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Effects of Instrument Assisted Soft Tissue Mobilization Tool in Osteoarthritis Knee Patients

Vijay Krishna Kumar[1], Ansy George[2]

Affiliated to Rajiv Gandhi University of Health Science

[1]Principal, Department of Physiotherapy, Dr. B. R. Ambedkar College of Physiotherapy, Bangalore, India
EMAIL: hoddrbracp[at]gmail.com

[2]Intern, Department of Physiotherapy, Dr.B.R. Ambedkar College of Physiotherapy, Bangalore,India
EMAIL: ansy18george2000[at]gmail.com

Abstract: ***Background: Instrument assisted soft tissue mobilization (IASTM) is a beneficial treatment for myofascial restriction introduced by James Cyriax. IASTM is a new range of tool which enables clinicians to efficiently locate and treat individual. It is applied using instruments that are usually made of stainless steel with edges and contours that can conform to different body anatomical location. IASTM is a manual technique that has been known to be effective in improving active range of motion on hamstring muscles. Aim of Study: "To find out the effect of instrument assisted soft tissue mobilization tool in OA knee patient". Methodology: The study design is experimental study. The study was conducted in DR.B.R. Ambedkar College of physiotherapy with 20 samples by getting their consent who met inclusion criteria and exclusion criteria.20 patients were divided into two groups Group A and Group B. Visual analogue scale and active knee flexion range of motion using goniometry were used as outcome measure pre and post treatment. Results: The result obtained shows that group A has more improvement statistically than group B, clinically in terms of pain and active knee flexion range of motion. The result shows significant improvement in VAS and active Knee flexion range of motion from pre to post with p<0.001. Conclusion: The present study concluded that Instrument assisted soft tissue mobilization tool (IASTM) is effective in osteoarthritis knee patients.***

Keywords: Iastm tool, ultrasound therapy unit, osteoarthritis

1. Introduction

Knee osteoarthritis (OA) is a type of degenerative joint disorder that affects more than 80% of the elderly population over the age of 55. OA knee occurs most often in the hip and knee.[1] It is a widespread musculoskeletal condition in older age group, causing pain, physical disability, and decreased quality of life.[2]The aging of the population and the obesity pandemic are most likely contributing factors to the rise in the number of people with symptomatic knee OA. Medial, lateral, and patellofemoral joints are also affected by knee OA, which typically develops slowly over 10 to 15 years and interferes with daily activities.[3]

When compared to other types of Osteoarthritis, knee Osteoarthritis is the most common. The prevalence of knee OA rises with age, a longer lifespan, and higher population average weight, especially in obese women. In comparison to women, men have a decreased prevalence of knee OA. This was demonstrated in a Meta analysis of males and females, which revealed that the incidence of knee OA was lower in males under the age of 55 than in females. [3, 4]The risk of knee OA is increased by prior knee injury. OA is influenced by a number of factors, including advanced age, female gender, overweight and obesity, knee injury, repeated motion of the joints, bone density, muscle weakness, and joint laxity.[4]

There are two stages of osteoarthritis. Most often occurring in postmenopausal women, primary osteoarthritis can be localised or generalised. Secondary osteoarthritis has an underlying aetiology, such as trauma, obesity, Paget's disease, or inflammatory arthritis. The majority of patients, who are typically over 50, report pain and stiffness in the damaged joint or joints, which are exacerbated by activity and eased by rest. The typical duration of morning stiffness is shorter than 30 minutes. Joint discomfort and crepitus during movement are possible side effects. [5]

Knee joint discomfort is the most typical sign of OA knee. Pain might be chronic, recurring, sharp, or intermittent (on and off). Agonizing pain can range from minor to severe. Reduced range of motion is possible. An evaluation of the body weight, joint range of motion, discomfort location, muscular strength, and ligament stability should all be included of a physical examination. [4, 6]. Physical therapy management includes various treatment modalities like Short wave diathermy, Ultrasound therapy, and other heating modalities. The goals of OA knee treatment should be to reduce impairments, relieve pain, and improve function. Treatments with heat and cold are efficient painkillers. Heat treatments enhance circulation and ease stiff joints and tired muscles, whereas cold treatments slow circulation, which reduces swelling, thus alleviating acute pain. The efficiency of several common physical therapy practices, such as manual therapy, taping, bracing, and exercises, in easing OA knee symptoms.[2,3]

