A STUDY TO EVALUATE EFFECTIVENESS OF IASTM AND PLANTER FASCIA STRETCHING VERSUS HOT PACKS AND PLANTER FASCIA STRETCHING IN PATIENTS WITH CHRONIC HEEL PAIN

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ABSTRACT

BACKGROUND Plantar heel pain is one of the major complain presenting to foot and ankle specialists, may be seen in upwards of 11% to 15% of adults, thought to be multifactorial in origin. Different factors include increased age, decreased ankle and first metatarsophalangeal joint range of motion, obesity and excessive periods of weight bearing activity. Plantar fasciitis is a common cause of heel pain in adults. It is estimated that more than 1 million patients seek treatment annually for this condition. Plantar fasciitis is thought to be caused by biomechanical overuse from prolonged standing or running, thus creating micro tears at the calcaneal enthesis leading to inflammation at the origin of the plantar fascia and surrounding perifascial structures.

AIMS AND OBJECTIVES: To compare the effectiveness between IASTM and planter fascia stretching versus hot pack and planter fascia stretching in patients with chronic heel pain.

METHODOLOGY: Comparative study design. 60 patients diagnosed with diagnosed chronic heel pain. Will be randomly selected according to inclusion and exclusion criteria and are divided into two groups –

Group A: IASTM and planter fascia stretching

Group B: Hot pack and plantar fascia stretching

Study duration 30 minutes per day, 3 days in a week. Total 8 Weeks

CONCLUSION :

The study concludes that both IASTM with plantar fascia stretching and hot packs with plantar fascia stretching had significant effects on chronic heel pain but while comparing its showed the group treated with IASTM with plantar fascia stretching has statistically more significant effect than the group treated with hot packs with plantar fascia stretching for chronic heel pain.

INTRODUCTION

Plantar heel pain is one of the major complain presenting to foot and ankle specialists, may be seen in upwards of 11% to 15% of adults, thought to be multifactorial in origin. Different factors include increased age, decreased ankle and first metatarsophalangeal joint range of motion, obesity and excessive periods of weight bearing activity1,2,3,4 . Plantar fasciitis is a common cause of heel pain in adults. It is estimated that more than 1 million patients seek treatment annually for this condition. Plantar fasciitis is thought to be caused by biomechanical overuse from prolonged standing or running, thus creating micro tears at the calcaneal enthesis leading to inflammation at the origin of the plantar fascia and surrounding perifascial structures5,6 .

Plantar fasciitis (PF) occurs more frequently in individuals with structural foot deformities, including pes planus, pes cavus, and leg length discrepancies, each of which are associated with tightness of the intrinsic foot muscles or heel cord. PF more often affects only one foot, although approximately 30% of patients have bilateral symptoms.7, 8, 9, 10, 11 Specialized techniques like IASTM i.e., Instrument assisted soft-tissue mobilization, utilize instruments by applying longitudinal pressure along muscle bres. IASTM used in treating tendinopathies, has given results i.e. pain resolution and improvement in range of motion (ROM) and helps in returning to normal function (lifestyle) faster compared to other therapeutic interventions and also natural healing. 12,13 Treatments for plantar heel pain are varied and research findings supporting their use are sometimes conflicting. Stretching is frequently utilised as a conservative 2 treatment for plantar heel pain .Systematic reviews investigating the efficacy of conservative treatments for plantar fascia have been published. However none of the reviews have focused specifically upon stretching.14,15,16,17,18,19

Conservative treatments for PF usually include rest, anti-inflammatory drugs, shoe inserts, shoe wear modification, stretching exercises, and physical therapy. Examples of physical therapy are massage, mobilization, therapeutic ultrasound, and taping. However, there is controversy about the treatment benefits and there is insufficient evidence about their efficacy. 20,21,22,23,24

Conservative treatment for plantar fasciitis consist of exercises (strengthening and stretching exercises), corticosteroid therapy, use of modalities like cryotherapy, ultrasound with or without the application of phonophoresis, electrical stimulation, contrast bath, Whirlpool bath, NSAIDs(non-steroidal anti-inflammatory drugs), taping like calcaneal taping, kinesio taping, night splints, use of soft sole insoles and the use of orthotics. Davis et al concluded that 89% of the subjects had pain relief after 12 months of conservative treatment.1, 4, 5 The second characteristics is the localisation of the pain which is usually at the origin of the plantar fascia from the medial tubercle of the calcaneus. The pain may be aggravated by passive dorsiflexion of the toes in subjects with more severe condition. Heel pad swelling may accompany chronic plantar fasciitis.

