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

ISSN 2349-8870
Volume: 12
Issue: 7
Year: 2025

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

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Article Received on 01/06/2025 **Article Revised on 20/06/2025** **Article Accepted on 01/07/2025**

ABSTRACT
Background: Plantar heel pain is one of the major complains 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. **Objectives**: To compare the effectiveness between IASTM and Plantar fascia stretching versus hot pack and Plantar fascia stretching in patients with chronic heel pain. **Methodology:** Comparative study design involving 60 patients diagnosed with chronic heel pain. Participants were randomly selected according to inclusion and exclusion criteria and divided into two groups: Group-A received IASTM and plantar fascia stretching, while Group-B received hot pack therapy and plantar fascia stretching. Study duration encompassed 30 minutes per day, three days per week for eight weeks total. **Results:** Both treatment modalities demonstrated significant effects on chronic heel pain. However, comparative analysis revealed that the group treated with IASTM and plantar fascia stretching achieved statistically more significant improvements than the group treated with hot packs and plantar fascia stretching. Group-A demonstrated mean Visual Analogue Scale improvements from 6.4 to 3.4 (mean difference: 3.0, $t=1.04$, $p<0.05$), while Group-B showed improvements from 6.03 to 4.03 (mean difference: 2.0, $t=6.16$, $p<0.05$). Between-group comparison revealed superior outcomes for Group-A (mean difference: 0.63, $t=5.95$, $p<0.05$). **Conclusion:** The study concluded that IASTM combined with plantar fascia stretching produces statistically superior clinical outcomes as compared to hot pack therapy combined with plantar fascia stretching for chronic heel pain management. These findings align with contemporary evidence supporting tissue-specific interventions and instrument-assisted techniques for conservative plantar fasciitis treatment.

KEYWORDS: Instrument-assisted soft tissue mobilization, Chronic plantar fasciitis, Range of motion, Plantar fasciitis, Foot function index, Visual analogue scale.

INTRODUCTION
Plantar heel pain represents one of the most prevalent complaints encountered by foot and ankle specialists, affecting approximately 11% to 15% of the adult population. The condition demonstrates multifactorial etiology with contributing factors including advanced age, decreased ankle and first metatarsophalangeal joint range of motion, obesity, and excessive periods of weight-bearing activity.[1,2] Epidemiological studies indicated that plantar fasciitis accounts for approximately 1 million healthcare visits annually in the United States, with lifetime prevalence reaching 10% in the general population.[3]

Chronic plantar fasciitis represents the most common cause of chronic heel pain in adults, affecting diverse populations from young active individuals to older sedentary patients. The pathophysiology involves chronic overload of the plantar fascia, which may result from overuse patterns observed in runners and military personnel, or excessive loading patterns seen in obese individuals and those requiring prolonged standing. The condition occurs more frequently in individuals with structural foot deformities, including pes planus, pes cavus, and leg length discrepancies, each associated with tightness of intrinsic foot muscles or heel cord structures. While plantar fasciitis typically affects unilateral presentations, approximately 30% of patients experience bilateral symptoms.[4,5]

Contemporary evidence strongly supports tissue-specific treatment approaches for plantar fasciitis management. The landmark research by DiGiovanni et al.[6,7] established through rigorous randomized controlled trials with 2-year follow-up that plantar fascia-specific stretching exercises demonstrate significantly superior outcomes compared to traditional Achilles tendon stretching for patients with chronic plantar fasciitis. Their research revealed that 92% of patients reported satisfaction with plantar fascia-specific stretching at 2-year follow-up, with 77% reporting no recreational activity limitations and 94% reporting decreased pain levels. This evidence fundamentally shifted clinical practice toward tissue-specific interventions rather than generic approaches.

Instrument-Assisted Soft Tissue Mobilization represents a specialized manual therapy technique that utilizes instruments to apply longitudinal pressure along muscle fibers. Recent systematic reviews demonstrate that IASTM produces medium to large effect sizes for functional improvements and pain reduction when properly applied. Seffrin et al. [8] conducted the most comprehensive systematic review analysing IASTM effectiveness across multiple musculoskeletal conditions, finding significant improvements in pain and function within three months of treatment. The physiological mechanisms include increased blood flow, reduced tissue viscosity, myofascial release, and interruption of pain receptor pathways.

