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A pilot study of myofascial release therapy compared to Swedish massage in Fibromyalgia

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Summary

Fibromyalgia (FM) is characterized by widespread muscle pain and soft tissue tenderness. However, a lack of definitive muscle pathology has made FM both a diagnostic and a treatment puzzle. Much of the evidence for pathology in FM lies in the central nervous system – in particular abnormal amplification of pain signals in the spinal cord – a manifestation of central sensitization. An emerging body of evidence posits that peripheral pain generated from the muscles and fascia may trigger and maintain central sensitization in FM.

Since FM patients so frequently seek manual therapy to relieve muscle symptoms, the present study compared two different manual therapy techniques in a parallel study of women with FM. Eight subjects received myofascial release (MFR) while four subjects received Swedish massage, 90 min weekly for four weeks. Overall symptom burden and physical function were assessed by the Fibromyalgia Impact Questionnaire Revised (FIQ-R).

A unique challenge for the manual therapist in treating conditions involving central sensitization is to determine if localized pain reduction can be achieved with targeted therapy in the context of ongoing widespread pain. Localized pain improvement was measured by a novel questionnaire developed for this study, the modified Nordic Musculoskeletal Questionnaire (NMQ).

Between-group differences in FIQ-R did not reach statistical significance, but the total change scores on FIQ-R for the MFR group (mean = 10.14, SD = 16.2) trended in the hypothesized and positive direction compared to the Swedish massage group (mean = 0.33, SD = 4.93) yielding a positive Aikin separation test. Although overall modified NMQ scores improved in both groups there were no consistent focal areas of improvement for the Swedish massage group. In contrast, the MFR group reported consistent pain reductions in the neck and upper back regions on the NMQ. These data support the need for larger randomized controlled trials of MFR versus other massage techniques and support the assessment of localized pain reduction in future manual therapy studies in FM.

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Keywords

Fascia; Fibromyalgia; Myofascial release; Massage therapy; Central sensitization; Swedish massage

Background/significance

Fibromyalgia (FM) is a syndrome of widespread muscle pain and fatigue that affects between 2 and 3 percent of the U.S. population, with similar numbers worldwide (Lawrence et al., 1998; White et al., 1999; Wolfe et al., 1995). FM is defined as a self-report of at least three consecutive months of widespread musculoskeletal pain, with tenderness at a minimum of 11 of 18 specific soft tissue tender points on physical examination as established diagnostic criteria (Wolfe et al., 1990). Although FM is characterized by muscle pain, the preponderance of evidence to date points to pathology in the central nervous system. In particular, three decades of research has demonstrated augmentation of pain processing in FM (Gracely et al., 2002; Staud et al., 2004; Jensen et al., 2009; Robinson et al., 2011). This exaggerated nervous system response to pain is a phenomenon termed ‘central sensitization’. Central sensitization occurs when there is persistent peripheral nociceptive input leading to an increased excitability of the dorsal horn neurons of the spinal cord. There is persuasive evidence that chronic pain repetitively activates both A-delta and C fibers, which stimulate the release of neurotransmitters and neuromodulators such as substance P, nerve growth factor, glutamate and calcitonin gene-related peptide (Urban and Gebhart, 1999). These neurochemicals sensitize neurons in such a manner that they become hyperexcitable and respond inappropriately to low/normal levels of stimulation.

However, in an illness whose primary complaint is muscle pain, the muscles cannot be ignored. In fact, muscle may play a key role in triggering the central nervous system sensitivity observed in FM (Staud, 2011). An emerging body of evidence points to peripheral pain generated from muscle and fascia as the trigger of central sensitization in FM. Myofascial trigger points are spots of exquisite muscle tenderness and hyperirritability, and FM muscles have significantly more trigger points than do healthy muscles (Alonso-Blanco et al., 2011). A recent double blind study found that myofascial trigger point injections not only relieved regional muscle symptoms but also reduced global pain sensitivity in FM subjects. The authors conclude that ‘localized muscle/joint pains impact significantly on FM, probably through increased central sensitization by the peripheral input; their systematic identification and treatment are recommended’ (Affaitati et al., 2011).

