Review Article

Effectiveness of Instrument Assisted Soft Tissue Mobilization on Range of Motion: A Systematic Review and Meta-Analysis

Seungmin Shin*

Physical Education Department, King Fahd University of Petroleum and Minerals, Dhahran, Kingdom of Saudi Arabia

Corresponding author:
Seungmiun Shin,
Physical Education Department,
King Fahd University of Petroleum and Minerals, Dhahran,
Kingdom of Saudi Arabia,
E-mail: seungmin.shin@kfupm.edu.sa

Received: 03-01-2022,
Manuscript No. AMHSR-22-47823;
Editor assigned: 05-01-2022,
PreQC No. AMHSR-22-47823(PQ);
Reviewed: 20-01-2022,
QC No. AMHSR-22-47823;
Revision: 26-01-2022,
Manuscript No: AMHSR-22-47823 (R);
Published: 31-01-2022,

DOI: 10.54608.annalsmedical.2021.24

Abstract

Purpose: This study performed an effect-size analysis of instrument assisted soft tissue mobilization for increase range of motion. **Subjects & Methods:** The database search was conducted using pubMed, web of science core and google scholar. The meta-analysis was based on 20 studies, covering a total of 638 participants, and used a fixed effects model. **Results:** The effect size estimate show that instrument assisted soft tissue mobilization had a significant effect on increase range of motion (SMD: 4.72, 95% CI: 3.98-5.45). **Conclusion:** The finding from this review suggest that instrument assisted soft tissue mobilization is effective at improve range of motion. However, further research is needed, large sample size, to provide evidence-based recommendations.

Keywords: Instrument assisted soft tissue mobilization; Range of motion; Meta-analysis

Abbreviations: GHA: Glenohumeral Horizontal Adduction range of motion; GIR: Glenohumeral Internal Rotation range of motion; Lum Flex: Lumbar Flexion; Lum Exten: Lumbar Extension; Lum Lateral B Rt: Lumbar Lateral Bending Right Side; Lum Lateral B Lt: Lumbar Lateral Bending Left Side; IASTM stretch WBL: IASTM *vs.* Stretching Weight Bearing Lunge; IASTM stretch MRP1: IASTm *vs.* Stretching Modified Root Position 1; IASTM stretch MRP2: IASTm *vs.* Stretching Modified Root Position 2; IASTM control WBL: IASTM *vs.* Control Weight Bearing Lunge; IASTM control MRP1: IASTM *vs.* control Modified Root Position 1; IASTM control MRP2: IASTM *vs.* Control Modified Root Position 2; Rt Plantar Flex: Right Side Plantar Flexion; Rt Dorsi Flex: Right Side Dorsi Flexion; Lt Planar Flex: Left Side Plantar Flexion; Lt Dorsi Flex: Left Side Dorsi Flexion; Immediate PHF: After treatment immediate Passive Hip Flexion; Immediate AKE: After treatment immediate active knee extension; 48 hrs post PHF: 48 hours after treatment Passive Hip Flexion; 48 hrs post AKE: 48 hours after treatment Active Knee Extension

Introduction

Loss of joint Range of Motion (ROM) is common dysfunction in physically active people and may be a predisposition to musculoskeletal injury. [1,2] Numerous factors can contribute to loss of ROM, including poor flexibility, [3,4] previous injury, [5,6] and immobilization. [7,8]

Instrument Assisted Soft Tissue Mobilization (IASTM) is form of manual therapy involving rigid instruments of various shapes and materials to locate and treat soft tissue disorders. IASTM is applied using specially designed instruments to provide a mobilizing effect to soft tissue (e.g. scar tissue, myofascial adhesion) to decrease pain, improve Range of Motion (ROM) and function. [9-12] While the therapeutic mechanism of IASTM is not clearly understood. The IASTM stimulate connective tissue remodeling through resorption of excessive fibrosis, along with inducing repair and regeneration of collagen secondary to fibroblast recruitment [13,14] and absorption of scar tissue, mobilization of fascia, improve tissue healing.

