

THE EFFECT OF INSTRUMENT ASSISTED SOFT TISSUE MOBILIZATION (IASTM) VERSUS STRETCHING TECHNIQUE ON PAIN AND FOOT FUNCTION IN SUBJECT WITH ACUTE AND SUBACUTE PLANTAR FASCIITIS

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Abstract-

Background: Plantar fasciitis is a prevalent cause of adult heel discomfort. The pain is mainly caused by collagen degradation at the plantar fascia's origin at the medial tubercle of the calcaneus. Plantar fasciitis is a syndrome caused by recurrent stress to the plantar fascia at its origin on the calcaneus. It is a widespread foot ailment that affects millions of people worldwide. It occurs in a wide range of people, including athletes and people who pursue a secondary lifestyle. Plantar fasciitis affects both men and women; however, it is more common in women. Its prevalence and severity are strongly related to obesity.

Aim: To compare the effect of instrument assisted soft tissue mobilization and stretching technique on pain and foot function in subjects with acute and subacute plantar fasciitis.

Methodology: Participants were briefed about the nature of the study and the intervention. Their informed written consent was taken. 52 participants were selected based on the selection criteria. Prior and after the treatment both the outcome measures, numerical pain rating scale (NPRS) and Foot Function index (FFI) were measured. Participants were randomly divided into two groups with n=26 in each group. Group A received IASTM while group B received Stretching technique. The treatment was given for 2 days / week for 2 weeks

Outcome measures: Prior and after the treatment both the outcome measures, Numeric pain rating scale (NPRS) for pain and Foot Function Index for Function were measured.

Results: The group A showed clinical and statistical significance in term of FFI outcome with higher mean difference values resulting in [p=0.001], whereas both the groups Group A (p value=0.001<0.05) showed equal and effective clinical as well as statistical significance in terms of pain

Conclusion: It is concluded that treatment protocol that the study showed that IASTM and stretching both are significant in terms of clinical outcome and have been proved statistically significant.

Key words: IASTM, Stretching technique, NPRS, Foot Function Index

1. INTRODUCTION

- Plantar fasciitis is a prevalent cause of adult heel discomfort. The pain is mainly caused by collagen degradation at the plantar fascia's origin at the medial tubercle of the calcaneus.[1] Plantar fasciitis is a syndrome caused by recurrent stress to the plantar fascia at its origin on the calcaneus. It is a widespread foot ailment that affects millions of people worldwide. [2]The plantar fascia is a thick fibrous sheet of connective tissue that extends from the calcaneus's medial tubercle to the metatarsophalangeal joints, producing a medial longitudinal arch.[2] It occurs in a wide range of people, including athletes and people who pursue a secondary lifestyle.[2] Tenderness in the medial tubercle of the heel bone is a characteristic indication of plantar fasciitis.Pain occurs during the first few steps of the morning.[1]Pain at the start of activities that reduces or disappears as they warm up.[1]Toe and ankle pain during passive dorsiflexion.[3]The pain may be accompanied by stiffness after extended standing and weight bearing.[1]
- The load of the body weight is applied to the arch with each stride, causing the arch to descend. Because of the arch drop, the ball of the foot and heel expand wider apart. To counteract this strain, the fascia in the foot tightens. If the fascia's stress is higher than it can take, the fascia is damaged and the area becomes inflamed.[4]
- Excessive stress on the tissue as a result of sports activity, muscle weakness or tightness, incorrect shoes, increase in body weight, aging, unsuitable footwear, and occupation have all been associated to plantar fasciitis.[4] Plantar fasciitis is usually not the consequence of a single occurrence, but rather of a history of recurring micro trauma paired with a biomechanical foot weakness. Finally, age-related degenerative changes, such as atrophy of the heel fat pad, may enhance one's risk.[4] The load on the foot is classified into two types: The muscles contracting to move the foot cause intrinsic load. The calf muscles are responsible for a large portion of the intrinsic load imparted to the fascia.Extrinsic load refers to all loading variables other than intrinsic load in the plantar fascia. Body weight, step frequency, and standing duration are a few of these factors.[4]

