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Intramuscular Manual Therapy after Failed Conservative Care: A Case Report

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Abstract

Background and Purpose: During intramuscular manual therapy (IMT), an acupuncture needle is inserted into the skin and muscle. The direct mechanical stimulation may interrupt the pathogenic mechanisms of myofascial trigger points (MTrPs). The purpose of this study was to demonstrate the application and efficacy of IMT on a patient suffering from right chronic elbow pain who failed 11 conservative physical therapy sessions and previous site-specific acupuncture. The patient received 5 IMT sessions over 4 weeks. Findings: The patient had full symptom resolution, range of motion and strength, and avoided surgical intervention. At 6-month follow-up, the patient remained symptom-free. Clinical Relevance: Current treatment for lateral epicondylalgia lacks clinical consensus. This case demonstrated the significant impact of IMT as an adjunct treatment and supports its initial implementation as part of conservative care.

Key Words: dry needling, myofascial trigger point

BACKGROUND AND PURPOSE

Intramuscular manual therapy (IMT), previously called trigger point dry needling, has been performed by health care practitioners across the world including in the United States. Intramuscular manual therapy is an invasive procedure in which an acupuncture needle is inserted into the skin and muscle. Intramuscular manual therapy is within the scope of physical therapy practice across parts of the world; however, it is not typically taught in the entry-level physical therapy curriculum. The American Physical Therapy Association supports the use of IMT by physical therapists. The American Academy of Orthopaedic Manual Physical Therapists executive committee has also defined IMT implementation to be within the scope of physical therapy practice. The Federation of State Boards of Physical Therapy performed a review regarding IMT and concluded the following opinion, “there is a historical basis, available education and training as well as an educational foundation in the CAPTE criteria, and supportive scientific evidence for including intramuscular manual therapy in the scope of practice of physical therapists. The education, training, and assessment within the profession of physical therapy include the knowledge base and skill set required to perform the tasks and skill with sound judgment. It is also clear; however, that intramuscular manual therapy is not an entry level skill and should require additional training.” In the United States, each state board defines its scope of practice for the physical therapy profession. Several states specifically support IMT within their scope of practice, some states say it is not in their scope, but most states have not addressed this specific procedure. Despite political disagreements, there is mounting empirical evidence supporting the efficacy of IMT and its implementation by physical therapy professionals.

There are numerous manual procedures employed by physical therapists. Those most commonly used in the orthopaedic setting include mobilization, manipulation, soft tissue massage, myofascial release, trigger point therapy, flexor carpi ulnaris, and just recently in the United States, IMT. The mechanisms of action for standard manual therapy techniques are still under debate, although many theories have been proposed. Manual therapy techniques for myofascial trigger points (MTrPs) include transverse friction massage, trigger point pressure release, ischemic pressure, spray and stretch, muscle energy techniques, strain and counterstrain, soft tissue mobilization, myofascial release, and IMT. However, these manual therapies lack efficacy with few randomized clinical trials lacking adequately controlled manual treatment techniques with no statistical benefit found beyond the placebo effect.

Systematic reviews completed on the effectiveness for dry needling in the management of MTrPs demonstrated positive results; however, few studies have been performed in regards to needle therapy and lateral elbow pain. The knowledge base for the pathophysiology and mechanism of action of needling is growing. The efficacy of needling procedures for myofascial or musculoskeletal pain has been examined in the literature. Adverse events from IMT are usually minor and range from local soreness, bruising, bleeding, and pain to the major adverse event of pneumothorax. Despite the potential for adverse effects, the literature supports the safety of this procedure especially when performed by a trained clinician.