The Graston Technique (GT, Graston Technique, LLC, Indianapolis, IN) is commonly used IASTM technique that involves applying 6 stainless-steel instruments to localize, treat, and release soft tissue restriction. Graston technique generates mechanical micro-traumatic damage to the treated area. It thus creates an inflammatory response to accelerate the healing tissue, increasing the number of fibroblasts, and promoting collagen synthesis. [15] Although there are several studies related to graston technique and improve range of motion. Therefore, the objective of this study was to provide an accurate overview and quantify the effect of trials evaluating the effect of graston technique *vs.* other treatment of placebo on range of motion and, to conduct a comprehensive systematic review and meta-analysis of effects of graston technique on Range of Motion (ROM).

Literature Review

Data source and search

A systematic search strategy was conducted according to the

How to Cite this Article: Shin S, et al. Effectiveness of Instrument Assisted Soft Tissue Mobilization on Range of Motion: A Systematic Review and Meta-Analysis. Ann Med Health Sci Res. 2022;12:8-11.

Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines for reporting systematic reviews. [16,17-22]

The following databases were searched on pubMed database, science direct and google scholar collection. The search term includes "IASTM", "Instrument Assist Soft Tissue Mobilization", "graston technique", "soft-tissue mobilization", "Range of Motion" and "ROM"

Study selection procedure

Articles were included of the following:

1. A Randomized Controlled Trail (RCT) study.
2. Range of Motion (ROM) was measured preintervention and postintervention.
3. Peer reviewed, the article was written in english.
4. Human participants were assessed.
5. IASTM was examined as an intervention as compared with another group.

Studies were excluded if they were non-english publication clinical trials that include case series, case report, clinical commentary, dissertations, and non-peer reviewed source as conference poster of abstracts.

Data extraction

Information on the authors, years of publication, sample size, gender and age of the subject, outcome measurements, intervention, and result. Regarding the considerable factor expected heterogeneity. The random-effect model was applied for the analysis of data to obtain the expected heterogeneity and the considerable factor. The Cochran Q-test was utilized to estimate the heterogeneity between the selected studies.

Data synthesis and statistical analysis

The management and edition of data, estimation of standard error, and pooled mean effect size were estimated using Comprehensive Meta-Analysis software (CMA) version 2.0 (Biostat, Englewood, NJ, USA). The effect size was calculated using fixed effect model, and Standardized Mean Difference (SMD) was calculated.

Study selection

The database searches identified 50 articles. After through inclusion and exclusion procedures, duplication and irrelevant articles were excluded. Therefore only 5 articles selected as the final article for systematic review and meta-analysis. The selection flowing is shown in Figure 1.

Within 5 articles, 20 different studies were identified. For the treatment two different IASTMs were used. Four articles (9

