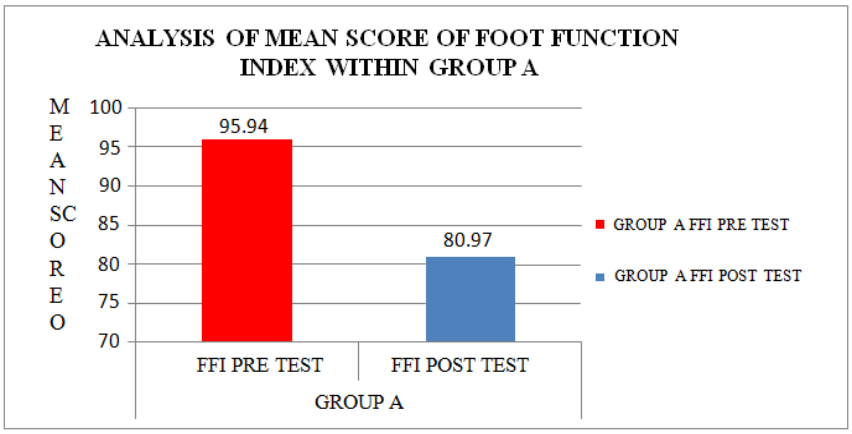


Graph-4.

Results: The above table and graph shows the mean score of VAS changes between the Group A Post-test is 4.2 and Group B Post-test is 2.67 were found to be statistically highly significant ($p<0.05$).

Analysis Of Mean Score Of FFI Within Group A
Table-5.

Group A		Mean	SD	P Value	Inference
FFI	Pre test	95.94	2.43	0.001	Highly significant
	Post test	80.97	3.53		

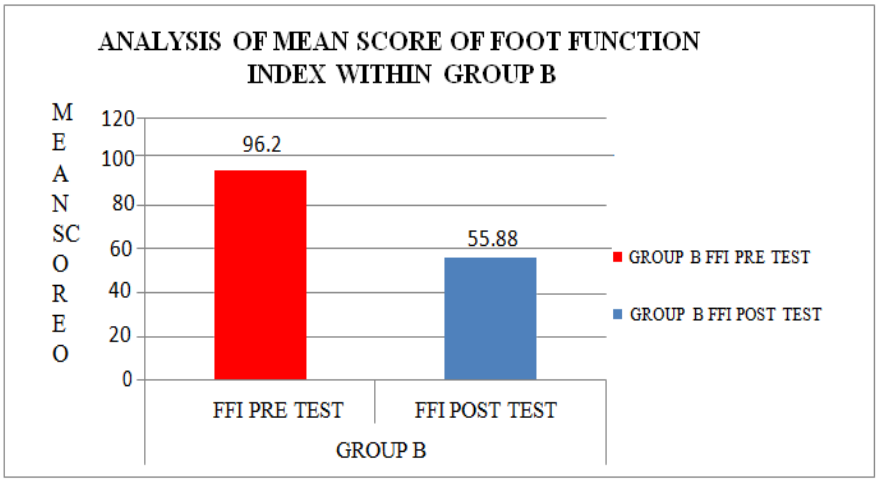


Graph-5.

Results: The above table and graph shows that the mean score of FFI chances from pre- test and post-test values with in the group A were found to statistically highly significant(P<0.005).

Analysis Of Mean Score Of FFI Within Group B
Table-6

Group A		Mean	SD	P Value	Inference
FFI	PRE TEST	96.20	1.99	0.001	HIGHLY SIGNIFICANT
	POST TEST	55.88	5.79		

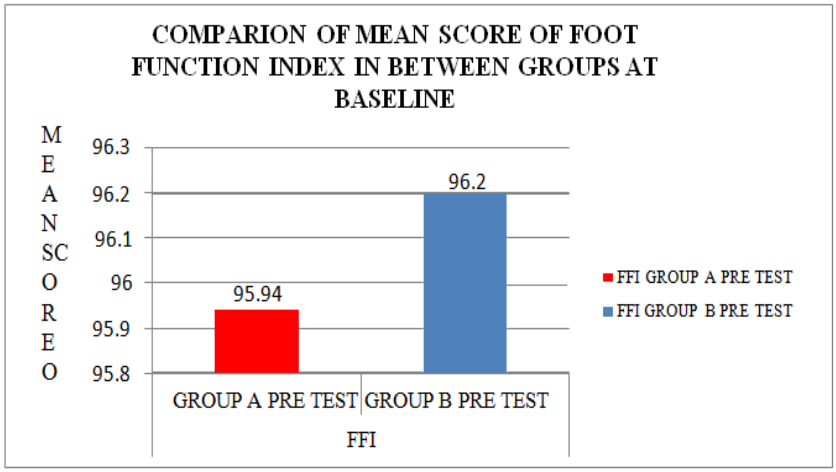


Graph-6.

Results: The above table and graph shows that the mean score of FFI changes from pre -test and post- test values within the group B were found to be statistically highly significant (P<0.005).