- **INCIDENCE**-Plantar fasciitis is a leading cause of heel pain, accounting for over 15% of all foot related problems affecting the middle aged 40 - 50 years.[4],Plantar fasciitis affects both sexes equally but is more frequent in females.[5],Its prevalence and severity are strongly related to obesity.(65%)[5],It is most common in weight-bearing occupations, particularly manufacturing workers, store clerks, and nurses.[4]
- **PREVALENCE**-The overall incidence of PHP was 3.83 cases (95% CI = 3.77 to 3.89) per 1000 patient-years, the incidence in females was 4.64 (95% CI = 4.55 to 4.72), and the incidence in men was 2.98 (95% CI = 2.91 to 3.05). PHP was found in 0.4374% of the population (95% CI = 0.4369 to 0.4378%). PHP prevalence surged in September and October of each calendar year.
- Stretching is helpful in the treatment of plantar fasciitis because it helps correct functional risk factors such as gastrosoleus complex tension and intrinsic foot muscle weakness. It is very crucial to increase calf muscular flexibility.[1]Stretching techniques that are frequently utilised include wall stretches and stair stretches, among others.[1]Another useful strategy is to use a slant board or to position a two-inch or four-inch piece of wood in areas where the patient stands for extended periods of time (workplace, kitchen, etc.) to stretch the calf.[1]
- Dynamic stretches are also beneficial, such as rolling the foot arch over a can or a tennis ball.[1]Plantar fascia and Achilles tendon stretching is thought to be beneficial in the treatment of plantar fasciitis. [3]The purpose of a stretching programme is to reduce stress on the plantar fascia caused by either a tight plantar fascia or a tight Achilles tendon, as both the plantar fascia and Achilles tendon enter onto the calcaneus.[3]
- Instrument Assisted Soft Tissue Mobilization (IASTM) is a technique that uses an instrument to provide myofascial release. Many devices, such as fascial abrasion technique, foam roller, astym treatment, Graston technique, and others, have previously been employed.[6] Instrument-assisted soft-tissue mobilisation (IASTM) makes use of devices to exert longitudinal pressure along muscle fibres. IASTM, when used to treat tendinopathies, produces effects such as pain relief and increased range of motion (ROM), allowing patients to return to normal function (lifestyle) faster than other therapeutic approaches and natural healing.[7]
- Instrument assisted soft tissue mobilisation (IASTM) has been recommended as a treatment for reducing muscular tension.[8]Various stainless steel instruments of various material, size, and shape have been invented, with each instrument fashioned in a unique way.Instrument assisted soft tissue mobilisation (IASTM) has been presented as a treatment for reducing muscular tension.[8]Various stainless steel devices of various substance, size, and shape have been produced, with each instrument meant to help the clinician improve soft tissue mobilisation.[7] The edge mobility tool is one of these instruments. The tool is made of stainless steel and has various sharp and dull edges that aid in shaping the body by operating on deep and superficial tissue work.[7]IASTM application provides therapeutic advantages in a short amount of time.[8]

2. MATERIALS:

Data collection form/ assessment form
 IASTM tool
 Plinth and pillow
 Lubricant/gel/cream
 cotton
 Assessment sheets
 Informed Consent form
 Foot function index scale

3. METHODOLOGY

Type of study- Experimental study
 Study design- Quasi experimental Study
 Study duration- 6 months
 Sampling technique- Purposive sampling technique
 Sample size- 52
 Study setting- Tertiary hospitals in Sangli district.

4. LIST OF ABBREVIATIONS

IASTM	Instrument Assisted Soft Tissue Mobilization
ROM	Range Of Motion
NPRS	Numeric Pain Rating Scale
FFI	Foot Function Index
MFR	Myofascial Release Technique
AROM	Active Range Of Motion

5. OUTCOME MEASURES

1. Numeric pain rating scale(NPRS)⁽⁶⁾ -

It is a unidimension measure of pain intensity in adults. It is 11 point numeric scale ranges from “0” i.e. no pain and “10” i.e. extreme pain. Score ranges from 0-10 points, with higher scores indicating greater pain intensity.

2. Foot function index

A Foot Function Index (FFI) was developed to measure the impact of foot pathology on function in terms of pain, disability and activity restriction.

6. INTERVENTIONS

Ethical clearance was obtained from the institutional ethical committee. Subjects were selected according to the inclusion criteria. Prior to the study subjects were explained the procedure. A written informed consent was taken from the subjects prior to study.. The subjects were randomly divided into two groups- Group A: IASTM, Group B:Stretching. The intervention was given for 5 consecutive days, 2 session/day.

