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Does instrument assisted soft tissue manipulation decrease pain in patients with musculoskeletal complaints?

Jessica Ritegno
Philadelphia College of Osteopathic Medicine

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Jessica Ritegno, PA-S

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ABSTRACT

OBJECTIVE: The objective of this selective EBM review is to determine whether or not instrument assisted soft tissue manipulation (IASTM) is an effective therapy in decreasing patient reported pain originating from musculoskeletal sources.

STUDY DESIGN: Systematic review of three randomized controlled trials published between 2007-2016, all in English language.

DATA SOURCES: Three randomized controlled studies, which studied the effects of IASTM on various musculoskeletal regions of patient reported pain compared to patients who received other forms of treatment, were obtained using PubMed.

OUTCOMES MEASURED: The outcome of each study was a patient reported decrease in pain using a visual analog scale (VAS) after IASTM intervention and an increase in functional ability using an Oswestry Disability Index (ODI). These results were compared to the patient's responses on the VAS and ODI at baseline prior to beginning the study.

RESULTS: All three RCTs determined that pain decreased over time after any form of intervention, regardless of if it was IASTM or each individual control group.

CONCLUSIONS: Based on the results of these three RCTs, it appears there is a decrease in MSK for patients who underwent a trial of IASTM therapy. This seemed to last over a significant amount of time after the intervention was applied. Further investigation is warranted to determine if IASTM is more beneficial when applied to chronic versus acute injuries.

KEY WORDS: instrument assisted soft tissue manipulation, pain, musculoskeletal

INTRODUCTION:

Patient complaints of musculoskeletal (MSK) pain is one of the most common, and one of the most frustrating maladies health care providers are confronted with on a daily basis. According to the American Academy of Orthopaedic Surgeons, over a quarter of all Americans currently are suffering from a musculoskeletal condition[1]. Musculoskeletal conditions are the second leading cause of primary care visits in the country, and cost the United States over 850 billion dollars a year in health care spending[1]. This paper strives to evaluate the efficacy of instrument assisted soft tissue manipulation (IASTM) as a therapeutic approach for the treatment of musculoskeletal pain conditions.

The American population is advancing in both age and weight, which directly results in escalating MSK problems, making it imperative for health care providers to understand MSK pain and complaints as well as how to effectively treat them[1]. Of the 1.25 billion ambulatory visits to physician's offices in both outpatient and emergency room settings in the United States in 2009-2010, over 105 million of these reported visits were for MSK disorders[2]. Furthermore, the rising cost of healthcare in the United States begs for alternative, cost effective solutions to current expensive treatments. The use and subsequent misuse or overuse of opioids for chronic pain is quickly becoming a public health concern[3]. In a survey conducted by interviewing primary care health care providers within the Veteran's Administration Hospital system, it was found that provider perceptions of barriers to reducing opioid prescription and increasing the use of non-pharmacologic treatments for pain were centered on availability and access to these forms of treatment3. Some of the major barriers these providers listed were simply lack of

education about alternative treatment options, belief that these options would increase provider workload, and belief that patients would be resistant to alternative forms of care[3]. These perceptions, on top of the rising cost of healthcare as well as the opioid addiction crisis, prove just how important it is to find safer alternatives to MSK pain complaints that are not only cost effective, but also therapeutically effective.

Almost everyone has been affected by MSK pain at least once in his or her lifetime. As such, it is commonly known how debilitating these conditions can be. MSK pain affects the muscles, bones, ligaments, joints, tendons, and nerves of the body. MSK disorders encompass rheumatologic conditions such as rheumatoid arthritis, degenerative conditions such as osteoarthritis, acute sports injuries and other orthopaedic complaints[2]. MSK pain can be acute or chronic, and is typically caused by either injury to a specific region, or repetitive use or overuse of a particular joint. Aside from pain, other symptoms of MSK disorders include limited range of motion, edema, erythema, aching, stiffness, inability or difficulty performing activities of daily living (ADLs), fatigue, stress, increased sensitivity, and even depression[4]. Chronic widespread pain conditions, such as fibromyalgia, are poorly understood as far as to how or why they develop, but these conditions still contribute to the rising healthcare costs in the United States[4]. Chronic pain conditions account for up to 15% of the general population and are becoming more prevalent in primary care office visits throughout the country and therefore must be managed accordingly[4].