The osteopathic manipulative treatment technique of counter strain may provide immediate improvement of plantar fasciitis symptoms; however, maintenance of these results has not been documented, to the authors' knowledge.26,27 The plantar fascia should be placed in a position of least resistance with passive flexion of the knee and plantar flexion of the ankle and toes.27 This position should be maintained for approximately 90 seconds while monitoring the tender point, which is most commonly located at the plantar fascial insertion on the medial calcaneus.27 The foot should then be returned to a neutral position and reassesed.27 A Foot Function Index (FFI) was developed in 1991 to measure the impact

of foot pathology on function in terms of pain, disability and activity restriction. 49 It is a self-administered index consisting of 23 items divided into 3 sub-scales. Both total and subscale scores are produced. A Foot Function Index (FFI) was developed to measure the impact of foot pathology on function in terms of pain, disability and activity restriction. The FFI is a self-administered index consisting of 23 items divided into 3 sub-scales. Both total and subscale scores are produced. Previous studies have reported that heel pain occurs in about 10% of the American population, and 80% of this group was diagnosed with PF . 43,46,47 No literature was found to compare the effectiveness of IASTM and planter fascia stretching versus hot pack and planter fascia stretching in patients with chronic heel pain, hence our study aims to find out the difference between their effects on Chronic heel pain

AIM OF THE STUDY To compare the effectiveness between IASTM and planter fascia stretching versus hot pack and planter fascia stretching in patients with chronic heel pain.

OBJECTIVES OF THE STUDY : The main objectives of the study are:

1. To evaluate the effects of IASTM and planter fascia stretching in patients with chronic heel pain.

2. To evaluate the effectiveness of hot pack and planter fascia stretching in patients with chronic heel pain.

3. To compare the effectiveness between IASTM and planter fascia stretching versus hot pack and planter fascia stretching in patients with chronic heel pain

METHODOLOGY STUDY

It is a comparative study .60 patients with chronic heel pain will be randomly selected according to inclusion and exclusion criteria in which groups was divided into two groups –

Group A: IASTM and planter fascia stretching

Group B: Hot pack and planter fascia stretching

All patients participated in the study after voluntarily signing the consent form.

OUTCOME MEASURES ¬ VISUAL ANALOGUE SCALE Reliability of the VAS for acute pain measurement as assessed by the ICC appears to be high. Ninety percent of the pain ratings were reproducible within 9 mm. These data suggest that the VAS is sufficiently reliable to be used to assess acute pain.

FFI : (Foot Function Index) The FFI has been shown to be a reasonable tool for use with low functioning individuals with foot disorder

Scale	Questions	Scoring
Pain Scale	• Pain in the morning upon taking your firststep • Pain standing barefoot • Pain walking barefoot • Pain standing with shoes • Pain walking with shoes • Pain standing with orthotics • Pain walking with orthotics • How is your pain at the end of the day • How severe is your pain at its worst	0/90
Disability Scale	• Difficulty when walking in the house • Difficulty when walking outside • Difficulty when walking four blocks • Difficulty when climbing stairs • Difficulty when descending stairs • Difficulty when getting out of chair • Difficulty when standing tip toe • Difficulty when climbing curbs • Difficulty when running or fast walking	0/90
Activity Limitation	• Stay indoors all day due to feet • Stay in bed all day due to feet • Use an assistive device (stick, walker,crutches, frame) indoors • Use an assistive device outdoors • Limit physical activity	0/50

INCLUSION CRITERIA	EXCLUSION CRITERIA
a) Both Male and female patients. b) Age of 18-50 years c) Diagnosed with chronic heel pain. d) Pain provoked by taking the first few steps in the morning and after prolonged standing. e) Tenderness localized to the origin of the plantar fascia on the medialcalcaneal tubercle.	a) Previous foot surgery. b) Foot trauma within the previous three months. c) Tarsal tunnel syndrome. d) Loss of plantar foot sensation. e) Foot pathology other than plantar fasciitis including tendonitis, bursitis, orcalcaneus fracture. f) Generalized inflammatory disorders associated like rheumatoid arthritis,ankylosing spondylitis, Reiter's disease, gout, or lupus. g) Previous treatment of plantar fasciitis with dorsiflexion night splints and/ormedial arch supports. h) Inability or unwillingness to participate in the study. i) Age less than eighteen years. j) Peripheral neuropathy and diabetic neuropathy

PROCEDURE

After collecting the written consent form from the patients selected by inclusion andexclusion criteria they would be divided into two group- group A and groupB.General assessment was taken for both the group.

Group A: will be treated with IASTM with planter fascia stretching and home exercise program

PATIENT's POSITION: Lying prone on couch with the head rested on pillowwith the hands by their side.

Both the ankles out of bed lying outside the edge of bed and affected ankle supported by therapist's hand.

THERAPIST POSITION: Therapist standing near the affected side of the leg nearto the couch.