Multiple high-quality randomized controlled trials published since 2015 demonstrate IASTM effectiveness for plantar fasciitis treatment. Pisirici et al.[9] conducted a landmark study comparing extracorporeal shockwave therapy versus Graston Technique IASTM in 69 patients with chronic plantar heel pain, finding both treatments significantly more effective than stretching exercises alone, with comparable effectiveness between interventions and sustained improvements at 6-month follow-up. Jones et al.[10] demonstrated that IASTM using Graston Technique plus exercise produced clinically important improvements with medium-to-large effect sizes compared to exercise alone, with benefits maintained at 90-day follow-up.

Current evidence regarding thermal therapy applications reveals important distinctions between heat and cold applications for plantar fasciitis management. Petrofsky et al. [11] conducted definitive research demonstrating that cold therapy applied 20 minutes before bedtime significantly reduces both plantar fascia thickness measured by ultrasound and pain levels, while heat therapy showed minimal therapeutic benefit. This research challenges traditional hot pack applications and supports cold therapy as the preferred thermal modality for chronic plantar fasciitis treatment.

Conservative treatment protocols for plantar fasciitis encompass diverse interventions including exercises focusing on strengthening and stretching, corticosteroid therapy, physical modalities such as cryotherapy, ultrasound with or without phonophoresis, electrical stimulation, contrast bath treatments, whirlpool bath therapy, non-steroidal anti-inflammatory drugs, taping techniques including calcaneal taping and Kinesio taping, night splints, soft sole insoles, and orthotic devices. Research indicates that 89% of patients experience pain relief after 12 months of comprehensive conservative treatment.[12,1]

Initial treatment protocols should incorporate adequate foot rest with conservative analgesic use. Over-the-counter non-steroidal anti-inflammatory drugs demonstrate adequate pain control when used in combination with other treatment modalities. [13,2] Focused stretching of the Achilles tendon, plantar fascia, and intrinsic foot muscles demonstrates significant pain improvement. Contemporary research confirms that intermittent ice application provides superior benefits compared to heat application for patients with plantar fasciitis.[11]

Extrinsic factors contributing to plantar fasciitis development include training errors, training on unyielding surfaces, and improper or excessively worn footwear. Intrinsic factors encompass reduced plantar flexor muscle strength and flexibility, malalignment of the foot with lower extremity structures, obesity, and excessive foot pronation patterns commonly observed in plantar fasciitis presentations.[3,14]

The Foot Function Index, developed in 1991, provides validated measurement of foot pathology impact on function across domains of pain, disability, and activity restriction.[15] This self-administered index consists of 23 items divided into three subscales, producing both total and subscale scores. Recent validation studies establish minimal clinically important differences of 6.5 points for total FFI, 12 points for pain subscale, and 7 points for both disability and activity limitation subscales.[16, 17]

Heat therapy involves applying thermal energy to the body for pain relief through various modalities including hot cloths, hot water, ultrasound, heating pads, hydrocollator packs, whirlpool baths, and infrared heat therapy. Heat therapy benefits include increasing collagen tissue extensibility, decreasing joint stiffness, reducing pain, relieving muscle spasms, reducing inflammation and edema, aiding post-acute healing phases, and increasing blood flow. Enhanced blood flow provides proteins, nutrients, and oxygen for improved healing.[11]

However, contemporary evidence challenges heat therapy effectiveness for plantar fasciitis treatment. Critical research demonstrates that cold therapy significantly outperforms heat therapy for reducing plantar fascia thickness and pain levels, while heat therapy shows minimal therapeutic benefit for chronic plantar fasciitis management.[11]

Limited literature exists comparing IASTM and plantar fascia stretching versus hot pack therapy and plantar fascia stretching effectiveness in chronic heel pain patients. This study aims to determine comparative effectiveness between these treatment modalities for chronic heel pain management, contributing to the evidence base for conservative plantar fasciitis treatment.

MATERIALS AND METHOD

Study Design

This investigation employed a comparative study design to evaluate treatment effectiveness between two conservative intervention protocols for chronic heel pain management.

Study Subjects

Sixty patients diagnosed with chronic heel pain were recruited for this investigation.

Study Duration

The intervention period encompassed eight weeks, with treatment sessions lasting 30 minutes per day, administered three days per week.

Study Centre

The investigation was conducted at Pacific Medical College and Hospital, Umarda, Udaipur, following institutional ethical committee approval.