Currently, there are several acceptable paths when managing MSK pain. A plethora of treatment options exist, most of which are delivered in the primary care setting by first contact clinicians such as general practitioners, physical therapists,

chiropractors, and osteopaths[5]. Treatment options include, but are not limited to, non-pharmacological treatments such as self-management with ice, heat, and rest; exercise or manual therapy; bracing or splinting; and pharmacologic interventions such as analgesics, non-steroidal anti-inflammatory drugs (NSAID), opioids, and corticosteroid injections[5]. Refractory symptoms of pain may even be managed with surgical intervention[5].

The aforementioned treatment options all play effective roles in managing MSK pain complaints. However, all patients should be viewed as individual entities, and as such it should be understood that each patient might respond to each particular treatment option much differently. Therefore, the more therapeutically and cost effective treatment approaches that are accepted and available to patients, the better managed MSK pain can be. It is proposed that IASTM be considered as an additional, therapeutically effective way to manage multiple forms of MSK pain complaints. Hypothetically, IASTM should be considered as an effective therapy for these conditions. This systematic review will utilize three randomized controlled trials evaluating the efficacy of IASTM in managing patients suffering from MSK pain as opposed to other forms of treatment.

OBJECTIVE

The objective of this selective EBM review is to determine whether or not instrument assisted soft tissue manipulation (IASTM) is an effective therapy in decreasing patient reported pain originating from musculoskeletal sources.

METHODS

This systematic review will study a population of both male and female patients above the age of 18, with nonspecific musculoskeletal pain. The pain complaint could originate from either the axial skeleton, such as the thoracic or lumbar region, or an

extremity, such as the wrist or ankle. Any article selected must be published on or after 2007. Any article selected must be a randomized controlled trial (RCT). The intervention being reviewed was IASTM. In Burke et al. IASTM was compared to manual soft tissue manipulation, while in Lee et al. IASTM was compared to general exercise techniques such as stretching and stationary bike work. Crothers et al. compared IASTM to spinal manipulative therapy as well as a sham therapy of non-functional ultrasound.

The key words utilized in searching for sources included "pain," "instrument assisted therapy," "manual therapy," "soft tissue," and "musculoskeletal." All articles selected were published in peer-reviewed journals in the English language. The author used PubMed to conduct this research. Articles were selected based on relevance to the clinical question and that the outcomes of the studies mattered to patients (POEMs). Inclusion criteria consisted of any study published on or after 2007. Exclusion critera consisted of any form of pain that was not of MSK origin and patients under the age of 18. The statistics of this study were analyzed using mean change from baseline via standard deviation, 95% confidence interval, as well as p-values as all RCTs utilized non-dichotomous data.

Table 1: Demographics and Characteristics of Included Studies

Study	Type	# Patients	Age (Years)	Inclusion Criteria	Exclusion Criteria	Withdrawn from Trial (W/D)	Interventions
Burke, 2007[1]	RCT	26	30-40	1. ECG confirmed CTS; 2. Pain/paresthesia in median nerve distribution; 3. self reported pain of 33mm or >on VAS; 4. at least 2 of 8 other clinical findings	1. >50 years old; 2. Previous Tx interventions with surgery and/or steroid injections; 3. Hx of wrist trauma; 4. Hx of other MSK conditions; 5. Hx of underlying causes of CTS; 6. No pending lawsuits/insurance claims	4	Instrument Assisted Soft tissue manipulation/Graston technique vs. manual soft tissue manipulation
Crothers, 2016[6]	RCT	143	30-60	1. 18 or older w/ nonspecific t-spine pain of any duration; 2. Pain in T1-T12; 3.VAS score of at least 2 out of 10; 4. Oswestry Disability Index score of >15% at baseline	1. CI to manual or Graston therapy; 2. Referred pain to t-spine; 3. Substance abuse; 4. Non-English speaking; 5. Currently receiving care for t-spine pain from other providers; 6. Couldn't commit to study; 7. compensation or commenced litigation	27	Instrument Assisted Soft tissue manipulation/Graston technique vs spinal manipulative therapy and a sham, non-functional ultrasound treatment
Lee, 2016[5]	RCT	30	25-55	1. Onset of low back pain <12 weeks; 2. Chronic low back pain >than 90 days at time of enrollment in study	1. Hx of back surgery; 2. spinal fracture w/in 6 months; 3. spinal tumor/malignancy; 4. meds for psychiatric disorder; 5. exaggerated complaints d/t car or accident claim	0	Instrument Assisted Soft tissue manipulation/Graston technique vs. general exercises including stretching and stationary bike work