Reducing regional FM muscle pain through lidocaine injections has also been shown to diminish pain directly at the injection site as well as contralateral hyperalgesia and wind up, both important components of central sensitization (Staud et al., 2009). These studies indicate that targeting peripheral muscle pain generators can improve both local pain and reduce central pain sensitivity. Addressing local muscle pain is therefore an important therapeutic goal in FM.

Many FM patients already try to target muscle pain locally – manual therapies are used by 44–75% of FM patients (Barbour, 2000; Wahner-Roedler et al., 2005). The most frequently

chosen technique is Swedish massage, which typically consists of moderate pressure stroking of the neck, back, legs and arms with the goal to increase circulation and promote general relaxation. Many massage styles have been examined in FM, but to date no studies have directly compared two different techniques. Two single-arm studies and six randomized controlled trials have assessed various massage techniques including Swedish massage, shiatsu, mechanical deep massage, connective tissue massage, and manual lymphatic drainage. All of these studies found short-term reduction in FM symptoms, but only one single-arm study showed long-term benefits (Kalichman, 2010).

Recently the pain-generating role of fascia in maintaining FM symptoms has been suggested, raising the possibility that manual therapies that specifically target the fascia may provide more effective FM pain reduction (Liptan, 2010). The fascia surrounding skeletal muscle is a highly innervated connective tissue. Its principal cell is the fibroblast, which regulates inflammation and tissue repair. Fibroblast activation is induced by various stimuli that occur with tissue injury. In vitro modeling reveals that repetitive mechanical straining of fibroblasts induces changes in cellular morphology and secretion of inflammatory mediators (Dodd et al., 2006). Biopsy studies have demonstrated excessive levels of collagen and inflammatory mediators in the fascia of subjects with FM (Rüster et al., 2005; Spaeth et al., 2005). These findings suggest the presence of tissue injury in FM fascia similar to that seen in repetitive strain injuries (Sharma and Maffulli, 2006).

Myofascial release therapy (MFR) is a combination of manual traction and prolonged assisted stretching maneuvers designed to break up fascial adhesions. In vitro modeling of simulated MFR on fibroblasts injured by repetitive strain resulted in normalization of cell morphology and attenuation of inflammatory responses (Meltzer et al., 2010).

Two recent studies by Castro-Sánchez and colleagues found that MFR was effective in reducing FM pain, and also provided durable pain reduction which persisted at one month and to a lesser extent at six months post-intervention (Castro-Sánchez et al., 2011a, 2011b). The present pilot study compares Swedish massage directly to MFR – a head to head comparison that has not been performed previously. Since MFR more directly targets the proposed peripheral pain generators residing in the fascia we hypothesize it will produce more effective pain relief than Swedish massage for FM subjects.

Methods

Design

This quasi-experimental pilot study enrolled a convenience sample of 12 women with FM.

Inclusion and exclusion criteria

Study subjects were between the ages of 21 and 50, with a confirmed diagnosis of FM established by 1990 ACR criteria (Wolfe et al., 1990). Participants had to be on a stable regimen of pharmacological and/or non-pharmacological treatment for FM the previous three months leading up to study period and agree to maintain their present medication unchanged for the duration of their participation in the study. Exclusion criteria were pain conditions not associated with FM such as diabetic neuropathy, lumbar or cervical disc

disease, or severe depression. Subjects were excluded if they were currently receiving any form of manual therapy such as massage, MFR, Rolfing, chiropractic, or physical therapy, or if they stated an intolerance to touch. Also excluded were any subjects undergoing disability application or involved in litigation or scheduled elective surgery during the study period.

Protocol

All subjects were evaluated at pre-intervention, prior to each therapy session, and at two weeks post-intervention. All subjects received 90 min of massage once weekly for four weeks consecutive weeks, totaling six treatment hours per subject. Three therapists delivered the intervention. Each was a licensed massage therapist with experience treating FM patients with both Swedish massage and advanced training in MFR. For each Swedish massage session, the therapist utilized moderate pressure stroking of the neck, back, legs, and arms. MFR therapy consisted of prolonged assisted stretching of painful areas of soft tissue of the neck, back, arms, and legs. The study was approved by Oregon Health & Sciences University Internal Review Board, and a signed consent form was obtained from all subjects.

