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

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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

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...
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 Trial (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.](image-url)
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>
<thead>
<tr>
<th>Sl. No</th>
<th>Author(year)</th>
<th>Study design</th>
<th>Total N (eN/cN)</th>
<th>Mean age</th>
<th>Location</th>
<th>During week</th>
<th>No. of session/Min</th>
<th>Comparisons</th>
<th>Intervention</th>
<th>IASTM</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Laudner [18]</td>
<td>RCT</td>
<td>35(17/18)</td>
<td>20.2 ± 1.1</td>
<td>Shoulder GHA ROM</td>
<td>once</td>
<td>1/1 min</td>
<td>Control</td>
<td>GT</td>
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<td>Lumbar Flexion</td>
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<td>Lumbar Extension</td>
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<tr>
<td>2</td>
<td>Lee [19]</td>
<td>RCT</td>
<td>30(15/15)</td>
<td>36.8 ± 12.2</td>
<td>Lumbar lateral bending (Lt)</td>
<td>4 week</td>
<td>NA</td>
<td>Control</td>
<td>GT</td>
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<td></td>
<td></td>
<td>Lumbar lateral bending (Rt)</td>
<td>4 week</td>
<td>NA</td>
<td>Control</td>
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<td>Hip flexion</td>
<td>4 week</td>
<td>NA</td>
<td>Control</td>
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<tr>
<td>3</td>
<td>Rowlett [20]</td>
<td>RCT</td>
<td>40(20/20)</td>
<td>25.8 ± 6.7</td>
<td>Low limb</td>
<td>once</td>
<td>1/3 min</td>
<td>Control</td>
<td>Other IASTM</td>
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<td>4</td>
<td>Park [21]</td>
<td>RCT</td>
<td>20(10/10)</td>
<td>17.8 ± 0.7</td>
<td>Low limb</td>
<td>once</td>
<td>1/3 min</td>
<td>Control</td>
<td>GT</td>
<td></td>
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<tr>
<td>5</td>
<td>J Lee [22]</td>
<td>RCT</td>
<td>32(16/16)</td>
<td>23.3 ± 2.4</td>
<td>Hamstring</td>
<td>once</td>
<td>1/3.5 min</td>
<td>Massage stick</td>
<td>GT</td>
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**Table 1: characteristic of the reviewed article.**

![Figure 2: Forest plot of IASTM on range of motion.]

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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**