Comparison Of Mean Score Of FFI In Between The Groups at Baseline.
Table-7.

FFI		Mean	SD	P Value	Inference
Pre test	Group A	95.94	2.43	0.6309	Insignificant
	Group B	96.20	1.99		

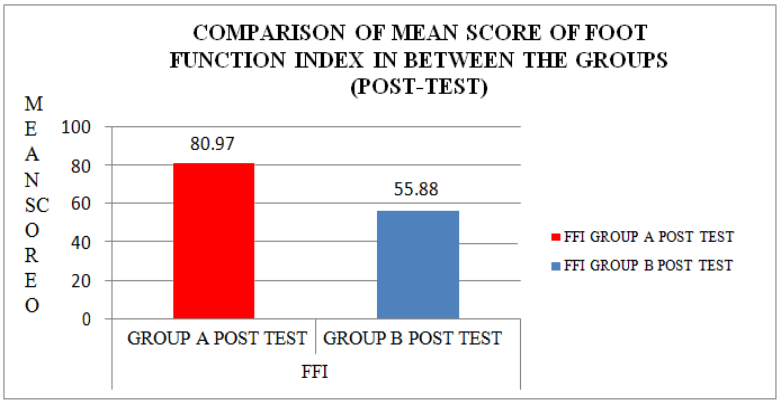


Graph-7.

Resaults: The above table and graph shoes the base line measurements of FFI mean score In group -A is 95.94 and in group-B is 96.26 which is statistically found to be insignificant.

Comparison of Mean Scores of FFI in Between The Groups (POST-TEST)
Table-8

FFI		Mean	SD	P Value	Inference
Post test	Group A	80.97	2.43	0.001	Highly significant
	Group B	55.88	5.79		



Graph-8.

Results: The above table and graph shows the mean score of FFI changes between the group A post- test is 80.97 and group -B post test is 55.88 were found to be statistically highly significant.

DISCUSSION

The aim of the study was to assess the effectiveness of Active Release Technique and Instrument Assisted Soft Tissue Mobilization along with conventional physiotherapy on pain and function in subjects with plantar fasciitis. Instrument assisted soft tissue mobilization and Active release technique are the techniques used in physical therapy practice but IASTM is an emerging intervention based on principles introduced by james cyriax, multiple studies suggest that treating acute, chronic musculoskeletal injuries with IASTM can decrease pain and improve function but there were limited studies on exploring the effects and comparison between IASTM and ART on pain reduction and functional improvement in subjects with plantar fasciitis.

Subjects were assessed for pain and function at baseline and after the end of intervention using VAS for pain and FFI for function. In total there were 2 drop outs one from each group ie; Group A 35 subjects (Active release group) and Group B 35 subjects (Instrument Assisted Soft Tissue Mobilization) due to their own reasons.

In group A there is statistically more significant improvement in VAS (p= 0.001) and FFI (p=0.001) the pretest to post test mean values changes for VAS (7.73-4.20) and FFI (95.94- 80.97). according to Arul pragassame.S et al., stated that ART is effective in reducing pain and improving functional performance in plantar fasciitis there is severe restriction of soft tissue

which inhibits foot biomechanical movements as these changes can restrict the translation of tissue and influences the biomechanics of the entire body. The mechanism behind these changes active release technique helps to restore the free and unimpeded movement of a soft tissues optimum texture and function, it also exerts the stretching effect and releases the restriction of scar tissue increases blood circulation pain reduction, range of motion and foot function.[26]

According to Emad T. Ahmed et al., has conducted a study on active release technique and ultrasound therapy versus ultrasound alone in the management of plantar fasciitis, in this study.[22] there was a significant reduction of total FFI scores from (96.33 ± 6.51 to 76.38 ± 3.46) in the application of ART and ultrasound therapy. The obtained effects are might be due to the release, separates and stretches the connective tissue adhesions and provides functional improvement to enhance healing. And it also restores the circulation, increase muscle flexibility, muscle strength and ROM which plays an important role in preventing lower extremity overuse injuries.[25]

In group B there is statistically more significant improvement in VAS (p= 0.001) and FFI (p=0.001) the pretest to post test mean values changes for VAS (7.79-2.67) and FFI (96.20- 56.88). According to the previous study conducted by Vinod babu. K et al., on IASTM technique with static stretching was effective on reducing pain, improving ankle dorsiflexion ROM and functional disability in subjects with plantar fasciitis. The author stated in this study the obtained results are might be due to the increasing blood flow, break up of soft tissue restrictions/ adhesions, tissue heating to the area, mast cell production and phagocytes, promote the restoration of normal tissue texture, enhance the proliferation of extracellular matrix fibroblasts, improve ion transport, decrease cell matrix adhesions, increase vascular response, and the remodeling of unorganized collagen fiber matrix. The deep pressure by IASTM inhibits the incoming sensory input of pain, it is thought that the pressure may also causes the release of the body's natural pain killers, i.e. endorphins. In addition it decreases pain levels explained by the "Gate Control Theory'' proposed by Melzack and Wall (1965). The mechanism of pain reduction in the treatment of the IASTM may influence the larger fibers to close the "gate" and decrease the sensation of pain experienced.[31]