Measures

The primary outcome measure was the Fibromyalgia Impact Questionnaire Revised (FIQ-R), a 21-item self-report instrument assessing FM primary symptoms, physical function deficits, and quality of life. This is an updated version of an extensively validated measure with higher numbers indicating more severe symptoms and impaired physical function (Bennett et al., 2009a). The FIQ-R was used to determine if further study was indicated, based on Aickin separation testing (Aickin, 2004).

In order to measure localized improvement in pain in the context of widespread, chronic pain, we modified the Nordic Musculoskeletal Questionnaire (NMQ). This validated tool assesses musculoskeletal complaints in different body regions (Kuorinka et al., 1987). The NMQ was adapted for this study to rate pain in seven different body regions: neck, shoulders, upper back, arms, lower back, upper legs, and lower legs, on a scale of 0–3 (see Appendix 1). Higher numbers on the NMQ indicate greater pain.

All outcomes were measured by a single examiner, who was blinded to treatment group. Univariate statistics were used to characterize the sample, while the Aickin separation test was applied to the FIQ-R to determine whether further studies were indicated. The Aickin separation test is used for early phase trials to determine whether the data were 1) in the hypothesized direction, 2) counter to the hypothesized direction or 3) equivocal. Results in the hypothesized direction warrant further research with adequate power to test for efficacy (Aickin, 2004).

Results

On average, the subjects were 34.5 years of age ($SD = 5.5$), with FM for 2.6 years ($SD = 0.9$). Ninety percent had tried massage in the past with 70% reporting some immediate improvement, which waned several hours post massage (See complete demographics on Table 1). There were no baseline differences between groups. There were no adverse events or early discontinuations. Recruitment was completed in ten days. Baseline tenderness was

high in both groups (baseline myalgic score 31.9 (SD = 7.7) and 36.3 (SD = 3.1) in the MFR and Swedish massage groups respectively. Myalgic score is measured by severity of pain on palpation of each of the 18 ACR tender points, with higher score indicating more pain on a scale of 0–54 (Tastekin et al., 2007).

The Aickin separation test indicated that the FIQ-R total change score in the MFR group (mean = 10.14, SD = 16.2) trended in the hypothesized direction compared to the Swedish massage group (mean = 0.33, SD = 4.93) (See Fig. 1). Between-group differences in FIQ-R did not reach statistical significance.

Secondary analyses revealed that 5 of 8 subjects in the MFR group reported clinically significant FIQ-R improvement post-intervention compared to one subject in the Swedish massage group. A 14% change in the FIQ-R is considered clinically significant (Bennett et al., 2009b). Three subjects in the MFR group had reductions of 30 percent in the FIQ-R.

The modified NMQ revealed consistent pain reductions were observed in the neck and upper back regions in the MFR group. Although modified MNQ scores improved in both groups there were no consistent focal areas of improvement for the Swedish massage group.

Discussion

In recent studies by Castro-Sánchez and colleagues, MFR was effective in reducing FM pain but the MFR dose in both studies was considerably greater than in the present study – 90 min once weekly for 20 weeks or twice weekly for 24 weeks (Castro-Sánchez et al., 2011a, 2011b). However these studies were limited by lack of an active comparison group. Instead the comparator groups were sham magnetic therapy or sham ultrasound.

The current study extends the Swedish and MFR studies in the extant literature by comparing two active manual therapies head-to-head in a parallel design. This is a critical next step on a path toward maximizing treatment efficacy of specific massage therapies and individualizing therapeutic techniques to specific patient profiles. As the current study was parallel in design, it is less likely that Hawthorne, placebo effect or therapeutic relationship influenced the data. The placebo response is a biologically active process known to reduce pain and often encouraged in clinical practice (Watson et al., 2012). However, it may confound the mechanism of action of therapies when studies do not compare two active modalities in a parallel fashion.

The primary research question asked by this study was whether a manual therapy that addresses the fascia is more helpful than one that focuses on muscle relaxation for reducing symptoms of FM. Although the difference did not reach statistical significance, the Aickin separation test indicated further research to compare the two techniques is indicated. This study also confirms that both MFR and Swedish massage were well-tolerated, acceptable interventions for persons with FM, and that a 90-min session was tolerable, independent of baseline disease severity or tenderness.