OUTCOMES MEASURES

Three RCTs were utilized in this review and the outcome that was measured was patient oriented (POEMs). The outcome measured for this review was patient reported decrease in pain from baseline. This was determined utilizing a Visual Analog Scale (VAS). Crothers et al. also utilized an Oswestry Disability Index (ODI) in making these determinations. Statistically, the outcome was measured using the decrease in self-reported pain using the VAS with a standard deviation presented as (+/-) as compared to baseline at the beginning of the study. The change in mean, or average, of all of these scores combined was then used to compare the comparison groups to the IASTM group.

RESULTS

Three RCTs were utilized to determine if IASTM was an effective treatment for MSK pain. In each study utilized, all data collected and analyzed was continuous, thus change in mean from baseline as well as confidence intervals were utilized for statistical analysis. Crothers et al. used a three-treatment arm study to analyze the efficacy of IASTM compared to both spinal manipulation therapy (SMT) as well as a placebo, which was a non-functional ultrasound unit when treating patients with nonspecific thoracic spine pain. Confidence Intervals (CI) was calculated at 95% across all three-treatment arms as well as across different time points observed within the study. Time intervals were at 1 week, 1 month, 3 months, 6 months, and 12 months. While $p < 0.01$ across all treatment arms with respect to time for both the VAS and ODI, there was not a statistically significant difference between the type of therapy applied to the patient[6].

Table 2: Baseline Data for Entire Sample and Three Treatment Groups

Variable	All (N=143)	SMT (N=36)	IASTM (N=63)	Sham US (N=44)
Pain (0-10 VAS)	5.6 (2.0)	5.5 (2.0)	5.7 (2.1)	5.5 (2.0)
Disability (0-100 ODI)	28.5 (10.4)	27.2 (10.2)	29.6 (11.1)	28.1 (9.9)

Table 3: Change in mean from baseline to end of study for pain severity and disability with IASTM

Variable	Baseline	1 week into study	6 months post study
Change in mean (VAS)	5.7 (2.1)	4.7 (1.9)	3.5 (2.5
Disability (ODI)	29.6 (11.1)	22.6 (11.8)	16.2 (13.1)

Table 4: Confidence Intervals (95%) comparing IASTM to other modalities

Time	IASTM vs SMT	IASTM vs Sham US
1 week	-0.3 (-1.2, 0.5)	0.1 (-0.7, 0.8)
6 months	-0.4 (-1.4, 0.7)	-0.2 (-1.2, 0.8)

Burke et al. compared IASTM to manual soft tissue manipulation on patients complaining of carpal tunnel syndrome (CTS). Immediately after both treatment interventions decreases were noted in pain ratings for the CTS wrist and no change was noted in the control wrist. At three months post treatments, there was a slight increase in pain ratings reported by the manual soft tissue group, whereas those patients that were treated with IASTM maintained improved pain ratings[7]. A p-value of < 0.05 was considered statistically significant. The data in Table 5 was taken from Burke et al.