GROUP A: IASTM (ACCEL TOOL) WITH PLANTAR FASCIA STRETCHING

- The patient will do a 5-minute bicycle exercise with minimum resistance to warm-up the tissues (Prior to IASTM).
- Instrument Assisted Soft Tissue Mobilization: -Each participant will then receive 2 minutes of IASTM (Instrument assisted soft tissue mobilization)
- Cream/lubricant will be applied on plantar region of foot as it will assist in reducing friction on skin and then the (IASTM) will be used in mobilizing the tissues on plantar region of foot by pressing the tool along the foot.
- The application of Accel tool will be in proximal and distal (alternating)
- Additionally, the participants will be given a Home Exercise Program.

They will be asked to do the program twice a day which will consist of the following exercises:

- ❖ Plantar fascia stretching (3 repetitions for 30 sec hold each).
- ❖ Ice will be applied after each session for pain management (as needed).

Group B: Will be treated with Hot pack with planter fascia stretching and home exercise program.

Temperature: Silica gel packs are heated in water that is 160° to 166°F, and they come out of the hot water at that temperature. They begin to cool off as soon as they are taken out of the water but will present a burn danger until they have cooled off considerably. Packs cool at various rates depending upon how hot they are when they come out of the water and how thick the towels are, so it is not possible to say exactly how fast they will cool off. Assume they have the potential to burn clients throughout the treatment and monitor them at all times.

Time Needed: 15 to 20 minutes on the skin for a relaxing sedative effect.

Equipment Needed: Metal hot pack container, hot pack, tongs or gloves to remove hot pack from the container, enough towels to make four to six layers of towel between the client's skin and the hot pack. Specially made terry cloth covers may be purchased from manufacturers of the packs, but at least one layer of towel is still needed between the coverand the client's skin.

Effect: Primarily thermal

Cleanup: Return hydrocollator pack to container, dispose of used towels. Water in the tankshould be changed periodically, depending upon how frequently it is being used, as the water in the tank will become contaminated with small silica particles.

Procedure

1. Check with patient to make sure there are no contraindications to the use of local heat.

2. Explain the use of local heat to client and get his or her consent.

3. Check the water temperature, which is displayed on the lower part of heater.

4. Remove the silica gel pack from the hot water with tongs, or put on gloves and pick up the pack by the loops on the edges.

5. Wrap it in one or more towels. You may fold a large bath towel in half and wrap the hot pack in it or use several smaller towels. The layers of towel will protect the client's skin from burning and prevent the pack from cooling off too fast. Silica gel packs generally require four to six layers of towels, but keep extra towels on hand to use if needed. Specially made terry cloth covers may also be used. More towels may be needed for an elderly person

6. Check to make sure the pack is not too hot by filling it with your own hand or wrist.

7. Warn the client the hot pack is going on, and say, "Be sure to tell me right away if this feels too hot."

8. Check the area visually before applying towel wrapped pack . This allows you to see what the patient's skin normally looks like.

9. Place the hot pack.

10. Check the skin every 2 or 3 minutes at first: lift the pack and check the tissue. It will be bright pink due to increased blood flow, which is normal, but check for any signs of blistering or burning.

Home Exercises Programme

- Calf Stretch (10 repetation, 5 sec. hold time, twice in a day)
- Rolling stretch (10 repetation, 5 sec. hold time, twice in a day)
- Towel stretch (10 repetation, 5 sec. hold time, twice in a day)
- Towel curls (10 repetation, 5 sec. hold time, twice in a day)
- Seated foot stretch (10 repetation, 5 sec. hold time, twice in a day)

DATA ANALYSIS

In present study, the two groups were compared for the significant difference to evaluate the effect of planter fascia stretching versus hot pack and planter fascia stretching in patients with chronic heel pain. The statistical tools used for analysis were paired and unpaired "t" test. The differences between pre - test and post – test values were found. The data was collected at beginning, at six week and at the end of twelve weeks. The mean difference of VAS and FFI of group A were compared with group B and the actual pattern of variation were observed. With the 't' value from the pre-test and post-test, the accurate level of significance was analyzed and interpreted. An alpha level of $p<0.05$ was the level of significance for the test. Paired 't' test was performed to analyze the efficacy of treatment within the groups and unpaired 't' test was performed to analyze the efficacy of treatment between both groups.

PAIRED 't' TEST WITHIN GROUP:

The paired 't' test was used to find out the significance within the same group with the values of parameters considered for the study.

UNPAIRED't' TEST BETWEEN GROUP:

The 't' test was used to find out the significance between the groups and it gives the valuable information regarding this study.

RESULTS

The present study was carried out to compare the effect of IASTM and planter fascia stretching versusHOT packs and planter fascia stretching in patient with chronic heel pain . The data obtained during the study was tabulated and statistically analyzed for interpretation of the results. The findings of the present study have been presented and discussed in this chapter under the following major headings.