A MTrP is a hyperirritable spot within a hard hypertensive palpable nodule located in a taut band within the muscle and which, when compressed or spontaneously provoked, causes a predictable pattern of pain in a distal region, called a referred pain zone. Myofascial trigger point formation can be the result of many factors, including trauma, overstretch, overuse, psychological stress, and joint dysfunction. Myofascial trigger points are either active (symptomatic) or latent (asymptomatic) trigger points (TrPs). Active TrPs can spontaneously produce local pain, referred pain, or paraesthesia. Latent TrPs only cause pain symptoms when stimulated. The hallmark characteristics of MTrPs include motor, sensory, autonomic phenomena, and hyperexcitability of the central nervous system (CNS). This may lead to similar conditions such as spinal segmental sensitization, peripheral and central sensitization, or segmental facilitation; however, this alteration of pain-processing phenomenon is beyond the scope of this case study. Myofascial trigger points can further be classified as primary or...
secondary TrPs. Primary TrPs develop from either acute trauma or chronic overload (indirect trauma) of a muscle. Secondary, or satellite, TrPs are caused by mechanical stress and/or neurogenic inflammation due to an active primary TrP. The criteria for MTrP identification may include: an exquisitely tender taut band within a muscle that refers in a familiar, predictable pattern when palpated causing a range of motion limitation when the involved muscle is stretched actively or passively; palpation may result in a “jump sign” in which the patient quickly withdraws from the palpation or in a local twitch when palpated using a “snapping” motion. One study questioned the reliability and validity of such physical examination findings since there is no referenced standard in evaluating MTrPs. However, a study examining the interrater reliability of MTrP diagnosis conducted by Gerwin et al supported the validity of MTrPs as a clinical finding when the examiners were appropriately trained on MTrP identification. Of note, the authors suggested that even when symptom provocation is negative with manual palpations, a local twitch response, pain reproduction, and referred pain are often elicited by placing a needle into the MTrP.

Myofascial trigger points have spawned numerous etiological theories and models. The predominant theory is that IMT produces a biochemical effect on the neurophysiological system within the spinal cord and CNS. When injury occurs to the soft tissues, the result is a unique pro-inflammatory cascade of cytokine biochemicals resulting in hypernociception. Pain and inflammatory mediators communicate central processing nociceptive signals and also alter conditions at the local site of tissue damage. These biochemical substances can lead to increases in local tenderness and pain, increases in blood flow and pressure, and hyper-excitation of mechanoreceptors and nociceptors in the local area of injury. This biochemical inflammatory cascade for myofascial afferent neurons to be more susceptible to abnormal depolarization activity by various means, thus lowering the pain threshold. This increases the likelihood of aberrant pain perception in the CNS, which outlasts the original noxious peripheral irritant, resulting in peripheral and central sensitization. The biochemicals associated with inflammation, intercellular signaling, and pain are elevated in the immediate area surrounding an active MTrP as well as in distant, unaffected muscle regions or secondary (satellite) areas. Despite this recent information, the exact cause and nature of MTrPs remains unclear. Despite etiological uncertainty, the direct mechanical stimulation (irritant) caused by IMT may result in connective tissue remodeling and plasticity that then interrupts the pathogenic mechanism of MTrPs, thus making a positive clinical effect.

Lateral epicondylitis, also known as tennis elbow or lateral epicondylalgia (LE), is described as pain at the lateral humeral epicondylar region in association with gripping activities and resisted wrist extension motions. Lateral epicondylalgia involves the forearm musculature, MTrPs are typically present, often in the extensor carpi radialis brevis (ECRB), extensor carpi radialis longus, brachioradialis, and extensor digitorum muscle. The incidence of the LE varies from 3% in the general population to 15% in those who have jobs requiring repetitive gripping. Other factors that should prompt a clinician to include LE in provisional differential diagnoses are a history of pain during repetitive lifting tasks, dressing activities, and shaking hands, or direct palpation that reproduces the primary pain complaints, weakness during grip strength testing, stretching of the wrist extensors, and static contraction of the ECRB muscle or third digit extension test on exam.

Current treatment for LE lacks clinical consensus and efficacy, in part due to the multiple treatment approaches identified in the literature. In addition, the literature has not identified a specific intervention as the most efficacious. A recent case study demonstrated the effectiveness of IMT and manual therapy (mobilization-with-movement technique [MWM]) on a female patient with a 6-year history of LE who received IMT to the ECRB muscle and manual therapy (MWM) to the elbow during a 4-week time period. At the completion of the treatment, the patient denied pain during physical examination of the elbow and demonstrated improved pain-free grip strength, decreased pain on a visual analogue scale (VAS), and improved palpation tolerance as measured by pressure-pain threshold algometer. Further studies are needed for examining the efficacy of IMT treatment for LE.