Table 5: Ratings of perceived pain as change in mean standard deviation (95% CI)

VAS (mm)	IASTM-CTS	IASTM-Control	Manual-CTS	Manual-Control
Baseline	61.5 +/- 26.56 (46.5-76.5)	32.1 +/- 24.09 (18.5-45.7)	60.5 +/- 17.90 (49.4-71.6)	13.20+/-13.50 (4.8-21.6)
Immediate Post	9.8+/-12.54 (2.7-16.9)	5.6 +/- 8.93 (0.5-10.7)	15.4 +/- 19.62 (3.2-27.6)	5.4 +/-7.89 (0.5-10.3)
3 Months Post	9.2 +/- 11.04 (3.0-15.4)	11.7 +/- 22.15 (0-24.2)	33.7 +/- 28.84 (15.8-51.6)	14.4 +/- 26.88 (0-31.1)

Lee et al. compared the effects of IASTM to a general exercise program for patients suffering from low back pain. Statistically significant effects of time were observed in pain. VAS significantly improved in the IASTM group from pre intervention to post intervention (IASTM 25.5 +/- 7.3mm vs 50.6 +/- 12.8mm, $p<0.001$; Exercise Program 44.6 +/- 12.9 vs 48.9 +/- 14.6, $p=0.334$). [8] The data for the table below was taken from Lee et al.

Table 6: Comparing VAS scores between IASTM and Exercise groups pre and post treatment

Group	Pre-Intervention	Post-Intervention
IASTM	50.6 +/- 12.7	25.5 +/- 7.3
Exercise Program	48.9 +/- 14.6	44.6 +/- 12.9

DISCUSSION

All three studies demonstrated the efficacy of IASTM in relieving MSK pain. In the Crothers study, it was found that no matter what the intervention was, all three groups found a significant improvement in their pain over time, including from the sham, non-working ultrasound unit.[6] This particular study focused on the thoracic spine region of the body as the primary pain source. A strength of this study was that the pain could be for any length of time, both chronic or acute; however this could also be seen as a weakness in that it was unspecified how long each participant suffered from their current pain complaint as well as if this effected how responsive they were to each respective intervention. Another limitation to this study was that disproportionate numbers of patients were randomly allocated to the three groups. There were 36 patients in the SMT group, 63 in the IASTM group, and 44 in the sham group[6]. This result may have had an adverse effect on the statistical power and analyses of each treatment arm. Another

strength to this study was that follow up ranged from one week to one year after each intervention. It is promising that even one year after the intervention, patients still reported improved VAS[6].

Burke et al. demonstrated the efficacy of IASTM in relieving CTS pain. As with the Crothers study, while IASTM did answer the POEM, both modalities of IASTM as well as manual muscle work were effective in decreasing pain. However, due to small patient sample sizes, clinically meaningful differences between IASTM and manual soft tissue manipulation interventions were small[7]. Accounting for patient drop off, a total of 22 patients completed the study, with 12 in the IASTM treatment arm[7]. Immediately after as well as three months post treatment, improvements were still noted in both the IASTM and manual muscle work groups, and while there was no statistically significant difference in those improvements between modalities, it was encouraging again that the treatment results lasted well after the treatment was applied.

Finally, Lee et al. demonstrated that IASTM was superior to an exercise program of stretching and stationary bike riding for chronic low back pain sufferers. Statistically significant decreases in pain levels were noted in the pre and post intervention group for the IASTM treatment arm, while this was not the case for the exercise arm[8]. This study was only conducted over one month of time. Another limitation to this study is that it was never explicitly stated how frequently each intervention was applied over the duration of the four weeks. This study also specifically observed the effects of IASTM on patients with low back pain that was at least 90 days or more in duration, narrowing the focus to chronic pain patients only[8].

IASTM is a relatively safe modality that involves a hand held rigid tool, typically made of stainless steel that is applied over MSK tissue in a brushing or sweeping motion after a frictionless emollient is applied to the skin. It is claimed that the instruments resonate in the clinician's hands, allowing the clinician to isolate MSK adhesions and restrictions, therefore mobilizing myofascial restrictions or scar tissue[6]. Contraindications to this therapy are very limited, but include any open wound over the area of treatment, uncontrolled hypertension, over a gravid uterus, over unhealed fractures, and in patients taking anticoagulants[9]. Access to this type of therapy is relatively open; multiple professionals that utilize manual therapy become certified in one form of IASTM. However, this type of therapy is typically considered either physical therapy or massage therapy, and as such several insurances either do not cover it at all, or a large portion of the cost of the therapy will come out of the patient's pocket, which may limit access to care. Regardless, it is relatively low in cost, especially when compared to more invasive measures such as surgical intervention.