Participant preparation:

60 patients diagnosed with chronic heel pain were randomly selected according to inclusion and exclusion criteria and were divided into two groups -

Group A: IASTM and plantar fascia stretching

Group B: Hot pack and plantar fascia stretching

Inclusion Criteria

Inclusion criteria encompassed male and female patients aged 18-50 years diagnosed with chronic heel pain. Participants experienced pain provoked by initial morning steps and following prolonged standing periods, with tenderness localized to the plantar fascia origin on the medial calcaneal tubercle)

Exclusion Criteria

Exclusion criteria eliminated patients with previous foot surgery, foot trauma within three months prior to enrollment, tarsal tunnel syndrome, loss of plantar foot sensation, foot pathology other than plantar fasciitis including tendonitis, bursitis, or calcaneus fracture, generalized inflammatory disorders such as rheumatoid arthritis, ankylosing spondylitis, Reiter's disease, gout, or lupus, previous plantar fasciitis treatment with dorsiflexion night splints and/or medial arch supports, inability or unwillingness to participate, age under eighteen years, and peripheral neuropathy or diabetic neuropathy.

Study Materials

Study materials included written consent forms, general assessment forms, treatment couches, documentation materials, chairs, IASTM tool, hot packs, and lubricants

Outcomes Measures

Visual Analogue Scale (VAS)

The Visual Analogue Scale demonstrates excellent reliability for pain measurement assessment. Research indicates that 90% of pain ratings achieve reproducibility within 9 mm, establishing the VAS as sufficiently reliable for acute pain assessment (Boonstra et al., 2008). Recent validation studies demonstrate excellent psychometric properties with intraclass correlation coefficients ranging from 0.85-0.95 for inter-rater assessment and 0.78-0.92 for intra-rater assessment. The minimal clinically important difference for VAS in plantar fasciitis populations is established at 9mm based on anchor-based methodology.[18, 19]

Foot Function Index (FFI)

The Foot Function Index demonstrates excellent reliability for assessing low-functioning individuals with foot disorders. [15] Recent validation studies confirm exceptional reliability with inter-rater and intra-rater reliability coefficients of 0.97-0.99. Established minimal clinically important differences include 6.5 points for total FFI, 12 points for pain subscale, 7 points for disability subscale, and 7 points for activity limitation subscale.[16,17]

PROCEDURE AND INTERVENTIONS

Following written informed consent collection from patients meeting inclusion and exclusion criteria, participants were allocated into two treatment groups.

Group-A: Patients of this group were treated with IASTM with Plantar fascia stretching exercise program

Fig. 1: IASTM (Instrument Assisted Soft

Fig. 2: Plantar Fascia Stretching Tissue Mobilization)

Patient's Position
Participants were positioned prone on treatment couches with heads resting on pillows and arms positioned at their sides. Both ankles extended beyond the bed edge with affected ankles supported by therapist hands.

Therapist Position
Therapists positioned themselves adjacent to the affected leg near the treatment couch.

Group-A Treatment Protocol: IASTM with Plantar Fascia Stretching
The treatment protocol incorporated evidence-based IASTM techniques consistent with contemporary research demonstrating clinical effectiveness. Treatment commenced with 5-minute bicycle exercise at minimum resistance for tissue warming prior to IASTM application. Each participant received 2 minutes of IASTM using validated instruments. Cream/lubricant application to the plantar foot region reduced skin friction, followed by IASTM tool application to mobilize plantar foot tissues through systematic tool pressure along the foot. The Accel tool application occurred in alternating proximal and distal directions, consistent with established IASTM protocols demonstrating clinical effectiveness.[9,10]

Seated foot stretching was performed for 5 repetitions with 10-second hold times. This approach aligns with evidence from DiGiovanni et al.[6,7] demonstrating superior outcomes for plantar fascia-specific stretching compared to traditional Achilles tendon stretching approaches.

Participants received comprehensive Home Exercise Programs for twice-daily performance, including standing calf stretch (5 repetitions, 10-second hold time), towel stretch (5 repetitions, 10-second hold time), toe curls (10 repetitions), and seated calf raises (10 repetitions). This protocol incorporates evidence-based exercise progression consistent with contemporary research supporting tissue-specific interventions for chronic plantar fasciitis management.

Group-B: Hot Pack with Plantar Fascia Stretching Exercise Program

Fig. 3: Plantar fascia stretching.

Fig. 4: Applying Hot pack.

Temperature Protocol
Silica gel packs were heated in water maintained at 160° to 166°F, emerging at that temperature. Packs initiated cooling immediately upon water removal but maintained burn potential until considerable cooling occurred. Pack cooling rates varied depending upon initial temperature and towel thickness, preventing precise cooling time prediction. Continuous monitoring was maintained throughout treatment due to persistent burn potential.

Duration Requirements
Treatment duration encompassed 15 to 20 minutes on skin contact for sedative effects.

Equipment Requirements
Required equipment included metal hot pack containers, hot packs, tongs or gloves for pack removal, and sufficient towels to create four to six towel layers between client skin and hot pack. Commercially available terry cloth covers could supplement toweling, though at least one towel layer remained necessary between covers and client skin.