IASTM is based on a traditional Chinese therapy known as "gua sha" (Nielsen et al., 2007). The term "gua sha" refers to the red patch that emerges on the skin when a tool is used to push or scrape the skin, increasing blood flow and

allowing blood and oxygen to reach the soft tissues (Chiu et al., 2010; Hammer, 2008). IASTM is based on these concepts and is a modified form of traditional soft tissue mobilisation techniques such as "gua sha."[7]

Instrument assisted soft tissue mobilisation (IASTM) is a new technique that allows physio to quickly discover and treat patients with soft tissue dysfunction. It is based on James Cyriax's premise. IASTM is performed with specially developed stainless steel devices that include edges and shapes that may mould to various body anatomical sites and enable for deeper penetration. It has a mobilising impact on soft tissues, reducing discomfort and increasing range of motion. [8]

Unhealed suture sites, untreated wounds, uncontrolled hypertension, skin infection, and unstable fractures are all absolute contraindications. The IASTM approach includes a therapy procedure that includes the following components: evaluation, warm-up, IASTM treatment (e.g., 30-60 seconds per lesion), post-treatment stretching, strengthening, and ice. [9]

2. Review of Literature

1. Naoki Iked, Shun otsuka [10] They investigated the impact of IASTM on the mechanical and neurological features of the plantar flexor and Achilles tendon. 14 healthy individuals participated in this randomised, controlled, crossover trial (11 males, 3 females, aged 21-32 years). IASTM was applied for 5 minutes on the skin of the lower leg's posterior aspect, focusing on the soft tissues (overlying the posterior gastrocnemius, soleus, and tibialis muscles, deep fascia and Achilles tendon). On another day, the identical individual was not wearing his IASTM and rested for 5 minutes between pre- and post-measurement. Dorsiflexion range of motion increased significantly by 10.7% 10.8% after IASTM, while ankle stiffness decreased dramatically by -6.2% 10.1%. They came to the conclusion that IASTM can increase range of motion.

Medicine and science in sports and exercise: April 2019

2. Amita agrawal, Kritika Saxena[11] The purpose of this study is to assess the effectiveness of IASTM as an additional treatment for relieving pain, range of motion, and functional capacity in individuals with adhesive capsulitis. 30 shoulders were randomly assigned to one of two groups: Group A (IASTM Plus conventional treatment) and Group B (no treatment) (conventional treatment). Treatment lasted 12 sessions, with three sessions per week for four weeks. Participants were examined before treatment, after the sixth session, and after the twelfth session. The Numerical Pain Rating Scale, Shoulder Pain and Disability Index, and IASTM, in conjunction with the standard regimen, were able to enhance mobility and function in patients with adhesive capsulitis.

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3. Ahmad Osailan, Khalid Talha[12] The purpose of this study was to assess the efficacy of IASTM with manual stretching in improving hip flexion active range of motion (ROM), muscle torque, and power on hamstring muscle complex (HMC) stiffness in a single session. Twenty-three young male college students were randomly assigned to one of two groups based on unilateral hamstring tightness as determined by the straight leg raising (SLR) test (65°). IASTM was applied to twelve subjects (group 1), and manual stretching was applied to eleven (group 2). The current study results show that IASTM is just as effective as manual stretching in improving hip flexion active ROM, muscle torque, and power in non-athletic people with HMC tightness.

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3. Methodology

- **Study Design:** Experimental Study
- **Study Setting:** Dr. B. R. Ambedkar Medical College and Hospital
- **Sample Size:** 20 Samples
- **Sampling Design:** Convenient sampling technique
- **Study Duration**: 4 Weeks

Inclusion Criteria

1. Aged between 40-60yrs
2. Female
3. Complain of knee pain (primary knee pain)
4. Knee pain due to muscle tightness (Hamstring and Quadriceps muscle)
5. Pain intensity (>5 measured with VAS scale)

Exclusion Criteria

1. Recent trauma
2. Knee joint infection
3. Skin allergy
4. Recent surgery(TKR,THR)

Outcome Measures

- VAS (Visual analogue scale)

Procedure

Twenty osteoarthritis knee patients were assessed using VAS scale and goniometer for pain and active knee flexion ROM and consent was taken. 20 patients were divided into two groups Group A and Group B each consisting 10 patients each. Group A is the experimental group in which the patients were treated with IASTM tool, patient specific exercises. Group B is the control group in which the patients were given ultrasound therapy and patient specific exercises.