GROUP A – IASTM (edge mobility tool) Instrument Assisted Soft Tissue Mobilization

1)PATIENT’S POSITION: Lying prone on couch with the head rested on pillow with the hands by their side. Both the ankles out of bed i.e. lying outside the edge of bed and affected ankle supported by therapist’s hand.

2) THERAPIST POSITION: Therapist standing near the affected side of the leg near to the couch.

-Cream/lubricant will be applied on posterior calf and plantar region of foot as it will assist in reducing friction on skin and then the Edge mobility tool will be used in mobilizing the tissues on gastrocnemius and soleus and plantar region of foot by pressing the tool along the leg and the foot.

-The application of tool will be in proximal and distal (alternating) directions.

-Each participant will then receive 10 minutes of IASTM (Instrument assisted soft tissue mobilization) using Edge mobility tool.

GROUP B –

STRETCHING EXERCISE

i. CALF STRETCH-

Wall exercise

With one leg, take a large step forward with your toes 2- 3 inches away from the wall.

Shift your weight onto the front leg and bend at the knee, keeping the back leg straight and both heels on the ground.

Using the wall for support, lean forward into the wall and feel the stretch along the back of your leg and calf.

3 repetitions 30 second hold,2-3 set

Stair stretch-

Keep the foot you want to stretch back and take one step up with the other foot.

Lean into the stairs keeping the back foot flat.

Feel the stretch in the back of the heel. Try to relax and allow your body to lean further into the step.

Hold the stretch for 15-30second and repeat it 2-3 times for each foot.

PLANTAR STRETCH-

Passive stretching-

The patient is placed in supine position with the ankle joint may remain at neutral position. The therapist pushes the toes into extension.

3 repetitions held for 30 sec hold 2-3 set.

7.RESULTS, FIGURES AND TABLES.

Normality test using Shapiro-Wilk

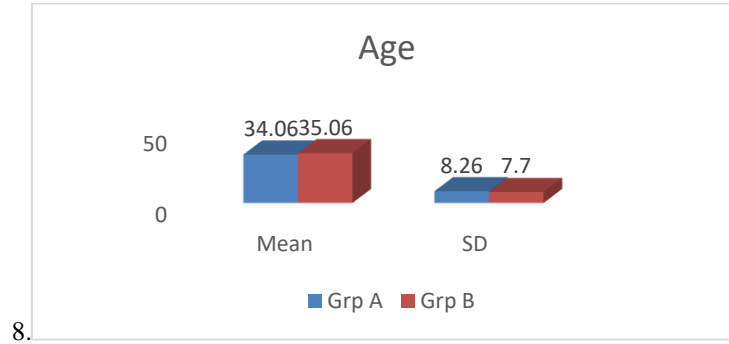
Variable	Time frame	Group A		Group B	
		z-value	p-value	z-value	p-value
NPRS	Pre	0.924	0.154	0.879	0.025
	Post	0.877	0.052	0.878	0.051
	Diff	0.873	0.052	0.875	0.050
FFI	Pre	0.984	0.981	0.983	0.977
	Post	0.957	0.545	0.961	0.612
	Diff	0.922	0.140	0.933	0.218

Data set is normally distributed as all the variables have indicated non-significant outcome in the observation. The researcher shall use parametric test for data analysis purpose in the following sections.