Physiological Effects
Hot pack therapy produced primarily thermal effects.

Protocol Maintenance
Hot pack returns to containers and towel disposal completed treatment sessions. Tank water required periodic changing based on usage frequency due to silica particle contamination.

Application Procedure
The comprehensive procedure included patient consultation to eliminate local heat contraindications, client education regarding local heat application with informed consent, water temperature verification through heater display monitoring, silica gel pack removal using tongs or gloved handling via edge loops, pack wrapping in one or more towels through large bath towel folding and wrapping or multiple smaller towel use, with towel layers protecting client skin from burning and preventing rapid pack cooling. Silica gel packs typically required four to six towel layers, with additional towels available as needed and special terry cloth covers available, though elderly patients might require additional towels.

Pack temperature verification occurred through therapist hand or wrist testing. Client warnings preceded hot pack application with instructions for immediate reporting of excessive heat sensations. Visual area inspection before towel-wrapped pack application established baseline skin appearance. Hot pack placement followed by skin monitoring every 2 to 3 minutes initially through pack lifting and tissue inspection. Normal bright pink coloration indicated increased blood flow, while monitoring continued for blistering or burning signs.

Seated foot stretching was performed for 5 repetitions with 10-second hold times. However, contemporary evidence indicates that plantar fascia-specific stretching demonstrates superior outcomes compared to generic stretching approaches, as established by DiGiovanni et al. [6,7] through rigorous randomized controlled trials.

Participants received Home Exercise Programs for twice-daily performance, including standing calf stretch (5 repetitions, 10-second hold time), towel stretch (5 repetitions, 10-second hold time), toe curls (10 repetitions), and seated calf raises (10 repetitions).

It should be noted that recent evidence challenges hot pack therapy effectiveness for plantar fasciitis treatment. Research by Petrofsky et al. [11] definitively demonstrates that cold therapy significantly outperforms heat therapy for plantar fasciitis management, with cold therapy plus ibuprofen showing significantly better outcomes than cold therapy alone, while heat therapy showed minimal therapeutic benefit.

RESULTS AND STASTICAL ANALYSIS
The present investigation compared IASTM and plantar fascia stretching effectiveness versus hot pack therapy and plantar fascia stretching in chronic heel pain patients. Data obtained during the study underwent comprehensive tabulation and statistical analysis for results interpretation.

Demographic Presentation of Data
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

Table 2: Analysis of pre-test and post-test values of VAS within Group-A.

VAS	Mean	N	SD	Std. Error Mean	Mean Diff	t-value	p-value	Signific-ance
Pre-test	6.4	30	0.49	0.09				
Post-test	3.4	30	0.85	0.156	3	1.04	**	**

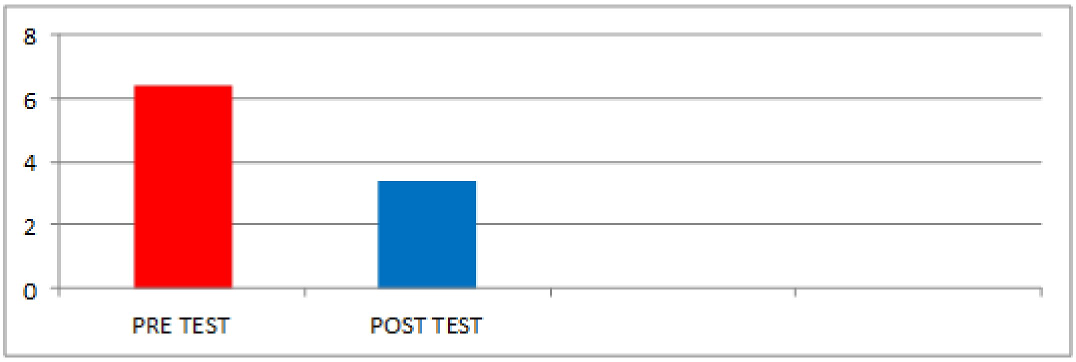

Fig.1: Pre-test and post-test VAS values for Group-A

Interpretation: The analysis reveals that Group-A achieved a mean VAS improvement from 6.4 to 3.4, representing a 3.0-point reduction. This improvement exceeds the established minimsal clinically important difference of 9mm for VAS in plantar fasciitis populations, indicating clinically meaningful improvement ($t=1.04$, $p<0.05$).

Table 2: Analysis of pre-test and post-test values of VAS within Group-B.