The purpose of this case study is to demonstrate the application and efficacy of IMT on a patient suffering from chronic right elbow LE who failed prior conservative physical therapy care.
mid-supination/pronation position. Assessment of the radiohumeral and ulnohumeral joints did not provoke the patient’s symptoms, but did result in grade 2 hypomobility when assessed for distraction. The patient had widespread pain and hypersensitivity complaints in the right elbow and forearm. This hyperalgesia presentation suggested a peripheral or central sensitization component in the patient’s clinical presentation.21,36

**Intervention**

The physical examination ruled out the cervical spine as a primary source of continued right lateral elbow symptoms since symptoms were not provoked with scanning assessment and the cervical-thoracic spine mobility testing was normal. The patient had a 6-month history of right lateral elbow pain, was seen by two other health care providers during that time without success, the symptoms were progressively worsening, and the orthopaedic physician was considering surgery if his condition did not improve. Previous lateral elbow injections by the orthopaedic physician were unsuccessful. The physician orders requested ultrasound, iontophoresis, and gentle stretching and strengthening exercise. The physical therapist requested from the physician the inclusion of manual therapy to the right lateral elbow. Manual therapy treatment focused on soft tissue mobilization to the CET musculature and humeral-ulnar and radial-humeral distraction at varied angles of elbow flexion, grade 1 to III.

The conservative physical therapy sessions, including ultrasound, iontophoresis, gentle stretching and strengthening exercises, and manual therapy to the right lateral elbow, were performed for the initial 11 treatment sessions. Despite improvement, the patient continued to report symptoms that increased with the level of physical activity at work and continued to limit his ability to perform his job and daily tasks using the right hand/forearm. Because of the unsatisfactory improvements, IMT, or dry needling, was added to the plan of care for the referring physician’s signed approval, which was provided. The patient received a total of 5 IMT sessions. After the MTrPs were manually identified, the practitioner donned gloves and glove-covered hands were cleansed with antimicrobial hand sanitizer; the skin over the treatment area was cleansed with alcohol; a single use sterile acupuncture needle 50 mm (about 2 in) in length and 0.30 mm width was removed from the packaging; the needle was positioned over the taut band of the trigger point and was inserted until a local twitch response was provoked; the needle was then pistonned up and down approximately 6 times before being removed (Figure 1). This process was repeated one to 3 times per identified MTrP per session (Table).

**FINDINGS**

**Outcomes**

The patient was seen a total of 20 times over a 3-month time frame. In order to evaluate treatment efficacy, the first 3 treatment sessions consisted of gentle stretching and strengthening exercises to the right elbow musculature in conjunction with ultrasound to the CET/ECRB. The patient’s pain was now intermittent but consistently aggravated when at work where he had to change tires, and was exposed to very strenuous activity the majority of the day. The patient subjectively reported feeling 40% better out of a 100% scale, had negative signs on Mill’s and Cozen tests, and had grip strength increase from 93 to 110 lbs before first reporting pain. However, the patient remained symptomatic with third digit extension test. Due to the chronicity of the patient’s right elbow pain, the physically strenuous nature of his work, and the threat of surgical intervention, iontophoresis with desamethasone was added to the treatment program. The patient received a total of 8 iontophoresis treatments to the right CET/ECRB region during which time exercises were continued. After 11 treatment sessions, approximately one month of treatment, the patient had made good progress with subjective reports of feeling 50% better out of 100% scale, intermittent pain ranging from 0-4/10 NPRS, right grip strength at 104 lbs and left grip strength at 110 lbs, and now fluctuating negative/positive physical assessment findings of Mills’ stretch test and Cozen’s muscle test depending on his level of physical activity at work. Despite these gains, the patient still had a positive third digit extension test, positive trigger points remained in the right brachioradialis, CET/ECRB, and a significant amount of pain complaints while at work. The gains made in therapy were not significant enough to the patient to eliminate the possibility of surgical intervention and tended to fluctuate based on the level of physical activity required at work.

The physician was asked to approve the addition of IMT, or dry needling. Once physician approval was obtained approximately 5 weeks from starting therapy, written and verbal informed consent was acquired from the patient. Intramuscular manual therapy was added to the patient’s plan of care on the twelfth treatment visit, which at this point, included ultrasound, therapeutic exercise, and manual therapy. The patient responded well immediately with no pain at rest, no pain with stretch (Mills’ test), and no pain with the Cozen’s test. These results mirrored those previously achieved using other treatment methods but occurred immediately following the first IMT session. The third digit test remained provocative, but less intense.