1. DEMOGRAPHIC PRESENTATION OF DATA
2. ANALYSIS OF PRE-TEST AND POST-TEST VALUES OF VAS WITHIN GROUP A:
3. ANALYSIS OF PRE-TEST AND POST-TEST VALUES OF VAS WITHIN GROUP B:.
4. ANALYSIS OF PRE-TEST AND POST-TEST VALUES OF FFI WITHIN GROUP A

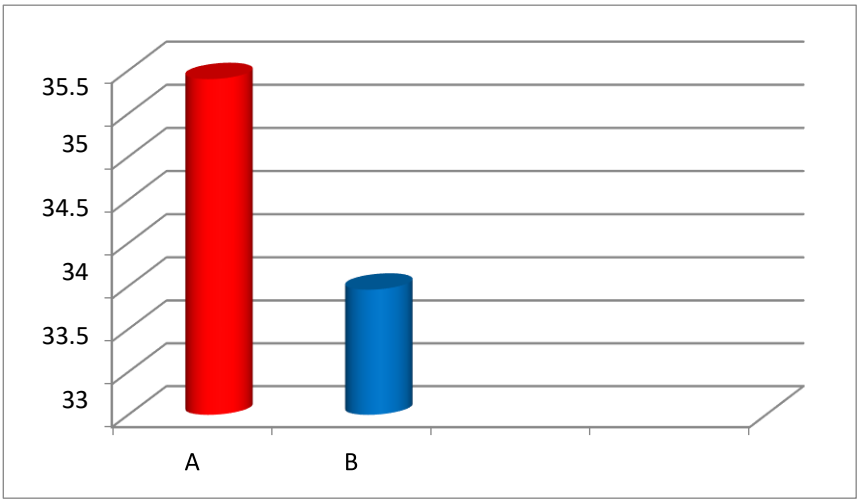
5. ANALYSIS OF PRE-TEST AND POST-TEST VALUES OF FFI WITHIN GROUP B
6. ANALYSIS OF POST-TEST VALUES OF VAS WITHIN GROUP A & B:
7. ANALYSIS OF POST-TEST VALUES OF FFI WITHIN GROUP A & B:

1. DEMOGRAPHIC PRESENTATION OF DATA IN GROUPS:

Thirty chronic Heel pain patients of age group between 18 – 50 years were randomly selected according to inclusion and exclusion criteria and divided into two groups with 30 patients in each group. Group A had a mean age of 35.4 years and Group B had a mean age of 32.96 years. The demographic data has been presented in tables and depicted in figure.

TABLE : 1 DEMOGRAPHIC PRESENTATION OF DATA IN GROUPS:

GROUPS	NUMBER	AGE IN YEARS	
		MEAN±SEM	SD
Group A	30	35.4±1.97	10.83
Group B	30	32.96±1.64	8.99
Total	60	68.36±3.61	19.82



INTERPRETATION: The above table shows the mean of group A and Group B were 35.4 and 32.96 respectively. The Total Mean is 68.36 within Group A analysis

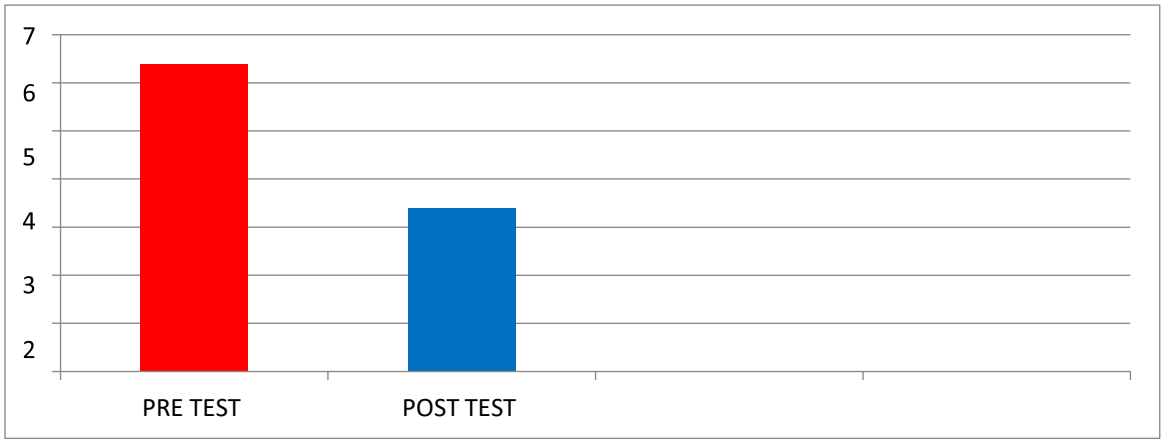
1. ANALYSIS OF PRE-TEST AND POST-TEST VALUES OF VAS WITHIN GROUP A:

The Heel functions of each patient in Group A was assessed by using VAS before the start of the treatment as pre-test values and at the end of 12th week as post-test values. The data has been presented in table and depicted in figure

VAS	Mean	N	SD	Std. Error Mean	Mean Diff	T	P	Significance
Pre-test	6.4	30	0.49	0.09	3	1.04	**	**
Post-test	3.4	30	0.85	0.156				

* Significant difference (P<0.05)

GRAPH 2



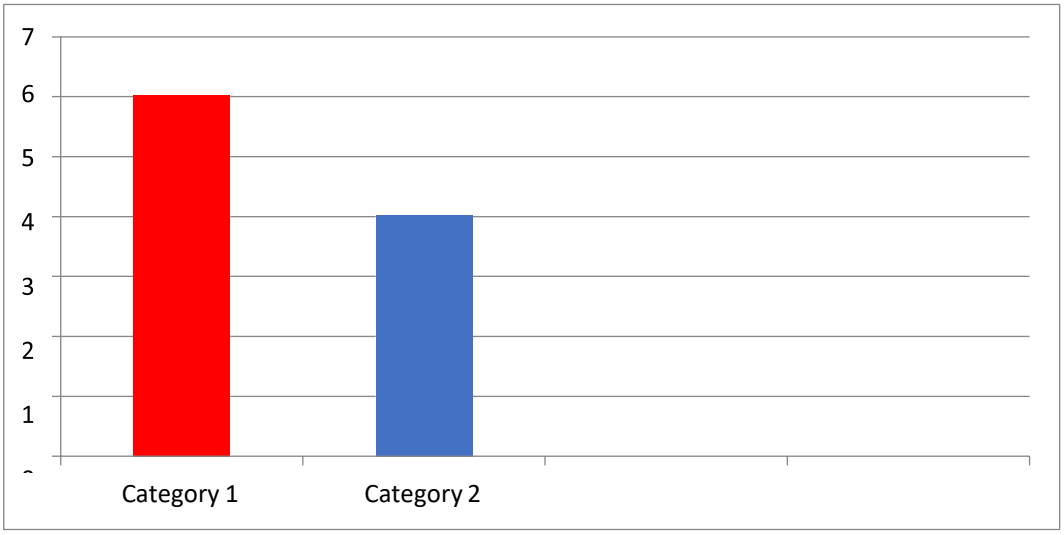
INTERPRETATION: The above table shows the mean of pre-test and post – test values of VASfor group A were 6.4 and 3.4 respectively. The mean diff is 3 and't' value is 1.04 and 'P' value less than 0.05 within Group A analysis.

2. ANALYSIS OF PRE-TEST AND POST-TEST VALUES OF VAS WITHIN GROUP B:

VAS	Mean	N	SD	Std. Error Mean	Mean Diff	T	P	Significance
Pre-test	6.03	30	0.71	0.131	2	6.16	**	**
Post-test	4.03	30	0.76	0.14				

***** Significant difference (P<0.05)

GRAPH 3



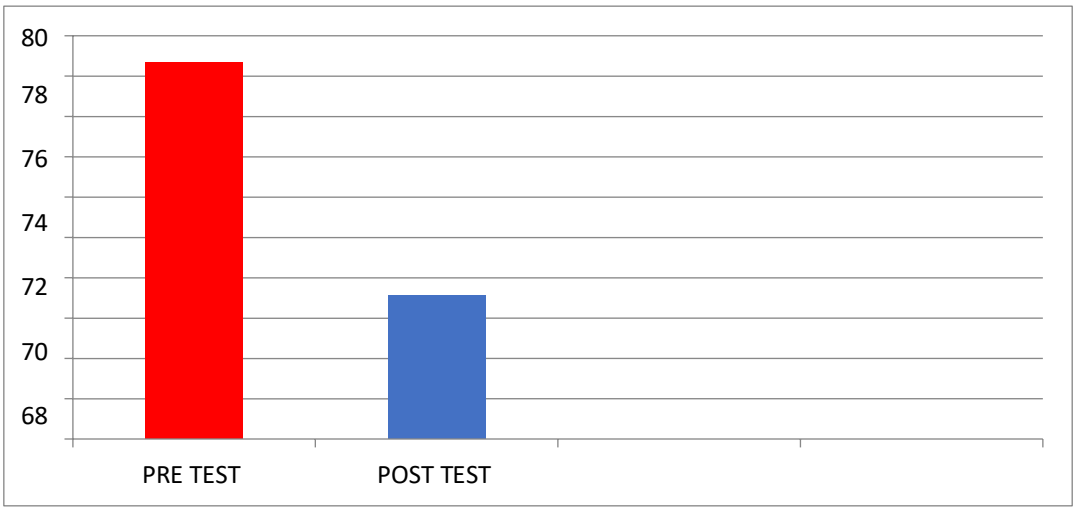
INTERPRETATION: The above table shows the mean of pre-test and post – test values of VAS for group B were 6.03 and 4.03 respectively. The mean diff is 2 and‘t’ value is 6.16 and ‘P’ value less than 0.05.