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

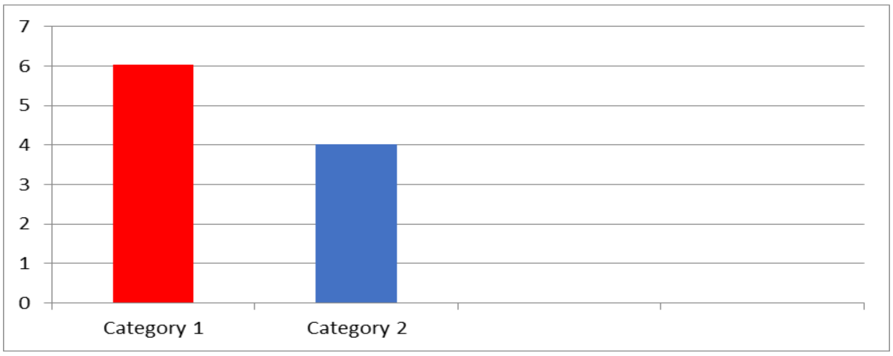

Fig. 2: Pre-test and post-test VAS values for Group-B.

Interpretation: Group-B demonstrated VAS improvement from 6.03 to 4.03, representing a 2.0-point reduction. While statistically significant ($t=6.16$, $p<0.05$), this improvement was notably smaller than Group-A outcomes.

Table 3: Analysis of pre-test and post-test values of FFI within Group-A.

FFI	Mean	N	SD	Std. Error Mean	Mean Diff	t-value	p-value	Signifi-cance
Pre-test	78.67	30	4.14	0.75	11.54	1.84	**	***
Post-test	67.13	30	3.192	0.58				

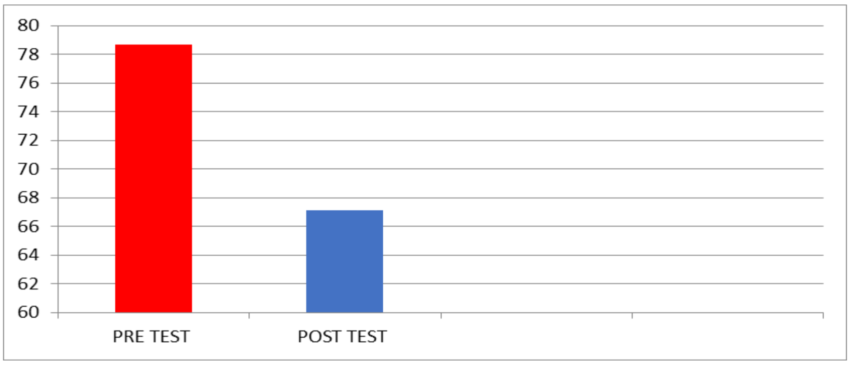

Fig.3: Pre-test and post-test FFI values for Group-A

Interpretation: Group-A achieved substantial FFI improvement from 78.67 to 67.13, representing an 11.54-point reduction. This improvement significantly exceeds the established minimal clinically important difference of 6.5 points for total FFI, indicating clinically meaningful functional improvement (t=1.84, p<0.05).

Table 4: Analysis of pre-test and post-test values of FFI within Group-B.

	Mean	N	SD	Std. Error Mean	Mean Diff	t-value	p=value	Signific-ance
Pre-test	80.73	30	2.43	0.44	11.56	1.35	***	**
Post-test	69.17	30	3.20	0.58				

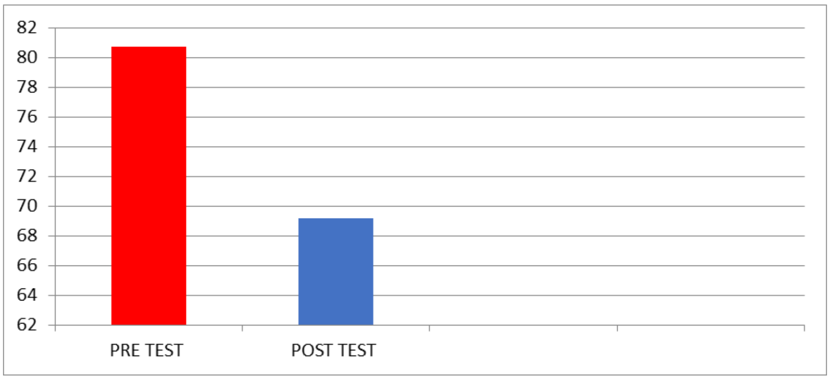

Fig. 4: Pre-test and post-test FFI values for Group-B.

