ORIGINAL ARTICLE

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IMMEDIATE EFFECT OF INSTRUMENT ASSISTED SOFT TISSUE MOBILIZATION ON HAMSTRING MUSCLE EXTENSIBILITY – PRE AND POST TEST DESIGN.

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ABSTRACT:

Background: Hamstring is a group of muscles at the posterior aspect of the thigh which is more prone to strain or tearing. Instrument Assisted Soft Tissue Mobilization (IASTM) is a new range of tool used for assessment and treatment of muscle tightness. Objective was to find out the effect of Instrument Assisted Soft Tissue Mobilization (IASTM) on increasing Hamstring muscle extensibility in terms of knee extension range of motion. **Materials and Methods:** 30 participants were selected using purposive sampling and assessed for hamstring tightness and pre-test ROM was measured using the AKE test. Then they were given hot pack for 5-10mins, after that IASTM was administered using edge tool, for 1min. The post-release subject was engaged in light active exercise and then post-test ROM was measured and the difference was noted. **Results:** There was a significant difference in the AKE test pre and post value when compared with the paired t-test. (p-value < 0.0001). **Conclusion:** Edge tool used for Instrument Assisted Soft Tissue Mobilization is useful to increase Hamstring Muscle Extensibility. **Keywords:** Hamstring muscle tightness, Instrument Assisted Soft Tissue Mobilization, Range of motion, Active Knee Extension Test.

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INTRODUCTION

Instrument-assisted soft tissue mobilization or simply IASTM is a new range of tool which enables clinicians to efficiently locate and treat individuals diagnosed with soft tissue dysfunction. The technique itself is said to be a model evaluation from traditional Chinese medicine called GUA SHA. However, GUA SHA was not used to treat musculoskeletal conditions but was traditionally applied along meridians to move the bad chi out through the skin. IASTM is a procedure that is rapidly growing in popularity due to its effectiveness and efficiency while remaining non-invasive, with its own indications and limitations.[1]

IASTM i.e. tool-assisted MFR represents a specific approach to soft tissue manipulation that uses different instruments to detect and treat myofascial restrictions to improve ROM and decrease pain. Instrument-assisted soft tissue mobilization (IASTM) is a popular treatment for myofascial restriction based upon the rationale introduced by James Cyriax .[1,2,3]

The idea to use an instrument is thought to provide a mechanical advantage for the clinician by allowing deeper penetration and more specific treatment, while also reducing imposed stress on the hands.[1]

The perception of using the instrument for soft tissue mobilization is theorized to increase vibration sensed by the clinician and patient. The increased perception of vibration may facilitate the clinician's ability to detect altered tissue properties (e. g, identify tissue adhesions) while facilitating patients awareness of altered sensations with the treated tissues.[4] Thus this study aimed to find the immediate effect of instrument assisted soft tissue mobilization on hamstring extensibility.

METHODOLOGY

The study was conducted at Dr. Vithalrao Vikhe Patil College of Physiotherapy, Ahmednagar in the Department of Musculoskeletal Physiotherapy. The Sampling technique used was Purposive Sampling. Its a Pre and Post-test design. The sample size was 30. Participants with age group 20 to 40 years, Hamstring tightness, reduced knee extension range were included in the study. Patient intolerance / Noncompliance and any injury around the Hamstring muscle or any systemic illness were excluded from the study. The Outcome Measure for this study was the Active Knee Extension Test, as described by David J. Magee.[5]

PROCEDURE

Institutional Ethical Committee Clearance was obtained before starting the study. Then patients were selected randomly and were explained about the test and the treatment manoeuvre. Written informed Consent was taken from the participants.

While starting with the IASTM manoeuvre ,we measured the Hamstring muscle tightness test using Active Knee Extension Test (AKE). During AKE Test ,the participant was first taken in the supine position. The hip of the leg to be tested was placed in 90◦ flexion. The contralateral leg was flat on the examination table, the clinician extends the knee until reaching a maximal tolerable stretch of the hamstring muscle as indicated by the patient, with ipsilateral hip in 90◦of flexion. The knee angle was then measured with a universal goniometer. The fulcrum of the goniometer was placed at the lateral condyle of the femur. The moving arm pointing towards the lateral malleolus and stationary was pointing towards the greater trochanter. The pre-test knee extension range was measured from 90◦to available range and it was noted.