According to Shivani Bhurchandi et al., has conducted a study on efficacy of Instrument Assisted Soft-Tissue Mobilization in Patients with Heel Pain. The application of IASTM initiates the controlled micro trauma created by instruments and results in regional inflammation this induces fibroblasts release and it increases collagen synthesis it leads to regeneration of tissues which improves the healing process, it also rises the temperature of along with blood flow due friction movement between tool and tissue leading to increase in tissue oxygenation and elimination of metabolic waste products. The reduction of heel pain is may be due to repetitive fast strokes are given through IASTM tool over the tightened fascia which helps in releasing and softening of fascia till the adhesions break down. The improvement in ROM might be linked to mechanical pressure that was applied naturally during the IASTM tool application. the mechanical tension produced in the fascia activates mechanoreceptors which alters the information sent to CNS resulting in change in tissue tension leading to increase in ROM and functional performance.[32]

According to Shashwat Prakash et al., has conducted a study on effect of manual therapy versus conventional therapy in patients with plantar fasciitis. In conventional physiotherapy, Ultrasound induces the mechanical effects help to remove the traumatic exudates and reduces the adhesion formation. Heat produced by ultrasound in large diameter nerve fibers may reduce pain through gate mechanism. Accelerated protein synthesis stimulate the repair of damaged soft tissues.

Strengthening plays an important role in the treatment of plantar fasciitis and corrects the functional risk factors such as weakness of intrinsic foot muscles. Strengthening exercises of intrinsic foot muscles were cited as the helpful treatment in heel pain and also supporting the arches of the foot.[33]

Stretching reduces the tension in the fascia which becomes tight during plantar fasciitis, there by it recreates the windlass mechanism by optimizing tissue tension. The stretching of muscles is to improve dorsiflexion range of motion and also releasing the stress on plantar fascia during push-off phase of gait cycle.[34]

The study findings indicating that after 4 weeks of interventions instrument-assisted soft tissue mobilization along with conventional physiotherapy was more effective than active release technique with conventional physiotherapy in reducing pain and improving function. Thus this study concludes that instrument-assisted soft tissue mobilization is a useful adjunct in plantar fasciitis along with standard physiotherapy treatment.

CONLUSION

The findings of the study concluded that, a 4 week intervention of both active release technique and Instrument assisted soft tissue mobilization have shown to be statistically significant in reducing pain and improving the function in subjects with plantar fasciitis. However Instrument assisted soft tissue mobilization technique was more effective when compared with Active release technique.

RECOMMENDATIONS FOR FURTHER RESEARCH

- The length of the study can be extended by 6 or 8 weeks.

- The intervention was given only to the subjects with unilateral plantar fasciitis in this study.
- Further research is required on these techniques as there are few evidence based studies on these interventions.

ACKNOWLEDGEMENT

It is with a sense of pride and pleasure when I look back to acknowledge those who have been a source of encouragement in my entire endeavour.

I am grateful to **Dr. Ganni Bhaskara Rao, Chief Patron,** G.S.L Educational Institutions, Rajamahendravaram, for his valuable support and help in permitting me to take the Subjects from G.S.L Medical College& General Hospital.

I take this pleasant and unique opportunity to express my deep sense of gratitude and offer my most sincere and humble thanks to my teacher and **My Principal** and my esteemed research Guide, **Dr. R. Geetha Mounika MPT (ORTHOPAEDICS),** Associate professor, who helped me to shape my dissertation well right from the beginning and for allowing and supporting me to undertake the study and for the expert guidance, affectionate nature and friendly attitude.

I also sincerely thanks to my faculty for their valuable suggestions and constant look to bring out this work **Dr. P.Chaturvedi, Dr. P. kiran Prakash, Dr. P.R.S.Tulasi, Dr.P. Pundarikaksha, Dr. S Jyothi, Dr. K.Priyanka, Dr.D.Sai Sushmitha, Dr.M.Parvathi Bhanu, Dr. I. Lakshmana Rao, Dr.Ch. Hemanth, Dr. G. Roja** GSL College of Physiotherapy, Rajahmundry, for supporting me to complete the study.

I am immensely thankful **to Dr. Ch. Ganapati Swamy,** Statistician, G.S.L Medical College, who helped me with his valuable and expert suggestions during the task of statistical analysis. I also thank my Librarian **Mr. B. Ramesh Babu** for his support.

I express my gratitude to my friends who helped me at every stage of my dissertation. I express my special thanks to all my Subjects who were very cooperative during the course of dissertation Last but not the least; I express my everlasting gratitude to **my Parents** for encouraging me and leading me through this gratifying task.

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