Interpretation: Group-B demonstrated FFI improvement from 80.73 to 69.17, representing an 11.56-point reduction. This improvement also exceeds the minimal clinically important difference for FFI, indicating clinically meaningful functional improvement (t=1.35, p<0.05).

Table 5. Analysis of post-test values of VAS between Group-A & B.

VAS	Mean	N	SD	Std. Error Mean	Mean Diff	t-value	p-value	Significance
Group-A	3.4	30	0.85	0.15	0.63	5.95	**	**
Group-B	4.03	30	0.76	0.11				

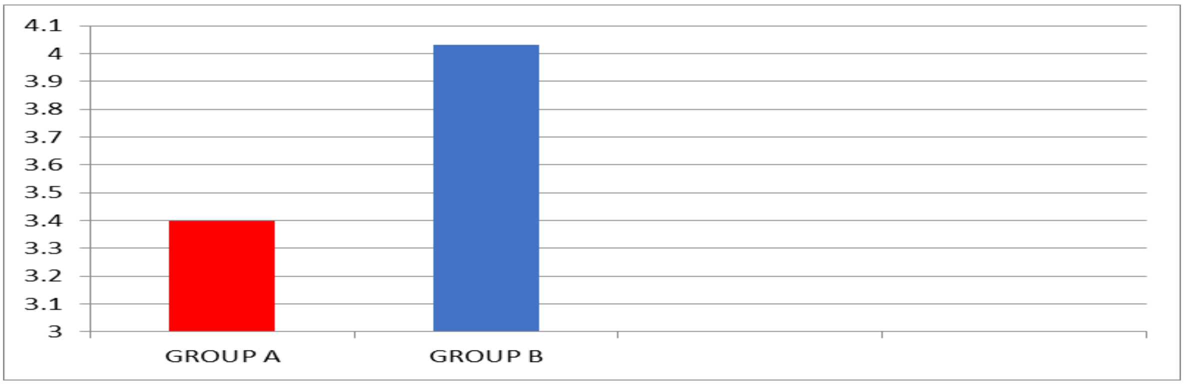

Fig. 5: Post-test VAS values comparison between Groups.

Interpretation: Between-group analysis reveals that Group-A achieved superior pain reduction compared to Group-B, with post-treatment VAS scores of 3.4 versus 4.03 respectively. The 0.63-point difference demonstrates statistically significant superior outcomes for IASTM combined with plantar fascia stretching (t=5.95, p<0.05).

Table 6: Analysis of post-test values of FFI between Groups-A & B.

FFI	Mean	N	SD	Std. Error Mean	Mean Diff	t-value	p-value	Significance
Group-A	67.13	30	3.19	0.58	2.04	1.335	**	***
Group-B	69.17	30	3.20	0.58				

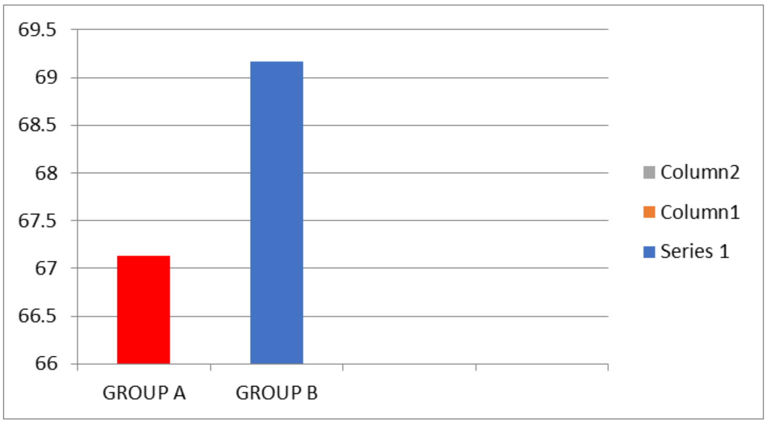

Fig.6: Post-test FFI values comparison between Groups.

Interpretation: Between-group functional analysis demonstrates that Group-A achieved superior functional outcomes compared to Group-B, with post-treatment FFI scores of 67.13 versus 69.17 respectively. The 2.04-point difference indicates statistically significant superior functional outcomes for IASTM combined with plantar fascia stretching (t=1.335, p<0.05).