- Iastm tool treatment starts with a good warm up which prepares densified area for treatment. This also helps by decreasing sensitivity in affected area.
- Always apply lubricant to skin and caused minimal irritation.
- Make sure the skin is not broken and that there are no obvious protrusions on the skin.
- A stainless steel tool is then placed on the lateral part of thigh region on the trigger point. The tool is designed in a way so that is able to flawlessly follow the length of the muscles and tissue that may have been affected by the injury.
- The tool is placed in 45 degree at the edge of the skin. Start scanning superficially with the sharper side of the tool.
- Start to treat with dull side proximal to distal directions and is slowly slide on over the lateral part of thigh. When it passes over the densification can occur in any part of the body and may build up after an injury.
- Start with light pressure and slow strokes in one direction that is applied to the skin surface increases as the therapist continues the procedure. The tool enables the therapist to detect the densified areas as they are not especially trained to detect areas of densified tissue.
- The repeated rubbing on the affected area (the lateral aspect of thigh region) is what causes relief; the greatest changes occur in two minutes of treatment.
- Duration of the treatment given was 7 days for 2-3 minutes
- Patient position: side lying with hip and knee extended
- Therapist position: walk standing position behind the side of the patient.

Ultrasound therapy was given on the lateral part of thigh, after sterilizing the treatment area, coupling media was applied over the affected side and the transducer head. The transducer head was moved in circular pattern. The frequency of 1MHz, in pulsed mode and intensity of 0.5-0.8 w/cm^2 was employed. The duration of treatment was for 10 mins for 7 days.

Patient specific exercises are isometrics strengthening exercises for hamstrings and quadriceps, stretching for quadriceps and hamstrings for 10 mins and 1/3times per day with 10 RM. These exercises were carried out by the patients throughout the duration of study.

4. Data Analysis

Data Analysis and Interpretation

Statistical analysis of the data was done using SPSS 20.0. Descriptive statistics were calculated and summarized. Which includes mean and standard deviation. Inferential statistics had been carried out in the study.pre post comparison was done using paired t test and between group comparison was done using un paired t test. Level of significance was set at 5%.

Table 1: Pre Post comparison of VAS in group A and group B

VAS		Mean	Std. Deviation	Average improvement	t value	p value
Group A	Pre	6.600	0.966	2.2	16.5	p<0.001
	Post	4.400	0.966			
Group B	Pre	6.700	1.059	1.6	9.798	P<0.001
	Post	5.100	0.994			

The comparison between pre and post VAS is shown in the above table. In group A the average pre VAS was 6.6±0.966 and post VAS was 4.4±0.966 with an average improvement of 2.2 and p<0.001. In group B the average pre VAS was 6.7±1.059 and post VAS was 5.1±0.994 with an average improvement of 1.6 and p<0.001. The analysis shows statistically significant improvement of VAS in group A and group B.