Then while starting with the manoeuvre warm-up was given to the tissue to make it more pliable. For that hot pack was applied to the posterior aspect of thigh for 10 mins. Preparation of the treatment area – An emollient salve, the typical moisturizer was preferred medium for allowing smooth movement on the tissue. Post-warm-up Instrument Assisted Soft Tissue Mobilization for Hamstring muscle was performed for 1 minute using the edge tool. This was done with edge 1 of the tool.[6]

An initial scanning assessment technique using an angle of approximately 30◦ to skin. Light pressure was applied through the instrument, keeping wrists in a neutral position and fingers loose, in a sweeping motion from proximal to distal. The pressure was decreased as the tool was taken back proximally, never removing the instrument from the patient's skin. A distinct vibration is incurred whenever the instrument comes into contact with soft tissue lesions, thus guided specific areas of treatment.

Release Protocol:

The release was applied in a transverse direction to the underlying soft tissue lesion, therefore inducing a physiological inflammatory response.

Increased angles of application with maintained or increased pressure will increase the depth and the specificity of application. The release was applied for 1minute of treatment.

After release, at the end patient was engaged in light active exercise. The light active exercises conducted were Hamstring curls and Dynamic knee extension. Each exercise was repeated 10 sets of 10 repetitions. Post-exercise the ranges were again noted and the difference between pre and post-treatment range was calculated.

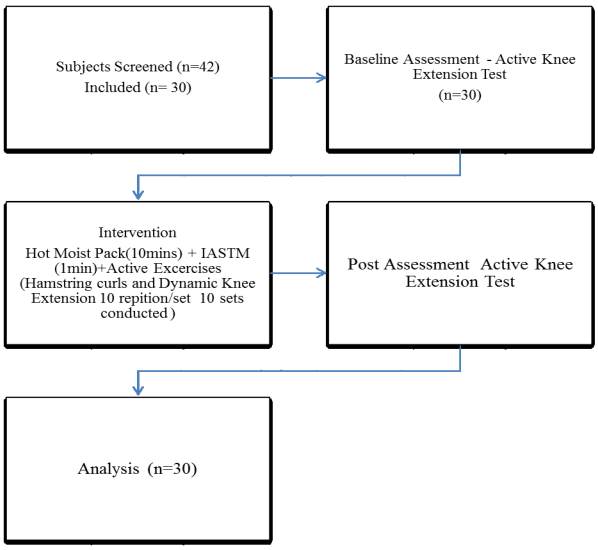

Fig 1 : Flowchart of study procedure

Fig 2: IASTM on Hamstring Muscle

RESULT

Results were analysed using SPSS24 version.Shapiro wilk test was used to determine the normality.

Table 1 shows baseline characteristics and Graph 1 shows the gender distribution .As the data passed the normality test ,Paired –t test was used for comparison of the data pre and post the intervention (Table 2 and Fig 3). Fig 4 shows the comparison of AKE test values between males and females.

Table 1 : Baseline characteristics of the participants

	Male	Female	p value
GENDER	12	18	---
AGE	19.91± 2.42	20.61±1.21	p>0.05
AKE TEST	109±5.02	106.27±6.4	p>0.05

(AKE –Active Knee Extension)

Table 2 : Pre and Post comparison of AKE

Pre Test	Post Test	t value	p value	Result
107.37±5.96	121.03±5.39	21.5	<0.0001	ES

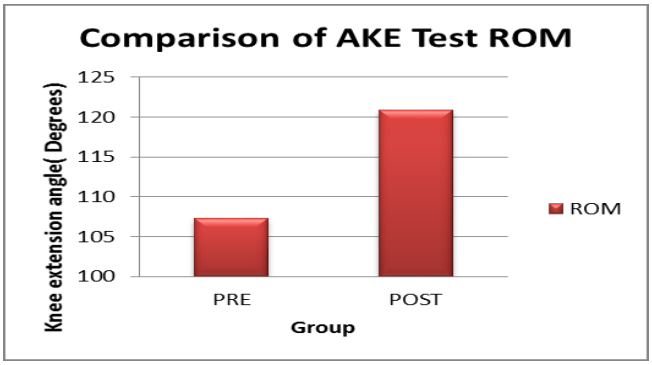

Fig 3: Comparison of Pre and Post AKE ROM

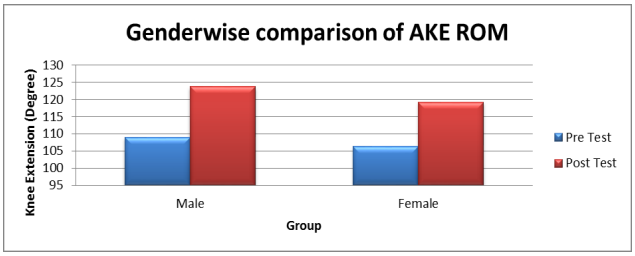

Fig 4: Comparison of AKE ROM between Genders

DISCUSSION

This study aimed at finding out ,the immediate Effect of Instrument Assisted Soft Tissue Mobilization on Hamstring Muscle extensibility.