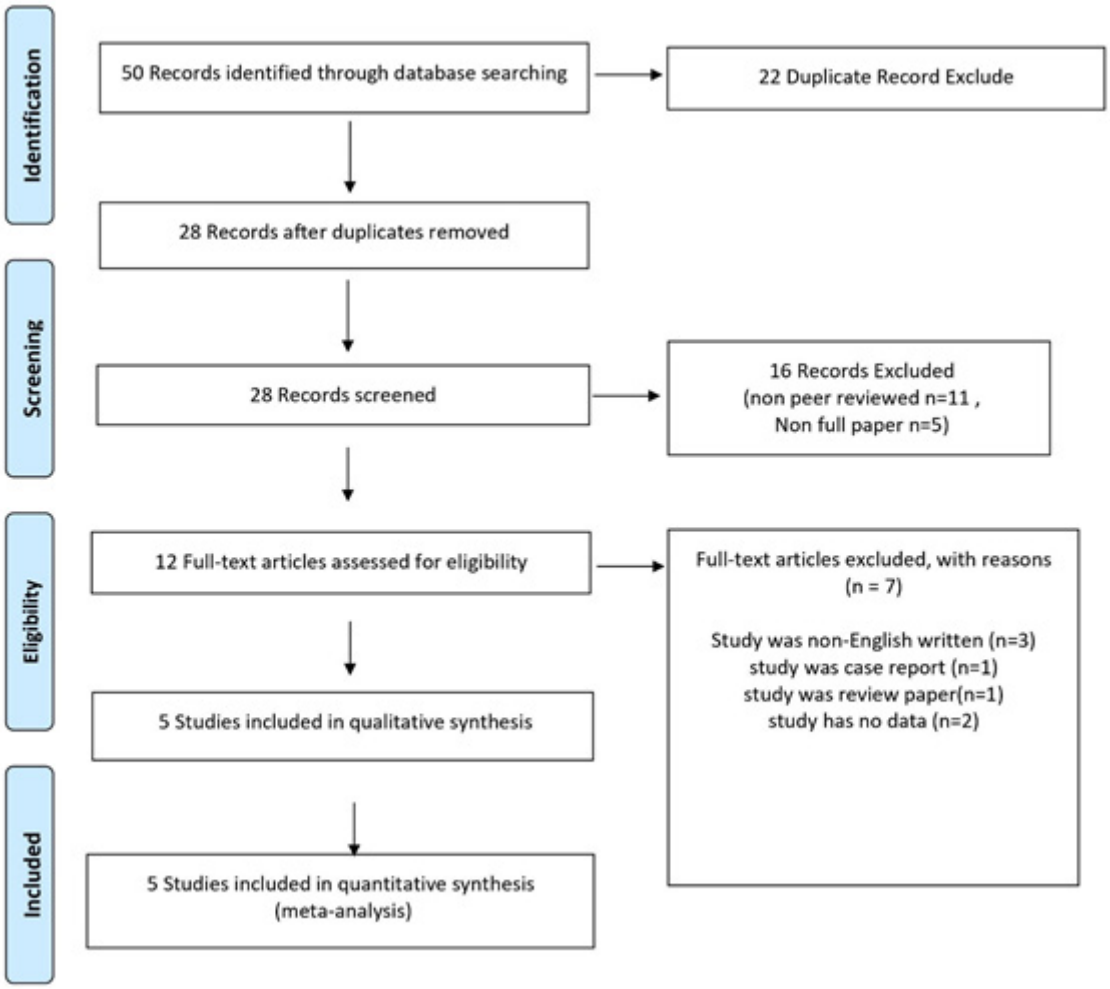

Figure 1: Screening process shown in the PRISMA flow chart.

different studies) used graston technique for treatment and one article (2 different studies) used other IASTM in Table 1.

The experimental group comprised 318 participants, while the control group comprised 320 persons (a total number of 638 participants). The I^2 of studies heterogeneity was 92.50%. Under the fixed effect the pooled summary mean difference was 4.722(95% CI: 3.98 to 5.49, p=0.000). The funnel plot was symmetric [Figure 2].

Discussion

In many sports, clinical cases, IASTM (Instrument Assisted Soft Tissue Mobilization) has been used an effective intervention for improve joint Range of Motion (ROM). However, a comprehensive analysis of the effect of IASTM on ROM has rarely been conducted. This study conducted a systematic review and meta-analysis of 5 articles that included 20 different studies and 638 participants. Eight studies were reported statistically significantly improve range of motion within the IASTM group.

Limitation

The main limitation of this systematic review is small number of articles and the heterogeneity of evidence surrounding IASTM.

Table 1: characteristic of the reviewed article.

		Participant				Intervention			
Sl. No	Author(year)	Study design	Total N (eN/cN)	Mean age	Location	During week	No. of session/ Min	Comparisons	IASTM
1	Laudner [18]	RCT	35(17/18)	20.2 ± 1.1	Shoulder GHA ROM	once	1/1 min	Control	GT
					Shoulder GIR ROM	once	1/1 min	Control	
2	Lee [19]	RCT	30(15/15)	36.8 ± 12.2	Lumbar Flexion	4 week	NA	Control	GT
					Lumbar Extension	4 week	NA	Control	
					Lumbar lateral bending (Rt)	4 week	NA	Control	
					Lumbar lateral bending (Lt)	4 week	NA	Control	
					Hip flexion	4 week	NA	Control	
3	Rowlett [20]	RCT	40(20/20)	25.8 ± 6.7	Low limb	once	1/3 min	Control	Other IASTM
					Low limb	once	1/3 min	Stretching	
4	Park [21]	RCT	20(10/10)	17.8 ± 0.7	Low limb	8 week	2/50 min	Control	GT
5	J Lee [22]	RCT	32(16/16)	23.3 ± 2.4	Hamstring	once	1/3.5 min	Massage stick	GT