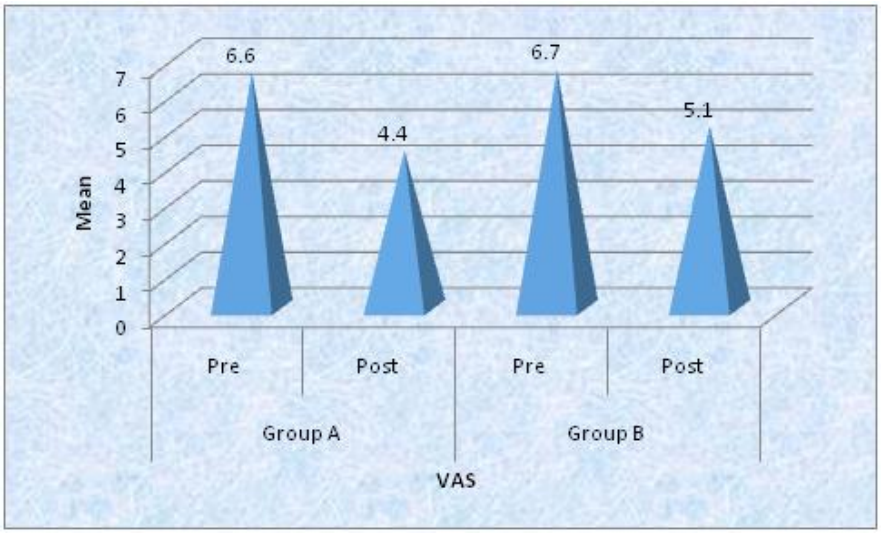

Figure 1: Representing pre post comparison of VAS in group A and group B

Table 2: Pre Post comparison of Knee flexion AROM in group A and group B

Knee flexion AROM		Mean	N	Std. Deviation	Average improvement	t value	p value
Group A	Pre	90.000	10	5.270	32.5	17.441	p<0.001
	Post	122.500	10	8.897			
Group B	Pre	96.500	10	11.067	20.5	6.781	p<0.001
	Post	117.000	10	10.593			

The comparison between pre and post Knee flexion AROM is shown in the above table. In group A the average pre Knee flexion AROM was 90±5.17 and post Knee flexion AROM was 122.5±8.897 with an average improvement of 32.5 and p<0.001. In group B the average pre Knee flexion AROM was 96.5±11.067 and post Knee flexion AROM was 117±10.593 with an average improvement of 6.781 and p<0.001. The analysis shows statistically significant improvement of Knee flexion AROM in group A and group B.

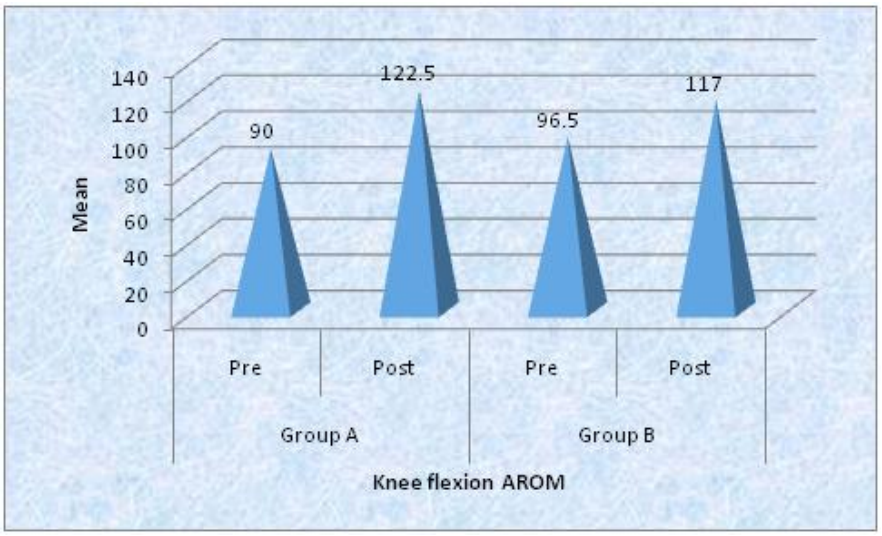

Figure 2: Representing pre post comparison of knee flexion AROM in group A and group B

Table 3: Table showing between group comparisons

	Group	Mean	Std. Deviation	t value	p value
VAS	Group A	2.200	0.421	2.846	p<0.05
	Group B	1.600	0.516		
Knee flexion AROM	Group A	33.000	5.868	3.524	p<0.05
	Group B	20.500	9.559		

The between group comparison of VAS showed that in group A average VAS was 2.2±0.421 and group B was 1.6±0.516 with of p<0.05. Between group comparison of knee flexion AROM showed in group A average knee flexion AROM was 33±5.868 and group B was 20.5±9.559 with p<0.05. Improvement in VAS and knee flexion AROM is significantly more in group A than in group B.