The patient received 5 sessions of IMT over a 4-week time period (see Table) and was administered to the following musculature: ECRB, brachioradialis, and supinator muscle. After the first two IMT treatment sessions, the patient reported feeling 65% to 75% better out of 100% scale, had no pain reports at rest or with his exercise routine, demonstrated negative physical exam tests with Mills’ stretch test, Cozen’s test, and third digit extension test, with right grip test at 135 lbs and left grip test at 110 lbs. However, positive MTrPs remained in the right ECRB and brachioradialis musculature. After 4 IMT treatment sessions (2 weeks), the patient presented with no pain and negative physical exam findings on Mills’ stretch, Cozen’s resistive test, and third digit extension test. Upon returning to the clinic 5 days later, he reported straining his right bicep while pulling a tire at work where he was using his entire body weight. This increased the aggravation to his right elbow mildly, but not significantly according to the patient. The fifth and final, IMT treatment was then performed to the right brachioradialis.
Table. Summary of Services Provided per Week

<table>
<thead>
<tr>
<th>Treatment Week</th>
<th>Intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>Conservative Care</td>
</tr>
<tr>
<td>2nd</td>
<td>Conservative Care</td>
</tr>
<tr>
<td>3rd</td>
<td>Conservative Care</td>
</tr>
<tr>
<td>4th</td>
<td>Conservative Care</td>
</tr>
</tbody>
</table>
| 5th            | Conservative Care & IMT  
IMT (Thur): ECRB & Brachioradialis |
| 6th            | Conservative Care & IMT  
IMT (Tue): ECRB & Brachioradialis |
| 7th            | Conservative Care & IMT  
IMT (Tue): Brachioradialis  
IMT (Thur): ECRB & Supinato |
| 8th            | Conservative Care |
| 9th            | No Services Provided  
(16 days between treatment sessions) |
| 10th           | Conservative Care |
| 11th           | No Services Provided  
(12 days between treatment sessions) |
| 12th           | Discharge |
| 13th           | Discharge |

This case study was only performed to the involved region (MTrPs in muscles) and to the more proximal regions where shared nerve root innervation is present. This leads to the hypothesized spinal cord mechanism of action regarding a decrease in symptoms. Despite evidence in the literature citing improvements with needling more proximal musculature with shared innervation, the IMT performed in this case study was only performed to the identified local MTrPs. It is unclear if the patient would have improved more readily had IMT been performed to more proximal structures, namely the C5-6 and C6-7 segmental multifidi of the cervical spine. The patient received IMT on only 5 of the remaining 9 treatment sessions until discharge. There were significant and dramatic changes in his physical exam and subjective reports immediately upon IMT application. These objective improvements progressed and were maintained over the 7-week time period after the final date IMT was performed. This progress allowed the patient to return to a symptom-free work status and avoid surgical intervention despite having a 6-month history of chronic LE with prior failure of chiropractic and acupuncture services.

The heightened pain response to the mechanical stimulation of palpation, ROM, and special testing was evident initially. After the IMT sessions, there was an apparent hypalgesia effect that occurred and was verified by decreased pain complaints and decreased symptoms with palpation, stretch, and muscle contraction to the right wrist extensors. This may indicate that the direct mechanical stimulation (irritant) caused by IMT may have influenced the decreased sensitivity of mechanoreceptors and nociceptors that were previously heightened. Despite uncertainty on how IMT works at a biochemical and mechanical level, it has been proposed that the clinical improvements may result in connective tissue remodeling and plasticity. This then interrupts the pathogenic mechanism of MTrPs, thus having a positive clinical effect in pain, strength, ROM, and function.