A secondary research question addressed how to measure improvement in localized areas of pain in the setting of widespread pain and central sensitization. This is a dilemma that will

need to be addressed in all future studies of conditions characterized by central sensitization such as FM, temporomandibular disorder, chronic headaches, low back pain and painful bladder syndrome/interstitial cystitis (Kindler et al., 2011). We append a novel questionnaire used in this study that could be adopted by therapists seeking to monitor for localized pain reduction in conditions of widespread pain such as FM (see Appendix 1).

This study has a number of limitations including a non-randomized, small convenience sample size ($n = 12$) that was not powered to determine efficacy. Additionally, there was an unequal distribution of subjects (8 in the MFR group and only 4 in the Swedish massage group). The study dose was intentionally low at 6 h over 4 weeks. This dose was informed by clinical practice and the practicality of patient access to massage. This dose is in contrast to the 30–40 treatment hours in the studies by Castro-Sánchez et al. (2011a, 2011b). The study did not include long-term follow-up to assess for durability of effect. These data cannot be extended to men, minorities or severely depressed persons with FM.

Future randomized controlled trials of MFR and Swedish massage powered for efficacy are needed to determine 1) if one type of massage is universally superior in FM, or 2) if selected patient characteristics can be applied to select the most efficacious massage technique(s), or 3) determine the ideal dose of therapy. Future studies could utilize mechanistic tests to determine which components of central sensitization or tissue inflammation may be manipulated with MFR. These would be limited to research laboratories but may include microdialysis of fascial interstitial fluid or imaging for changes in density of fascia with ultrasound or MRI elastography before and after manual therapy intervention (Shah et al., 2005; Basford and An, 2009). Alternatively future researchers could measure changes in pain facilitation and inhibition with thermo-sensory analyses, cold pressor testing and pain-evoked neuroimaging to better understand how central sensitization could be modified by manual therapies (Staud et al., 2004).

Conclusions

Both Swedish massage and MFR were found to be safe, tolerable, and acceptable by FM patients, and the Aickin separation test indicated that MFR may result in greater reductions in FM symptoms compared to standard Swedish massage and that further study is warranted. If larger studies on MFR and Swedish massage produce similar findings, this could significantly expand tolerable treatment options and direct further research on the peripheral pathology in FM towards the fascia.

More immediately, data are needed to determine the utility of the modified NMQ in monitoring response to treatment by massage therapists in a clinical, rather than research setting. The modified NMQ is a novel questionnaire developed to assess for localized pain improvement in the setting of widespread central sensitization-type pain conditions. As FM is a multi-symptomatic disorder, measurement tools may provide insight into which symptom or function domains are most malleable to various types of massage intervention.

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Appendix 1

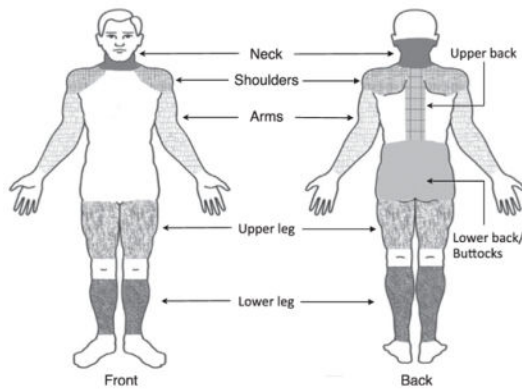
Modified Nordic Musculoskeletal Questionnaire.

MODIFIED NORDIC MUSCULOSKELETAL QUESTIONNAIRE (MNMQ)

Study ID number or name: _____ Date: _____

Directions: For each question, place an "X" in the box that best indicates how much pain you have experienced during the past seven days in each shaded area of the body marked on the diagram below. Please answer for each area and ONLY for the shaded area.

Neck	No Pain <input type="checkbox"/>	Mild pain <input type="checkbox"/>	Moderate Pain <input type="checkbox"/>	Severe pain <input type="checkbox"/>
Shoulders	No Pain <input type="checkbox"/>	Mild pain <input type="checkbox"/>	Moderate Pain <input type="checkbox"/>	Severe pain <input type="checkbox"/>
Arms	No Pain <input type="checkbox"/>	Mild pain <input type="checkbox"/>	Moderate Pain <input type="checkbox"/>	Severe pain <input type="checkbox"/>
Upper Back	No Pain <input type="checkbox"/>	Mild pain <input type="checkbox"/>	Moderate Pain <input type="checkbox"/>	Severe pain <input type="checkbox"/>
Lower back/ Buttocks	No Pain <input type="checkbox"/>	Mild pain <input type="checkbox"/>	Moderate Pain <input type="checkbox"/>	Severe pain <input type="checkbox"/>
Upper leg	No Pain <input type="checkbox"/>	Mild pain <input type="checkbox"/>	Moderate Pain <input type="checkbox"/>	Severe pain <input type="checkbox"/>
Lower leg	No Pain <input type="checkbox"/>	Mild pain <input type="checkbox"/>	Moderate Pain <input type="checkbox"/>	Severe pain <input type="checkbox"/>