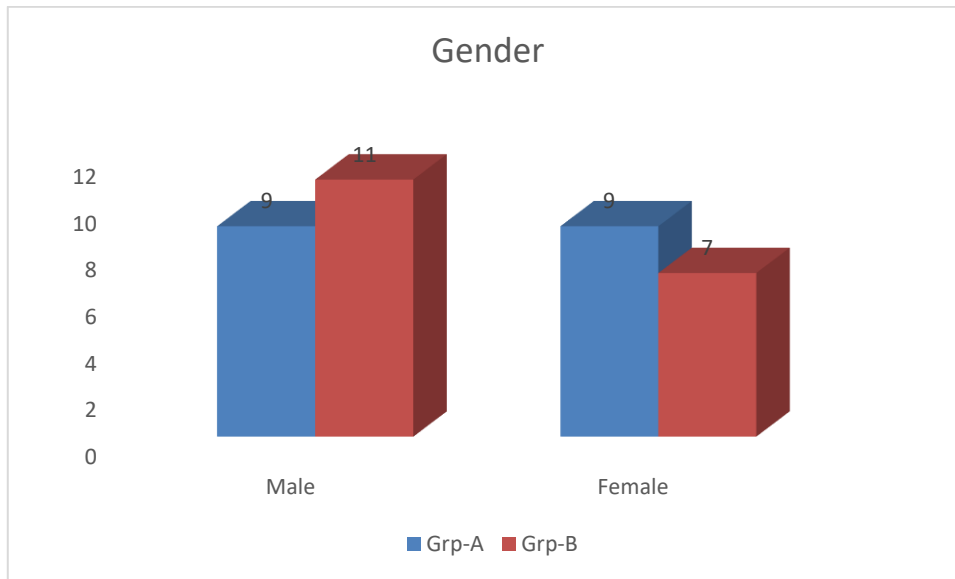
Independent sample test

Comparison of Groups with independent t test

Variable	Group	Mean	SD	t-value	p-value
Age	Grp A	34.06	8.26	0.376	0.709
	Grp B	35.06	7.70		



Particular	Group		Total	p-value
	Grp-A	Grp-B		
Gender	Male	9	11	0.502
	Female	9	7	
Total		18	18	36



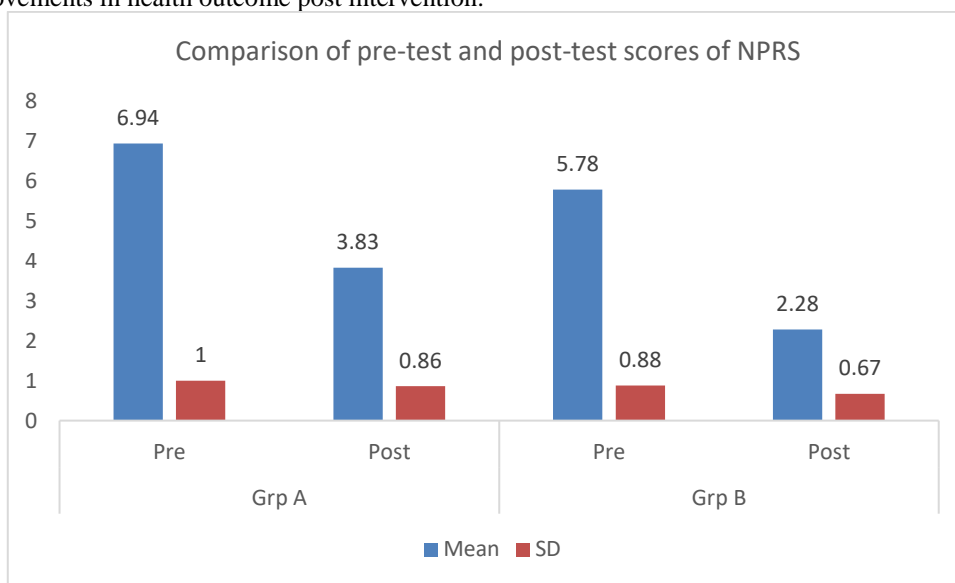
Within group Pre and post test

Comparison of pre-test and post-test scores of NPRS in two Groups by paired sample t test

Groups	Times	Mean	SD	Mean Diff.	SD Diff.	Effect size	t-value	p-value
Grp A	Pre	6.94	1.00	3.11	0.90	3.46	14.662	0.001
	Post	3.83	0.86					
Grp B	Pre	5.78	0.88	3.50	0.71	4.95	21.000	0.001
	Post	2.28	0.67					

The mean value in group A indicated changes post treatment and lower values are recorded for post treatment outcome and also the standard deviation shows the consistency with post treatment value which is less than pre value. The effect size or Cohen’s D indicates 3.46 value which is assumed to be very high in effect size as per the standard parameters of reference. Based on the results of the test analysis at 5% significance level, there is a significant statistical reliable difference between the pre & post treatment values with p-value is less than the 5% significance level (i.e. 0.001 < 0.05) in the study and therefore it justifies the improvements in health outcome post intervention.

The mean value in group B indicated changes post treatment and lower values are recorded for post treatment outcome and also the standard deviation shows the limited consistency with post treatment value which is more than pre value. The effect size or Cohen’s D indicates 4.95 value which is assumed to be very high in effect size as per the standard parameters of reference. Based on the results of the test analysis at 5% significance level, there is a significant statistical reliable difference between the pre & post treatment values with p-value is less than the 5% significance level (i.e. 0.001 < 0.05) in the study and therefore it justifies the improvements in health outcome post intervention.