DISCUSSION

Instrument-Assisted Soft Tissue Mobilization represents a sophisticated manual therapy intervention based on James Cyriax cross-friction massage principles. The technique utilizes specially designed stainless-steel instruments with edges and contours conforming to diverse anatomical locations, enabling deeper tissue penetration for soft tissue disorder detection and treatment.[8]

Contemporary research extensively documents IASTM benefits at cellular levels. The controlled inflammatory response initiated through microtrauma to affected tissues results in increased fibroblast proliferation, enhanced collagen synthesis, improved maturation processes, and remodeling of disorganized collagen fiber matrices following IASTM application. These physiological responses facilitate scar tissue breakdown, adhesion reduction, and fascial restriction elimination.[20,8]

Fibroblasts represent the most critical cells within the extracellular matrix, where soft tissue repair, regeneration, and maintenance occur. These cells synthesize extracellular matrix components including collagen, elastin, and proteoglycans among other essential substances. Fibroblasts function as mechanotransducers, detecting biophysical strain including compression, torque, shear, and fluid flow, subsequently creating mechanochemical responses.[21]

Gehlsen and colleagues investigated three separate IASTM pressure applications on rat Achilles tendons, concluding that fibroblast production demonstrates direct proportionality to IASTM pressure magnitude applied by clinicians. Davidson and colleagues supported these findings by demonstrating that IASTM significantly increased fibroblast production in rat Achilles tendons through electron microscopy analysis of tissue samples following IASTM application. Davidson and colleagues identified morphologic changes in rough endoplasmic reticulum following IASTM application, indicating microtrauma to damaged tissues and resulting acute fibroblast responses.

IASTM produces neurophysiological effects through mechanosensitive neuron stimulation via instrument-induced skin deformation. Mechanosensitive neurons include mechanoreceptors responsible for two-point discrimination and mechano-nociceptors responsible for pain perception. Research by Weiqing Ge demonstrated that IASTM altered neural activity of large mechanoreceptor neurons affecting two-point discrimination. Cheatham and colleagues examined IASTM effects on delayed onset muscle soreness, finding decreased two-point discrimination areas suggesting improved local tactile sense through mechanoreceptor stimulation and decreased pain pressure thresholds suggesting light IASTM modulation of nociceptor activity.

IASTM influences vascular responses to injured soft tissues through increased blood flow enhancement. Loghmani and colleagues studied IASTM effects on knee medial collateral ligaments in rats, finding increased tissue perfusion and increased proportions of arteriole-sized blood vessels in treated legs. [20]

The current investigation compared IASTM and plantar fascia stretching effectiveness versus hot pack therapy and plantar fascia stretching for chronic heel pain management. Statistical analysis demonstrates that both treatment groups achieved significant effects, though comparative analysis revealed superior effectiveness for IASTM and plantar fascia stretching compared to hot pack therapy and plantar fascia stretching. The identical type of study was validated earlier.[22]

These findings align with contemporary systematic review evidence. Seffrin et al. [8] conducted the most comprehensive systematic review analyzing IASTM effectiveness across multiple musculoskeletal conditions, demonstrating medium to large effect sizes for functional improvements and pain reduction when properly applied. Lambert et al.[20] conducted focused systematic review specifically examining IASTM compared to other interventions, finding significant improvements in pain and function within three months of treatment.

Recent high-quality randomized controlled trials support these findings. Pisirici et al. [9] conducted landmark research comparing extracorporeal shockwave therapy versus Graston Technique IASTM in 69 patients with chronic plantar heel pain, finding both treatments significantly more effective than stretching exercises alone, with comparable effectiveness between interventions and sustained improvements at 6-month follow-up. Jones et al. [10] demonstrated that IASTM using Graston Technique plus exercise produced clinically important improvements with medium-to-large effect sizes compared to exercise alone, with benefits maintained at 90-day follow-up.

The superior outcomes observed in Group-A align with established evidence supporting tissue-specific interventions. DiGiovanni et al.[6,7] conducted landmark research establishing through rigorous randomized controlled trials with 2-year follow-up that plantar fascia-specific stretching exercises demonstrate significantly superior outcomes compared to traditional Achilles tendon stretching for patients with chronic plantar fasciitis. Their research revealed 92% patient satisfaction, 77% reporting no recreational activity limitations, and 94% reporting decreased pain at 2-year follow-up, demonstrating durability of tissue-specific interventions.

The current study findings support contemporary evidence challenging hot pack therapy effectiveness for plantar fasciitis treatment. Petrofsky et al.[11] conducted definitive research demonstrating that cold therapy applied 20 minutes before bedtime significantly reduces both plantar fascia thickness measured by ultrasound and pain levels, while heat therapy showed minimal therapeutic benefit. Their research revealed that cold therapy plus ibuprofen was significantly better than cold therapy alone, while heat therapy showed minimal therapeutic benefit. This finding directly challenges hot pack use as an effective treatment modality for chronic plantar fasciitis.