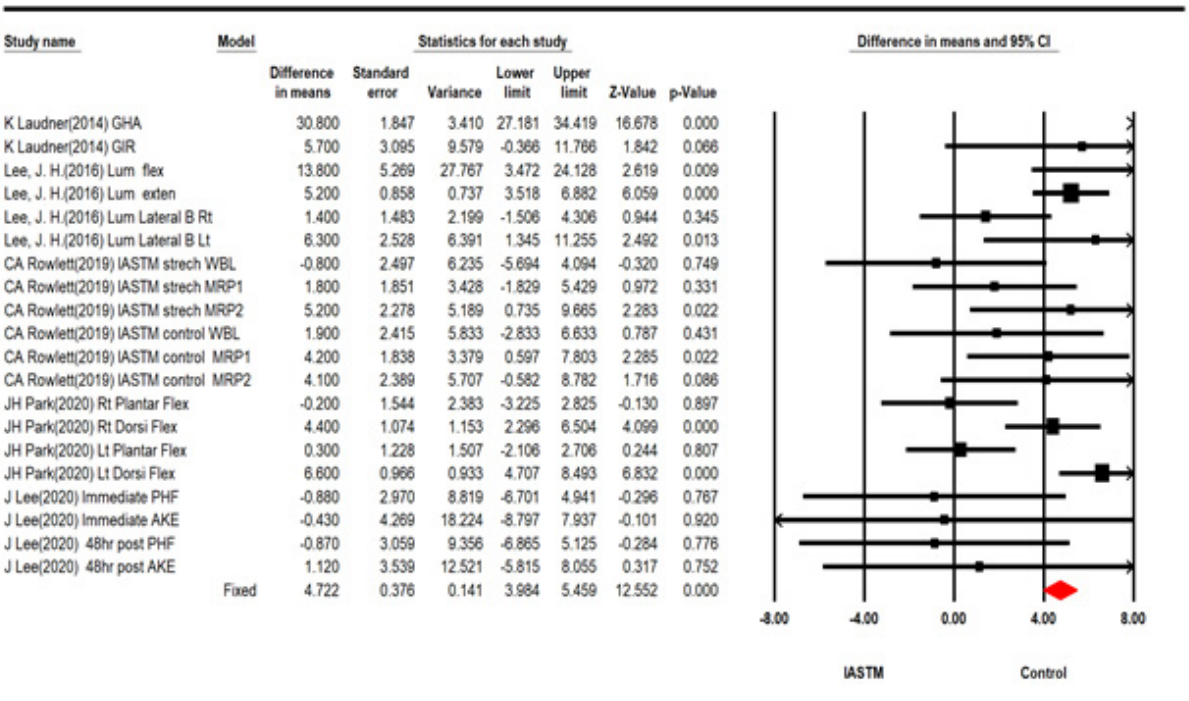

Figure 2: Forest plot of IASTM on range of motion.

It is difficult to compare the result of studies with different IASTM treatment location. (e.g. shoulder, low back, calf muscle, hamstring, etc.). This problem is further compounded when the IASTM application is used with various location of human body. A second limitation is literature search only include English language publications which may not have represented all the all the available evidence from non-english studies.

Conclusion

The current evidence of RCTs supports the efficacy of IASTM for increase range of motion. however, there is weak evidence supporting the efficacy of IASTM for increase lower extremity joint ROM for short period of time. IASTM and graston technique are popular form of myofascial release therapy but its efficacy has not been fully determined due to the heterogeneity of evidence. Future studies are needed to assess the different IASTM tool and different IASTM protocols.