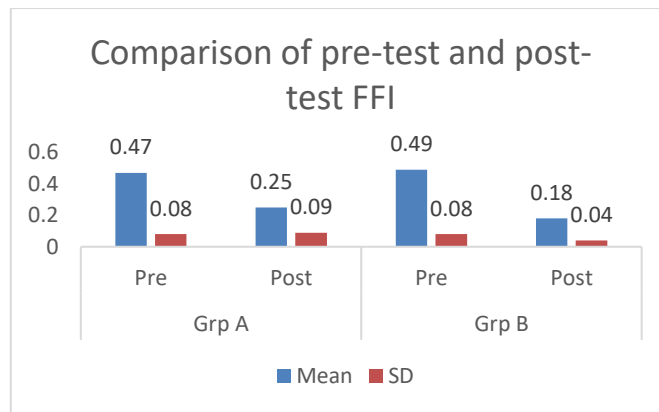
Within group Pre and post test

Comparison of pre-test and post-test FFI in two Groups by paired sample t test

Groups	Times	Mean	SD	Mean Diff.	SD Diff.	Effect size	t-value	p-value
Grp A	Pre	0.47	0.08	0.22	0.06	3.81	16.175	0.001
	Post	0.25	0.09					
Grp B	Pre	0.49	0.08	0.32	0.07	4.42	18.759	0.001
	Post	0.18	0.04					

The mean value in group A indicated changes post treatment and lower values are recorded for post treatment outcome and also the standard deviation shows the consistency with post treatment value which is less than pre value. The effect size or Cohen’s D indicates 3.81 value which is assumed to be very high in effect size as per the standard parameters of reference. Based on the results of the test analysis at 5% significance level, there is a significant statistical reliable difference between the pre & post treatment values with p-value is less than the 5% significance level (i.e. 0.001 < 0.05) in the study and therefore it justifies the improvements in health outcome post intervention.

The mean value in group B indicated changes post treatment and lower values are recorded for post treatment outcome and also the standard deviation shows the consistency with post treatment value which is less than pre value. The effect size or Cohen’s D indicates 4.42 value which is assumed to be very high in effect size as per the standard parameters of reference. Based on the results of the test analysis at 5% significance level, there is a significant statistical reliable difference between the pre & post treatment values with p-value is less than the 5% significance level (i.e. 0.001 < 0.05) in the study and therefore it justifies the improvements in health outcome post intervention



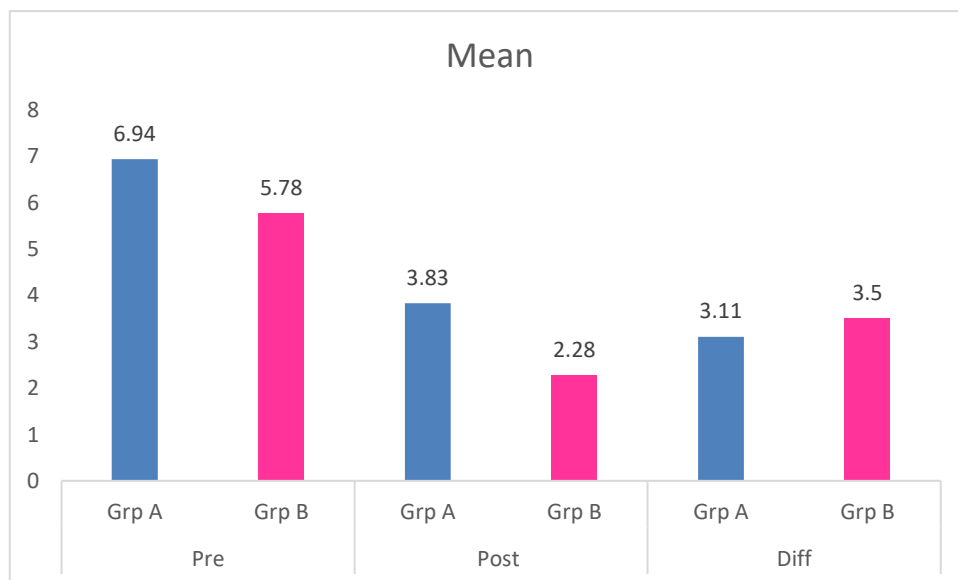
Between groups independent test for Group Statistics using independent t test for NPRS