In general between the three RCTs, there were other limitations that may make it more difficult to equally compare. Because the modality of this intervention is very physical in nature, it makes it difficult to truly blind the patient subjects as far as what form of therapy they are receiving. The Crothers study required an initial VAS score of at least 2 out of 10[6] while the Burke study required an initial score of 33mm out of 100[7], and the Lee study had a minimum requirement of 17mm out of 100 on the VAS[8]. The varying requirements across studies make the interpretation of each result all the more subjective. Additionally, the manner in which the patients developed their pain symptoms was never disclosed. In other words, patients enrolling in these studies could

be complaining of pain that originated from a wide range of injuries. The Lee study did not exclude patients who were taking pain medications or undergoing other forms of treatment for the area of pain being studied[8] while the other two studies did. None of the studies evaluated the efficacy of IASTM in regards to pediatric injuries.

CONCLUSION

The findings of all three studies have demonstrated that there is a statistically significant decrease in pain when patients with MSK injuries are treated with IASTM. While it may seem discouraging that two of the three studies proved it did not matter the type of physical intervention that was applied to still get benefit, there is something to be said about the perceived healing nature of manual therapies. To be more certain of the outcomes of all three studies, additional research should be done with larger study population numbers. Additionally, it would be beneficial to have individual studies on the efficacy of IASTM on acute injury recovery as well as separate studies evaluating the efficacy of IASTM on more chronic injuries. In this way it can be determined if there is a more beneficial time to intervene with IASTM therapy.

REFERENCES

1. Cardenas CP, Burge SK, Kizerian G. Musculoskeletal Manifestations in Primary Care . *Musculoskeletal Manifestations in Primary Care*. https://iims.uthscsa.edu/sites/iims/files/RRNet/FINAL%20-%20Cardenas.pdf. Accessed October 1, 2017.

2. Robert L. Musculoskeletal Hits Top 10 in Primary Care Visits. Musculoskeletal Hits Top 10 in Primary Care Visits. www.physicianspractice.com/printpdf/211949. Published June 23, 2015. Accessed October 1, 2017.

3. Giannitrapani KF, Ahluwalia SC, Mccaa M, Pisciotta M, Dobscha S, Lorenz KA. Barriers to Using Nonpharmacologic Approaches and Reducing Opioid Use in Primary Care. *Pain Medicine*. 2017. doi:10.1093/pm/pnx220.

4. Kerr JI, Burri A. Genetic and epigenetic epidemiology of chronic widespread pain. *Journal of Pain Research*. 2017;Volume 10:2021-2029. doi:10.2147/jpr.s143869.

5. Babatunde OO, Jordan JL, Windt DAVD, Hill JC, Foster NE, Protheroe J. Effective treatment options for musculoskeletal pain in primary care: A systematic overview of current evidence. *Plos One*. 2017;12(6). doi:10.1371/journal.pone.0178621.

6. Crothers AL, French SD, Hebert JJ, Walker BF. Spinal manipulative therapy, graston technique(R) and placebo for non-specific thoracic spine pain: A randomised controlled trial. *Chiropr Man Therap*. 2016;24:16-016-0096-9. eCollection 2016. doi: 10.1186/s12998-016-0096-9.

7. Burke J, Buchberger DJ, Carey-Loghmani MT, Dougherty PE, Greco DS, Dishman JD. A pilot study comparing two manual therapy interventions for carpal tunnel syndrome. *J Manipulative Physiol Ther*. 2007;30(1):50-61. doi: S0161-4754(06)00313-7.

8. 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. *J Phys Ther Sci*. 2016;28(6):1852-1855. doi: 10.1589/jpts.28.1852.

9. Hyde TE. Graston Technique Indications and Contraindications. Spine Health. https://www.spine-health.com/treatment/chiropractic/graston-technique-indications-and-contraindications. Published May 13, 2013. Accessed December 8, 2017.