3. ANALYSIS OF PRE-TEST AND POST-TEST VALUES OF FFI WITHIN GROUP A:

FFI	**Mean**	**N**	**SD**	**Std. Error Mean**	**Mean Diff**	**T**	**P**	**Significanc e**
Pre-test	78.67	30	4.14	0.75				
Post-test	67.13	30	3.192	0.58	11.54	1.84	**	***

***** Significant difference (P<0.05)

GRAPH 4



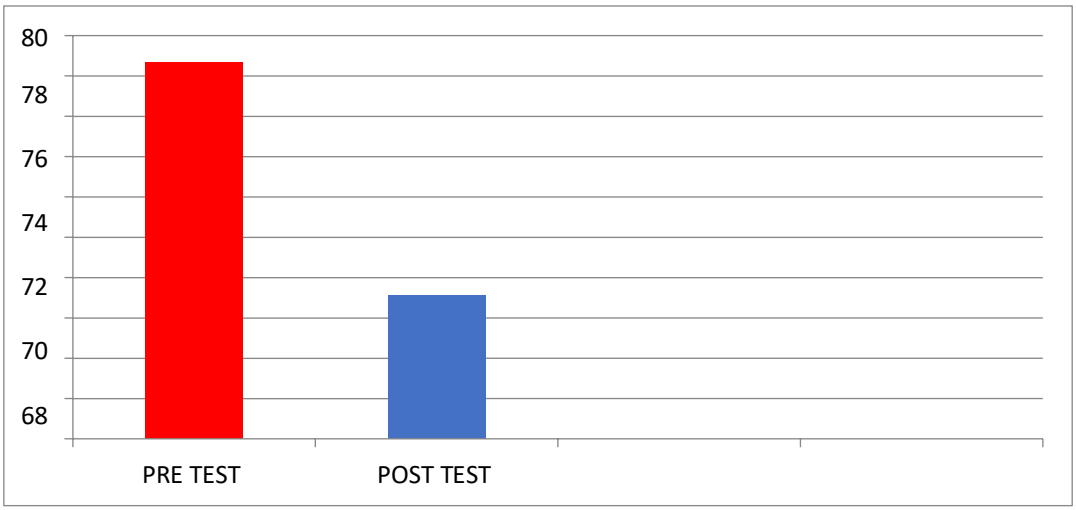
INTERPRETATION: The above table shows the mean of pre-test and post – test values of FFI for group A were 78.67 and 67.13 respectively. The mean diff is 11.54 and‘t’ value is 1.16 and ‘P’ value less than 0.05.

4. ANALYSIS OF PRE-TEST AND POST-TEST VALUES OF FFI WITHIN GROUP A:

FFI	Mean	N	SD	Std. Error Mean	Mean Diff	T	P	Significance
Pre-test	78.67	30	4.14	0.75	11.54	1.84	**	***
Post-test	67.13	30	3.192	0.58				

***** Significant difference (P<0.05)

GRAPH 4



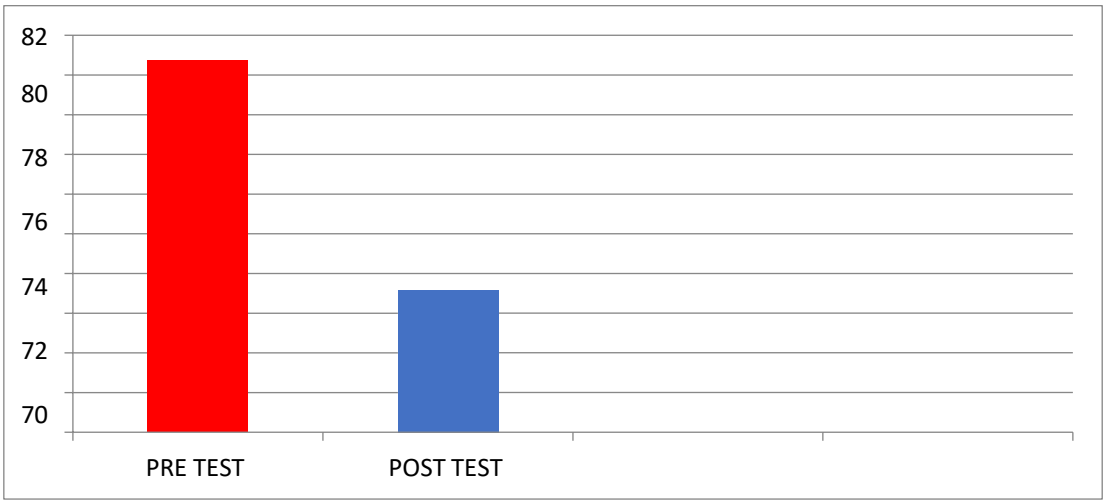
INTERPRETATION: The above table shows the mean of pre-test and post – test values of FFI for group A were 78.67 and 67.13 respectively. The mean diff is 11.54 and‘t’ value is 1.16 and ‘P’ value less than 0.05.