Time	Group	Mean	SD	t-value	p-value
Pre	Grp A	6.94	1.00	3.723	0.001*
	Grp B	5.78	0.88		
Post	Grp A	3.83	0.86	6.068	0.001*
	Grp B	2.28	0.67		
Diff	Grp A	3.11	0.90	-1.441	0.159
	Grp B	3.50	0.71		

From the above table it is observed that between groups analysis is significant for pre time frame at 5% level significance as the p-value is less than 5%. It shows significant differences between the groups

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From the above table it is observed that between groups analysis is non-significant for difference at 5% level significance as the p-value is more than 5%. It shows non-significant differences between the groups



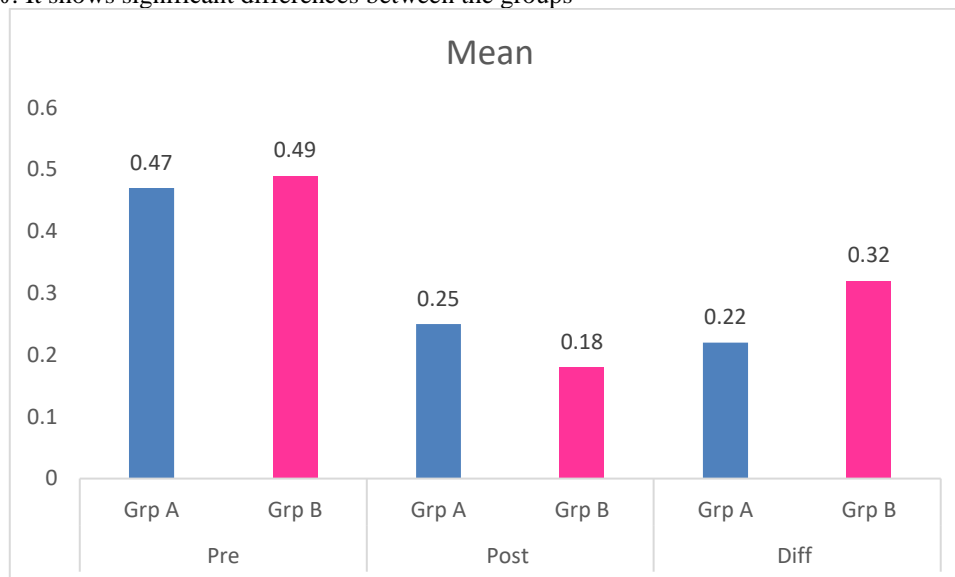
Between groups independent test for Group Statistics using independent t test for FFI

Time	Group	Mean	SD	t-value	p-value
Pre	Grp A	0.47	0.08	0.780	0.441
	Grp B	0.49	0.08		
Post	Grp A	0.25	0.09	3.264	0.003*
	Grp B	0.18	0.04		
Diff	Grp A	0.22	0.06	4.399	0.001*
	Grp B	0.32	0.07		

From the above table it is observed that between groups analysis is non-significant for pre time frame at 5% level significance as the p-value is more than 5%. It shows non-significant differences between the groups

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8. Discussion-

Plantar fasciitis is a prevalent cause of adult heel discomfort. The pain is mainly caused by collagen degradation at the plantar fascia's origin at the medial tubercle of the calcaneus.

Instrument Assisted Soft Tissue Mobilization (IASTM) is a method that uses an instrument to provide myofascial release. Many devices, such as fascial abrasion technique, foam roller, astym treatment, Graston technique, and others, have previously been employed. IASTM equipment are used to apply longitudinal pressure along muscle fibres. IASTM has been presented as a treatment for reducing muscular tightness. IASTM tool for increasing soft tissue extensibility by heat generation generated by friction from the device. The stainless instrument has many sharp and dull edges that aid in body sculpting by operating on deep and superficial tissue work. This softens the tissue and reduces its viscosity.

The use of IASTM as a technique to release tension in shortened muscles has a mechanical benefit that allows the clinician to have better penetration and more concentrated treatment for shorter portions of muscles while putting less strain on the therapist's hands. In addition, IASTM allows the therapist to identify changes in tissue properties, thereby focusing on the area with more severe fibrosis. IASTM equipment are used to apply longitudinal pressure along muscle fibres. Finally, IASTM, when used to treat tendinopathies, produced effects, namely, pain relief aids in returning to normal function (lifestyle) sooner than other therapeutic approaches and spontaneous healing. IASTM application provides therapeutic advantages in a short amount of time. Following that, each participant will receive 10 minutes of IASTM using Edge mobility tool.