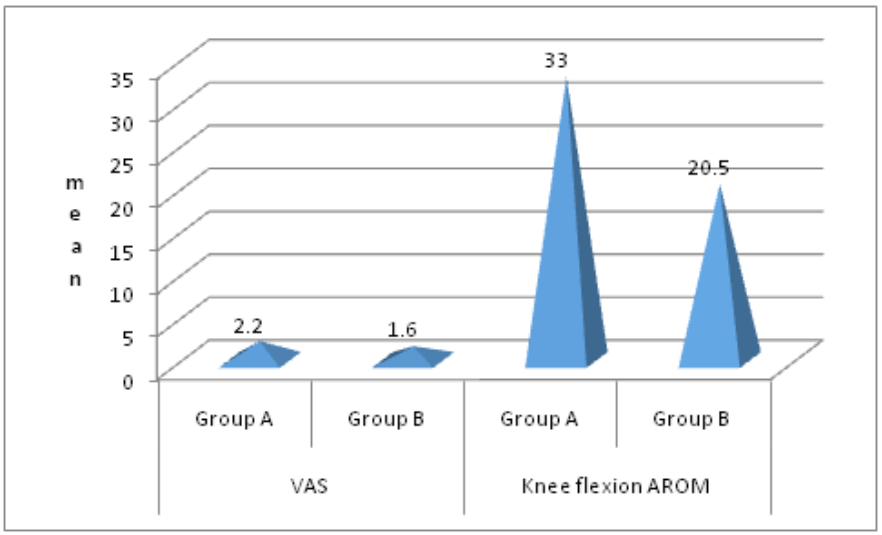

Figure 3: Representing between group comparisons

5. Discussion

This study is designed to see the **"Effectiveness of Instrument assisted soft tissue mobilization tool in knee Osteoarthritis".** It is the most common degenerative disease, primarily affects the articular cartilage and the subchondral bone of a synovial joint, eventually resulting in joint failure. The first OA change occurring in articular cartilage include a decrease in the superficial proteoglycan content, deterioration of superficial collagen fibrils, and an increase in the water content.[4]

In Group A, the mean active knee flexion ROM post intervention was 122^0 with a difference of 32.5^0 from pre to post intervention, with a t value of 17.441 indicating that there was significant improvement in active knee flexion ROM post intervention. The mean VAS post intervention was 4.400 with a difference of 2.2 from pre to post intervention, with a t value of 16.5 indicating that there was significant improvement in VAS post intervention.

In Group B, the mean active knee flexion ROM post intervention was 117^0 with a difference of 20.5^0 from pre to post intervention with a t value of 6.781 indicating that there was significant improvement in active knee flexion ROM. The mean VAS post intervention was 5.100 with a difference of 1.6 from pre to post intervention, which gave a t value of 9.798 indicating that there was significant improvement in VAS post intervention

On Comparing **Group A** and **Group B**, the t value of active knee flexion ROM was 10.66, and the t value of VAS was 6.702 and p value is $p<0.05$ which showed that there was significant improvement, as per within data there is significant difference

The possible physiology of reduction in pain and improved range of motion may be due to the following reasons, IASTM is a technique that involves using instruments to address musculoskeletal pathology-related impairments and help heal soft tissues. When a stimulus is applied to the injured soft tissue using an instrument, the activity and the number of fibroblasts increase, along with fibronectin, through localized inflammation, which then facilitates the synthesis and realignment of collagen is one of the proteins that makes up the extracellular matrix. When the scar tissue is removed by IASTM, functional normalization around the soft tissue can be achieved (Black, 2010). Microvascular and capillary hemorrhage, along with localized inflammation, can occur as a result of using IASTM to apply appropriate pressure and shear force to the soft tissue. Such inflammation restarts the healing process by removing the scar tissue and releasing adhesions, while also increasing blood and nutrient supply to the injured area and migration of fibroblasts.[7]

However, there are only few studies on the effects of IASTM. Some previous studies reported that the joint range of motion was improved by IASTM.IASTM involves repeated mechanical stimulations, such as compression and shear stress, of soft tissues at various intensities by stroking the skin with a bar or spurtle. On the other hand, changes in neural properties, such as stretch reflex or sensation of MTU elongation, pain, and maximum tolerable stretch (stretch tolerance), have been reported to improve the joint range of motion as well. Therefore, it is expected that joint range of motion is improved by decreasing joint and muscle stiffness and altering stretch tolerance by repetitive mechanical stimulation in IASTM. [10]