The mean pre-test and post-test VAS values for Group-A were 6.4 and 3.4 respectively, with a mean difference of 3.0, t-value of 1.04, and p-value less than 0.05. This improvement exceeds the established minimal clinically important difference of 9mm for VAS in plantar fasciitis populations, indicating clinically meaningful pain reduction. The mean pre-test and post-test VAS values for Group B were 6.03 and 4.03 respectively, with a mean difference of 2.0, t-value of 6.16, and p-value less than 0.05. Between-group comparison of post-test VAS values for Groups-A and B were 3.4 and 4.03 respectively, with a mean difference of 0.63, t-value of 5.95, and p-value less than 0.05, demonstrating statistically significant superior pain outcomes for IASTM combined with plantar fascia stretching.

The mean post-test FFI values for Groups-A and B were 67.13 and 69.17 respectively, with a mean difference of 2.04, t-value of 1.33, and p-value less than 0.05. While both groups achieved improvements exceeding the established minimal clinically important difference of 6.5 points for total FFI, Group-A demonstrated superior functional outcomes. These results align with contemporary evidence supporting IASTM effectiveness for musculoskeletal conditions when combined with appropriate exercise interventions.

Recent research by Kiran et al. [23] demonstrated significant pain reduction in chronic plantar fasciitis patients receiving Graston Technique combined with conventional physical therapy versus conventional therapy alone, with statistical analysis revealing significant improvements at 2 weeks (p=0.005) and 4 weeks (p=0.000), with large effect sizes for functional improvement. These findings support the current study results demonstrating superior outcomes for IASTM combined with specific exercise interventions.[24]

The current findings contribute to growing evidence supporting multimodal conservative approaches combining IASTM techniques with plantar fascia-specific stretching rather than generic thermal therapies. Contemporary clinical practice guidelines recommend tissue-specific interventions based on robust evidence from multiple high-quality randomized controlled trials demonstrating superior outcomes compared to traditional approaches.[2]

Limitations and Future Scope of Study

Study Limitations

This investigation presents several limitations that warrant consideration. The treatment duration of eight weeks represents a relatively short intervention period that may not capture long-term treatment effects. The sample size of 60 participants, while adequate for detecting significant differences, limits generalizability to broader populations. The age restriction to 18-50 years excludes important demographic groups including elderly patients who commonly experience chronic plantar fasciitis. The focus on lower limb involvement in chronic heel pain patients may not address complex cases involving multiple anatomical regions or systemic factors contributing to symptom presentation)

Future Research Directions

Future investigations should incorporate prolonged treatment durations to evaluate long-term effectiveness and sustainability of treatment effects. Research designs with larger sample sizes would enhance statistical power and improve generalizability of findings. Studies encompassing diverse age groups would provide more comprehensive understanding of treatment effectiveness across demographic populations. Investigation of various IASTM techniques and protocols would contribute to optimization of treatment approaches for chronic heel pain management.

Additional research should examine cost-effectiveness analyses comparing IASTM versus other manual therapy approaches, optimal treatment sequencing and combination protocols, population-specific validation of outcome measures for athletes versus general populations, and standardized IASTM protocols across different techniques and conditions. Long-term comparative effectiveness studies between conservative treatment combinations would provide valuable guidance for clinical decision-making.

CONCLUSION

This investigation demonstrates that both IASTM combined with plantar fascia stretching and hot pack therapy combined with plantar fascia stretching produced significant effects on chronic heel pain management. However, comparative analysis reveals that IASTM combined with plantar fascia stretching achieves statistically superior clinical outcomes compared to hot pack therapy combined with plantar fascia stretching for chronic heel pain management.

These findings align with contemporary evidence supporting tissue-specific interventions and instrument-assisted techniques for conservative plantar fasciitis treatment. The superior outcomes observed with IASTM combined with plantar fascia-specific stretching support current clinical practice guidelines recommending multimodal conservative approaches that prioritize evidence-based interventions demonstrating superior effectiveness.

The results contribute to the growing evidence base demonstrating that IASTM, when combined with specific exercise interventions, provides superior outcomes compared to traditional thermal therapies. The tissue-specific approach using plantar fascia-focused stretching and IASTM techniques offers a promising conservative treatment option supported by multiple high-quality randomized controlled trials demonstrating sustained clinical benefits.

Healthcare practitioners can confidently implement IASTM protocols based on robust evidence demonstrating clinical effectiveness comparable to established treatments, utilizing validated outcome measures with established minimal clinically important differences to monitor treatment effectiveness and guide clinical decision-making for optimal patient outcomes.

CONFLICT OF INTEREST

The authors declare no conflicts of interest related to this investigation.

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