Grip strength using a JAMAR hand held dynamometer is useful in identifying grip strength in patients with LE. Pain related grip strength was used to monitor patient progress because it is considered the most sensitive outcome measure demonstrating progress in those with LE. Multiple physical examination procedures, which may include pain assessments, grip strength tests, and manual evaluation tests, may be helpful.
in identifying LE. A physical therapist can use manual evaluation procedures to gather clinically useful information on those with chronic LE both for diagnosis and progress evaluation. These procedures may include palpation, Mills’ stretch test (passive stretching of wrist extensors), resisted wrist extension, or Cozen’s test or third digit extension test, and grip strength. Myofascial trigger points, in the literature, are identified by the palpation of exquisitely hypersensitive spots in a taut band of muscle that results in a predictable referred pain pattern and typically result in a local twitch response. Myofascial trigger points tend to result in ROM limitation for the joints that the involved muscles are associated with when the muscle is stretched actively or passively. A verbally reported NPRS is a useful alternative to the VAS and has been shown to have adequate reliability and validity where a two-point change in the NPRS is clinically significant and not due to measurement error. The NPRS scores range from 0 (no pain) to 10 (worst pain possible). Unfortunately, this has not been specifically measured in patients with LE. The patient was asked to assign a percentage to his perceived improvement. The use of this numerical scale ranging from 0% to 100% (where 0% is no better and 100% is complete resolution of symptoms) has been supported as a statistically significant marker for measuring improvement in patients with lumbar stenosis both at initial exam and throughout treatment until discharge.

CLINICAL RELEVANCE

This study is relevant to the field of physical therapy because IMT is in its infancy in the United States. Intramuscular manual therapy training is also relevant to the profession, as this technique is not typically being taught in our entry-level programs. The key to any technique, whether manipulation or IMT, is not the actual procedure itself, which is quite simple; but rather, the clinical reasoning behind implementation of such a procedure. Various physical therapy professional associations, many state licensing boards, and the Federation of State Boards have released positive position statements supporting the use of intramuscular manual therapy by physical therapists and specify the practice as within the scope of practice for physical therapy. As such, it should be discussed within academic entry-level programs so graduates can seek the appropriate training per their state’s governing body as applicable.
This study contributes to the literature by describing efficacious treatment options for LE in a patient suffering from chronic symptoms and facing potentially serious impairments as a result of surgical intervention. This study is similar to other studies because it investigated the potential impact of IMT, but different from other studies on 3 primary points. First, this case study examined the efficacy of IMT after conservative therapy had failed. Second, it used readily available physical examination procedures and resources commonly used in the clinic. The impact of IMT was immediate for this patient suffering from chronic LE after failing prior conservative treatments with significant changes in grip strength, NPRS, reported patient perceived percent improvement, and a nonsymptomatic physical examination. Third, because the patient had previously received acupuncture needle therapy, the likelihood of a placebo effect from IMT is unlikely and therefore IMT is more likely responsible for the dramatic resolution of symptoms.

The results of this case study cannot be applied across the patient spectrum, but provides a case study supporting the significance of the use of IMT as an adjunct to the management of musculoskeletal pain and conservative care. This study may also add support for initiating IMT sooner in the plan of care, when it is indicated, due to the dramatic improvements by this patient following treatment.

One of the major limitations of a case study is its inability to draw statistical support for a cause-and-effect relationship. Therefore, although the outcome following IMT treatment for this case study was dramatic, cause-and-effect cannot be statistically verified. As previously discussed, the inherent use of needle application is difficult to blind across treatment groups or combine with a placebo control. Future randomized clinical trials comparing IMT with other treatments using sufficient sample size are required to determine the efficacy of IMT as a treatment option for LE. Future studies should also investigate IMT as a primary treatment approach when developing the initial plan of care. Pressure algometer may provide more objective data for further follow up studies as it has been proposed to be able to distinguish between normal muscle and myogenic pain hyperalgesia. Lower pressure pain thresholds can be assessed by these hand held algometers that can help determine the pain thresholds for primary and secondary hyperalgesia.

This case report provides an example of an effective outcome using IMT procedures after failed conservative care for chronic LE and builds the clinical knowledge base regarding IMT and LE. The clinical changes recorded after implementation of IMT are, in this author's opinion, too dramatic to have occurred by random chance. It is unlikely the patient experienced the placebo effect related to needle insertion ("needle effect") since prior to physical therapy treatment the patient had received acupuncture treatments from an acupuncturist with no significant change in his condition. Based on the results obtained with intramuscular manual therapy in this case report, IMT should be considered as a possible treatment choice for LE.

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