6. Conclusion

The conclusion of this study is based on the pre post mean measures of active knee flexion ROM and visual analogue scale within and between group A and group B which concluded that there is significant improvement in both the Groups. There was a significant difference seen on Group A than in Group B on comparisons of both the groups. As per data analysis and interpretation and clinical improvement, null hypothesis is rejected, and alternate hypothesis is accepted. There was significant difference in terms of pain, active knee flexion ROM among the patients in Group A and Group B.

- **Limitation and Recommendations:** This study was conducted with small sample size and in future, studies with a larger sample size can be conducted for better results. This study showed the immediate effectiveness of the treatment; therefore, it is not possible to know the long-lasting effects of the treatment, for which a study of longer duration can be conducted.
- **Implications to Practice:** As this study has shown significant improvement in participants who received Instrument assisted mobilization tool treatment in terms of pain and range of motion, it can be used in the treatment protocol of Osteoarthritis Knee as with its immediate effectiveness, and it may also increase the patient therapist adherence and treatment adherence.

References

[1] Zübeyir Sari, Onur Aydogdu. Clinical outcomes of kinesio taping applied in patients with knee osteoarthritis: A randomized controlled trial. Journal of Back and Musculoskeletal Rehabilitation. 2017; 1045-1051.
[2] Arnab Chandra1, K. S. Sharad2, Anwer Shahnawaz3, Siddhartha Shankar Sikdar. A STUDY ON THE EFFICACY OF PATELLAR TAPING FOR KNEE OSTEOARTHRITIS AS COMPARED TO CONVENTIONAL PHYSICAL THERAPY. IJCRR. 2012;4(22): 91-98
[3] Michelle J Lespasio, DNP, JD, ANP; Nicolas S Piuzzi, MD; M Elaine Husni, MD, MPH; George F Muschler, MD; AJ Guarino, PhD; Michael A Mont, MD. Knee Osteoarthritis: A Primer. The Permanente Journal.2017; 16-183.
[4] Ashraf Ramadan Hafez1, Aqeel Mohammed Alenazi2, Shaji John, Kachanathu3, Abdulmohsen Meshari Alroumi4 and Elham Saed Mohamed5. Knee Osteoarthritis: A Review of Literature. Austin publishing group. 2014; 1(5). 1-8.
[5] I Haq, E Murphy, J Dacre. Osteoarthritis. postgrad med J. 2003; 377-383.

[6] David J Hunter, David T Felson. Osteoarthritis. BMJ.2006; 332: 639-642.
[7] Jooyoung Kim1, Dong Jun Sung2, Joohyung Lee1.Therapeutic effectiveness of instrument-assisted soft tissue mobilization for soft tissue injury: mechanisms and practical application. Journal of exercise rehabilitation. 2017; 1-22
[8] Scott W. Cheatham, PT, PhD, DPT, OCS, ATC, CSCS1 Matt Lee, PT, MPT, CSCS2 Matt Cain, MS, CSCS, USAW-I3 Russell Baker, DAT, ATC. The efficacy of instrument assisted soft tissue mobilization: a systematic review. JCCA.2016;60(3):201-211
[9] Tahir Mahmood, Waqar Afzal, Umair Ahmad, Muhammad Asim Arif, Ashfaq Ahmad. Instrument soft tissue mobilization integrated with exercise for musculoskeletal disorders. Rawal Medical Journal.2021; 46(3): 749-752
[10] Naoki ikeda, S.otsuka. Effects of instrument assisted soft tissue mobilization on musculoskeletal properties. Med.sci.sports exerc.2019;51:2166-2172
[11] Amita agrawal. Instrument assisted soft tissue mobilization in adhesive capsulitis: A randomized clinical trial. journal of body work and movment.2021;26:435-442.
[12] Ahmed osailan. IASTM versus stretching: a comparison in effectiveness on hip AROM, muscle torque and power in people with hamsting tightness. Journal of body work and movement therapies. 2021;27:200-206