GROUP B :

Stretching is useful in the treatment of plantar fasciitis and can help to correct functional risk factors. A thorough analysis of stretching shows that people with plantar fasciitis who stretch tend to improve over time in terms of both pain and foot function. The technique's efficiency may have been influenced by the unique anatomical component under stretch. Stretching techniques such as wall stretching, stair stretching, and passive plantar stretching can be used. This exercise requires two sessions each day, five to six days per week for two weeks.

The study studied and compared the effects of IASTM and stretching in subjects with acute and subacute plantar fasciitis. The study's goal is to examine the effect of instrument-assisted soft tissue mobilisation and stretching technique on pain and foot function using NPRS and FFI in participants with acute and subacute plantar fasciitis. The mean value in Group A revealed changes after treatment and lower values are recorded for post treatment outcome, and the standard deviation shows consistency with post treatment value that is less than pre value. The effect size, or Cohen's D, gives a value of 3.81, which is judged to be quite large based on the conventional parameters of reference. Based on the test analysis results at the 5% significance level, there is a significant statistically reliable difference between the pre and post treatment values in the study with a p-value less than the 5% significance level (i.e. 0.001 0.05), which justifies the improvements in health outcome post intervention.

The mean value in group B indicates post-treatment changes, with lower values recorded for post-treatment outcomes, and the standard deviation shows consistency with post-treatment values that are less than pre-treatment values. The effect size, or Cohen's D, reveals a value of 4.42, which is judged to be quite large based on the conventional parameters of reference. Based on the test analysis results at the 5% significance level, there is a significant statistically reliable difference between the pre and post treatment

values in the study with a p-value less than the 5% significance level (i.e. 0.001 0.05), which justifies the improvements in health outcome post intervention.

Thus, the study revealed that the between-groups analysis is non-significant, implying that there are no significant differences between the groups. However, when comparing within groups, both therapies (IASTM and Stretching) considerably improved foot function and pain relief, although foot function was significantly enhanced only in the IASTM group. This could imply that IASTM has a positive effect on foot function, and stretching can also assist ease discomfort.

There have been numerical studies that compare the benefits of IASTM and Stretching method to other procedures.

Ahmad Osailan, et.al.-A study compared a group treated with IASTM and a group treated with manual stretching but in improving hip AROM, Muscle torque and power in hamstring tightness patients. The study showed that IASTM was as effective as manual stretching in improving hip AROM, Muscle torque and power in hamstring tightness patients.

D Sweeting, B Parish, et.al.- The study which is to check effectiveness of manual stretching in treatment of plantar heel pain. This review aimed to assess the effectiveness of stretching on pain and function in people with plantar heel pain. Different stretching techniques showed a statistically significant reduction in some aspect of pain in favour of plantar fascia stretching.

Edward Jones, Margaret Finley, et.al -There is study which uses Instrument -Assisted Soft Tissue Mobilization tool for the Management of Chronic Plantar Heel Pain and this study favours the use of IASTM in conventional treatment for plantar heel pain.

K NADEEM, ET.AL -THIS STUDY SHOWS THE EFFECT OF IASTM ERGON TECHNIQUE ON PAIN, STRENGTH AND RANGE OF MOTION IN PLANTAR FASCIITIS PATIENTS. THIS RANDOMIZED CONTROL TRIAL DEMONSTRATES THAT THE INCLUSION OF INSTRUMENT-ASSISTED SOFT TISSUE MOBILIZATION USING THE ERGON TECHNIQUE FOR PLANTAR FASCIITIS LASTING 5 WEEKS IS AN EFFECTIVE TREATMENT INTERVENTION IN REDUCING PAIN AND IMPROVING STRENGTH AND ANKLE RANGE OF MOTION.

9.CONCLUSION-

The study showed that IASTM and stretching both are significant in terms of clinical outcome and have been proved statistically significant in terms of p value. However, on comparing both the exercise group, the group A which received IASTM technique high significance in improvement of foot function than that of group B receiving stretching in terms of clinical outcome and also have been proved statistically significant in terms of p value. However when comparison was made within groups both interventions (IASTM, Stretching) significantly improved foot function and relieves pain but foot function was significantly improved in IASTM group only. This may indicate that IASTM has beneficial effect on foot function and Stretching also helps to relieve pain.

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