To our knowledge this is first study done in hamstring muscles to improve extensibility using instrument assisted soft tissue mobilization. The efficacy of this technique is proved on trapezius, plantar fascia and trigger finger.

Our study resulted in significant difference in Active Knee Extension when compared pre and post test ROM value . (p value < 0.0001).

Our results are similar to the study done by M. Terry et al. In their study they treated guitarist with a finger joint injury using instrument-assisted soft tissue mobilization.[3]The patient gained positive outcomes with improvements in pain. Importantly, he was able to play the guitar with minimal to no pain as desired.[7] Physical measures also improved, including an immediate gain in finger range of motion with IASTM alone.

Also our study results match with some a study conducted by Dr. Basavaraj Motimath *et al* .In their study they found the immediate effect of Instrument Assisted Soft Tissue Mobilization (IASTM) With M2T blade technique in trapezitis[7].They concluded that Instrument Assisted Soft Tissue Mobilization (IASTM) with M2T Blade technique is an effective tool in immediate reduction of pain in subjects with trapezitis.[8]

Mechanism or effect of IASTM treatment on muscle is thought to stimulate connective tissue remodelling through restoration of excessive fibrosis, along with inducing repair and regeneration of collagen secondary to fibroblast recruitment.[1]

The mechanism behind improvement in extensibility of hamstrings is , the technique will result in release and breakdown of scar tissue , adhesions and fascial restrictions.[9,10]

The physiology explained for this is[9,10] –

1. Increased skin temperature of the area treated.
2. Faciliates reflex changes in chronic muscle holding pattern.
3. Alters spinal reflex activity (facilitated segment).
4. Increases the rate and amount of blood flow to and from the area treated.
5. Increases the cellular activity in the area, including fibroblasts and mast cells.
6. Increases histamine responses secondary to mast cells.

Our study also shows that females are more flexible than males, as pre test baseline mean values for women is 106.27 and for males it is 109.The results of this study support previous findings for between-sex differences in the mechanical properties of hamstring stiffness and extensibility. Previous research has provided insight into mechanistic factors that may contribute to the between-sex differences reported here. One study reported that increased electromechanical delay (EMD) of the medial hamstrings during the ISLR test was associated with greater hamstring extensibility in women, suggesting that the neuromuscular control of the hamstrings during stretch is altered in women .[11] Another study Croix et al reported that greater hamstring stiffness in men, as measured by an oscillating knee flexion/extension protocol, was positively associated with hamstring cross-sectional area (CSA). Measures of both stiffness and CSA were greater in male participants .[12]

The results of the study Sex comparison of hamstring structural and material properties done by J. Troy Blackburn suggest that the structural properties of the hamstrings differ across sex. Females demonstrated lesser hamstring stiffness compared to males in response to standardized loading conditions, indicating a compromised ability to resist changes in length associated with joint perturbation. However, the difference in hamstring stiffness was at least partially attributable to differences in muscle size, as the material properties of the hamstrings did not differ across sex.[13]

Another study that supports our result of females being more flexible than males when their flexibility was measured using Flexindex .They concluded that females tend to be more flexible than males of the same age throughout the life. [14] . Nischal et al found the prevalence of hamstring muscle tightness is greater in males as compared to females.[15]

A study done by Couture *et al* about Commercial foam rollers are commonly used for both clinical and home therapy.[16]Often self-administered using body weight as loading, little information is available as to the therapeutic effectiveness .The results of the present study showed no significant differences between baseline knee extension ROM and the ROM present after foam rolling for either a short (2 sets of 10s) or long (4 sets of 30s) duration. While the rolling times used in this study were comparable to previous research showing an increase in ROM which can be due to different rollers used or different rolling method.

A study done by F Ballentyne *et al* showed that a single application of Muscle Energy Technique to experimental group shows significant increase in ROM of knee and has no change in control group.When an significant torque applied to the experimental group there was no change seen in knee ROM .[17]Hence , this study concluded MET increases passive knee extension. This change in ROM was observed possibly due to increased tolerance to stretch as there is no viscoelastic changes.

Limitation of the study was that in few patients muscle soreness , bruising and petechiae was reported, but it got relieved in 24hrs-48hrs .No control group was added in our study hence effectiveness can't be generalised. Randomized controlled trial using control group for comparison can be helpful to improve the level of evidence for effectiveness of IASTM technique.

CONCLUSION

Edge tool used for Instrument Assisted Soft Tissue Mobilization is useful to increase Hamstring Muscle Extensibility in terms of knee extension range of motion. This study also proves that IASTM reduces therapist effort and improves accuracy of treatment. Hence ,this technique can be used in clinically setting for betters results in terms of Hamstring Muscle Extensibility

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