5. ANALYSIS OF PRE-TEST AND POST-TEST VALUES OF FFI WITHIN GROUP B:

	Mean	N	SD	Std. Error Mean	Mean Diff	T	P	Significance
Pre-test	80.73	30	2.43	0.44	11.56	1.35	***	**
Post-test	69.17	30	3.20	0.58				

***** Significant difference (P<0.05)

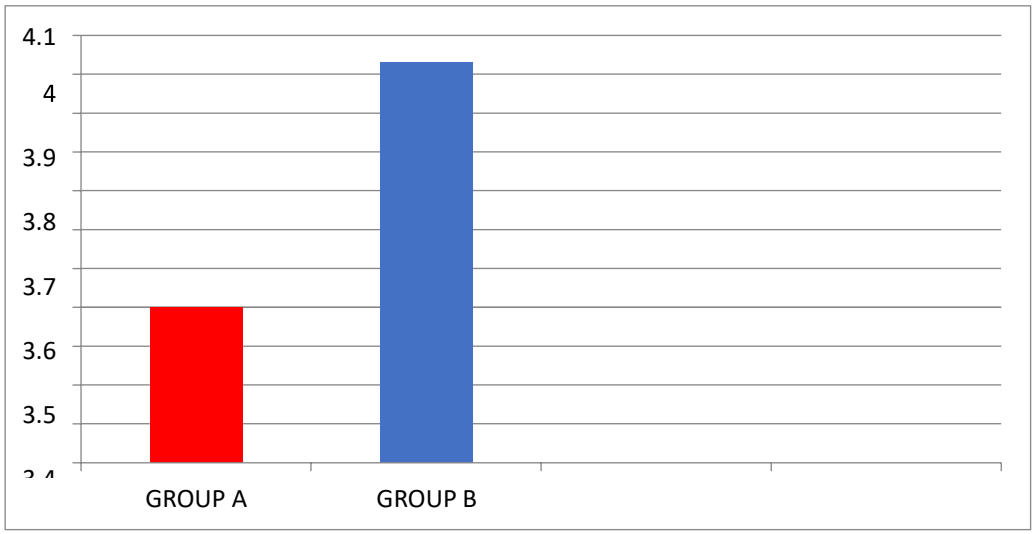
GRAPH 5



INTERPRETATION: The above table shows the mean of pre-test and post – test values of FFI for group B were 80.73 and 69.17 respectively. The mean diff is 11.56 and‘t’ value is 1.35 and ‘P’ value less than 0.05.

6. ANALYSIS OF POST-TEST VALUES OF VAS WITHIN GROUP A & B:

VAS	Mean	N	SD	Std. Error Mean	Mean Diff	T	P	Significance
GROUP A	3.4	30	0.85	0.15	0.63	5.95	**	**
GROUP B	4.03	30	0.76	0.11				



GRAPH 6

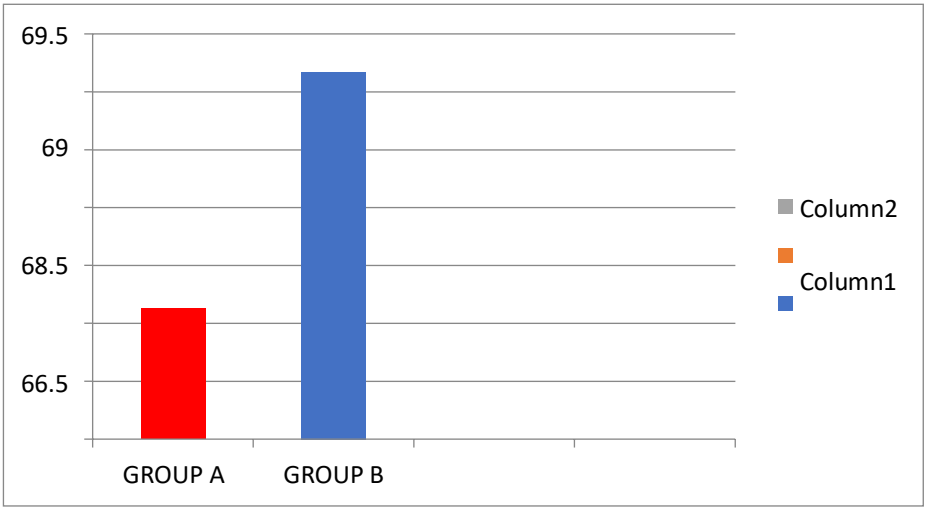
INTERPRETATION: The above table shows the mean of post – test values of VAS for group A& B were 3.4 and 4.03 respectively. The mean diff is 0.63 and't' value is 5.95 and 'P' value less than 0.05.