References

1. You JY, Lee HM, Luo HJ, Leu CC, Cheng PG, Wu SK. Gastrocnemius tightness on joint angle and work of lower extremity during gait. Clin Biomech. 2009;24:744-50.
2. Willems TM, Witvrouw E, Delbaere K, Mahieu N, De Bourdeaudhuij I, De Clercq D. Intrinsic risk factors for inversion ankle sprains in male subjects: A prospective study. Am J Sports Med. 2005;33:415-23.
3. Denegar CR, Miller III SJ. Can chronic ankle instability be prevented? rethinking management of lateral ankle sprains. J Athl Training. 2002;37:430.
4. Hertel J. Functional anatomy, pathomechanics, and pathophysiology of lateral ankle instability. J Athl Training. 2002;37:364.
5. Reid A, Birmingham TB, Alcock G. Efficacy of mobilization with movement for patients with limited dorsiflexion after ankle sprain: A crossover trial. Physiotherapy Canada. 2007;59:166-72.
6. Vicenzino B, Branjerdporn M, Teys P, Jordan K. Initial changes in posterior talar glide and dorsiflexion of the ankle after mobilization with movement in individuals with recurrent ankle sprain. J Orthop Sports Phys Ther. 2006;36:464-71.
7. Chesworth BM, Vandervoort AA. Comparison of passive stiffness variables and range of motion in uninvolved and involved ankle joints of patients following ankle fractures. Physical Therapy. 1995;75:253-61.
8. Kerkhoffs GM, Rowe BH, Assendelft WJ, Kelly KD, Struijs PA, van Dijk CN. Im mobilisation for acute ankle sprain. Arch Orthop Traum Sur. 2001;121:462-71.
9. Baker RT, Nasypany A, Seegmiller JG, Baker JG. Instrument-assisted soft tissue mobilization treatment for tissue extensibility dysfunction. Int J Athl Ther Trai. 2013;18:16-21.
10. DeLuccio J. Instrument assisted soft tissue mobilization utilizing graston technique: A physical therapist's perspective. J Orthop Sports Phys Ther. 2006;18:32.
11. Stow R. Instrument-assisted soft tissue mobilization. Int J Athl Ther Trai. 2011;16:5-8.
12. Laudner K, Compton BD, McLoda TA, Walters CM. Acute effects of instrument assisted soft tissue mobilization for improving posterior shoulder range of motion in collegiate baseball players. Int J Sports Phys Ther. 2014;9:1-7.
13. Howitt S, Jung S, Hammonds N. Conservative treatment of a tibialis posterior strain in a novice triathlete: A case report. J Can Chiropr Assoc. 2009;53:23-31.
14. Strunk RG, Pfefer MT, Dube D. Multimodal chiropractic care of pain and disability for a patient diagnosed with benign joint hypermobility syndrome: A case report. J Chiropr Med. 2014;13:35-42.
15. Gehlsen GM, Ganion LR, Helfst R. Fibroblast responses to variation in soft tissue mobilization pressure. Med Sci Sports Exerc. 1999;31:531-5.
16. Moher D, Liberati A, Tetzlaff J, Altman DG, Group P. Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. J Clin Epidemiol. 2009;62:1006-12.
17. Liberati A, Altman DG, Tetzlaff J, Mulrow C, Gotzsche PC, Ioannidis JP, et al. The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate healthcare interventions: Explanation and elaboration. BMJ. 2009;339.
18. Laudner K, Compton BD, McLoda TA, Walters CM. Acute effects of instrument assisted soft tissue mobilization for improving posterior shoulder range of motion in collegiate baseball players. Int J Sports Phys Th. 2014;9:1.
19. Lee JH, Lee DK, Oh JS. The effect of graston technique on the pain and range of motion in patients with chronic low back pain. Phys Ther. 2016;28:1852-5.
20. Rowlett CA, Hanney WJ, Pabian PS, McArthur JH, Rothschild CE, Kolber MJ. Efficacy of instrument-assisted soft tissue mobilization in comparison to gastrocnemius-soleus stretching for dorsiflexion range of motion: A randomized controlled trial. J Bodyw Mov Ther. 2019;23:233-40.
21. Park JH, Rhyu HS, Rhi SY. The effects of instrument-assisted soft tissue mobilization rehabilitation exercise on range of motion, isokinetic strength, and balance in chronic ankle instability taekwondo players. J Exerc Rehabil. 2020;16:516.
22. Lee J, Young A, Erb NJ, Herzog VW. Acute and residual effects of iastm and roller massage stick on hamstring range of motion. J Allied Health. 2020;49:5-51.