7. ANALYSIS OF POST-TEST VALUES OF FFI WITHIN GROUP A& B:

FFI	Mean	N	SD	Std. Error Mean	Mean Diff	T	P	Significance
GROUP A	67.13	30	3.19	0.58	2.04	1.335	**	***
GROUP B	69.17	30	3.20	0.58				

***** Significant difference (P<0.05)

GRAPH 7



INTERPRETATION: The above table shows the mean of post – test values of FFI for group A & B were 67.13 and 69.17 respectively. The mean diff is 2.04 and 't' value is 1.33 and 'P' value less than 0.05.

DISCUSSIONS

Instrument assisted soft tissue mobilization (IASTM) is a skilled myofascial intervention used for soft-tissue treatment. It is based on the principles of James Cyriax cross-friction massage.

It is applied using instruments that are usually made of stainless steel with edges and contours that can conform to different body anatomical locations and allows for deeper penetration. It is used for the detection and treatment of soft tissue disorders.

Studies have addressed the benefits of IASTM at the cellular level. The inflammatory response initiated through micro trauma to the affected tissues results in increased fibroblast proliferation, collagen synthesis, maturation and the remodelling of unorganized collagen fibre matrix following IASTM application. Which result in a breakdown of scar tissues, adhesions and facial restrictions.

Fibroblast is considered the most important cell in the extracellular matrix (ECM). The repair, regeneration and maintenance of soft tissue take place in the ECM. The fibroblast synthesizes the ECM, which includes collagen, elastin and proteoglycans, among many other essential substances. Fibroblasts have the ability to react as mechanotransducers, which means they are able to detect biophysical strain (deformation) such as compression,torque, shear and fluid flow, and create a mechanochemical response.

Gehlsen et al investigated the effects of 3 separate IASTM pressures on rat Achilles tendons. They concluded that fibroblast production is directly proportional to the magnitude of IASTM pressure used by the clinician. Davidson et al supported Gehlsen et al. by concluding that IASTM significantly increased fibroblast production in rat Achilles tendons by using electron microscopy to analyze tissue samples following IASTM application

Davidson et al. found morphologic changes in the rough endoplasmic reticulum following IM application. Thus, indicating micro trauma to damaged tissues, resulting in an acute fibroblast response.

IASTM have a neurophysiological effect as it stimulates mechanosensitive neurons through skin deformation by the instrument. Mechanosensitive neurons include

mechanoreceptors which are responsible for two-point discrimination and mechano-nociceptors which are responsible for pain perception.

A study by Weiqing Ge, found the IASTM changed the neural activity of the large mechanoreceptor neurons affecting the two-point discrimination. Another study by Scott

W. Cheatham et al, studies the effect of IASTM on DOMS (delayed onset muscle soreness) and the results found a decrease in the area of 2 point discrimination suggesting improvedlocal tactile sense through mechanoreceptors stimulation and a decrease in the pain pressure threshold which suggest that light IASTM modulated the nociceptors (small pain fibres) activity.

IASTM affects the vascular response to the injured soft tissue, through increasing the bloodflow. As evident by Loghmani et al, who studied the effect of IASTM on the knee MCL inrats, and found an increase in tissue perfusion and increase in the proportion of arteriole- sized blood vessels in the treated leg.

In this study the purpose was to compare the effectiveness between IASTM and plantar fascia stretching and hot packs with plantar fascia stretching in chronic heel pain.

The statistical analysis of results shows that both the group had significant effects but whilecomparing it showed that IASTM and plantar fascia stretching had more significant effect.

CONCLUSION

The study concludes that both IASTM with plantar fascia stretching and hot packs with plantar fascia stretching had significant effects on chronic heel pain but while comparing it showed that group treated with IASTM with plantar fascia stretching has statistically more significant effect than the group treated with hot packs with plantar fascia stretching for chronic heel pain.

LIMITATIONS OF THE STUDY

1. The study was limited due to shorter duration of treatment.

2. The study was limited due to less number of chronic heal pain patients.

3. The study was limited age group between 18-50 years.

4. The study was limited to lower limb involvement in chronic heal pain patients.

RECOMMENDATIONS FOR FURTHER STUDY

1. It may be recommended that treatment course could be of prolong duration, so that more results could be evaluated.

2. Further study could be design with large number of sample size.

3. It may be recommended that study could be done on different age groups.

4. It may be recommended that more studies are needed to be done in various techniques to improve in chronic heal pain patients.

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