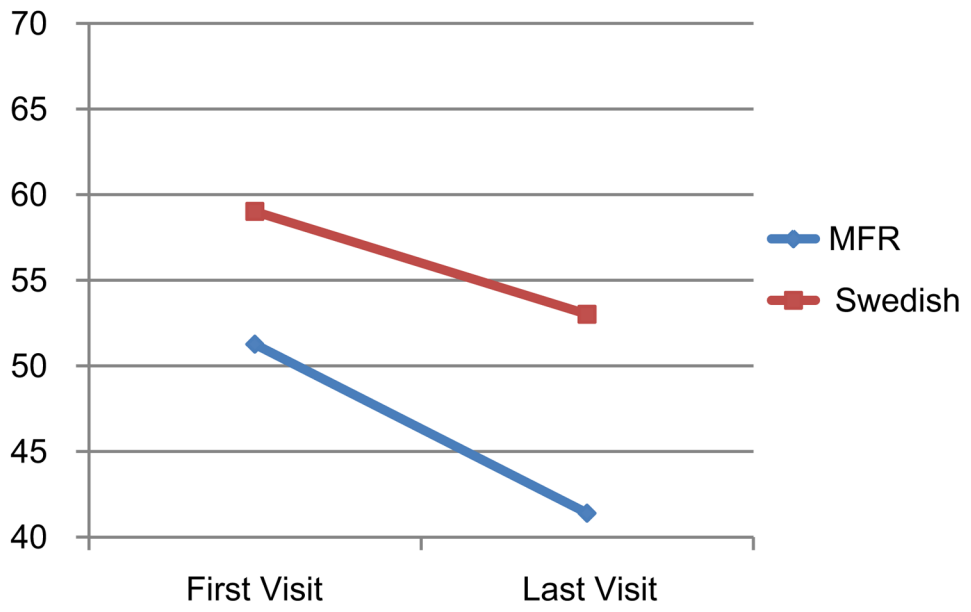


Figure 1. Mean total FIQ-R for both groups from first and last visit. Lower scores indicate symptom and function improvement.

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Table 1

Demographic data from both intervention groups.

Demographics	% of subjects
Marital status	
Married/domestic partnership/long-term live-in partner	50
Divorced/separated	30
Never married	20
Race	
Caucasian	100
Hispanic	20
Education level	
High school	20
Trade/technical school/community college	20
Some college	30
College	10
Post-graduate education	20
Income	
<\$9000	20
\$40,000–\$59,000	40
\$60,000–\$69,999	10
\$70,000–\$79,000	20
\$100,000–\$199,999	10
Length of time with FM symptoms	
1–5 years	60
6–10 years	10
>10 years	30
Length of time since diagnosis	
0–6 months	20
7–12 months	10
13 months–4 years	50
5+ years	20
Self-reported trigger for FM onset	
Motor vehicle accident	40
Viral illness	10
Other physical trauma (e.g. fall or injury)	20
None identified	30
Comorbid conditions ^a	
TMD	40
Endometriosis	20
Migraine	50
Sleep apnea	30
Restless leg	20

Demographics	% of subjects
Interstitial cystitis	10
IBS	50
Diabetic neuropathy	10
Arthritis	10
Tried massage in the past	
Yes	90
No	10
Experience with massage	
Massage made pain worse during and after massage	10
Pain relief during but benefits last only a few hours	70
Pain relief during and pain relieving effect lasted for several weeks	10
Working outside the home	
Yes	50
No	50
Receiving disability benefits	
Yes	10
No	90
Smoking status	
Former smoker	30
Current smoker	0%
Non-smoker	70

TMD-temporomandibular dysfunction; IBS-irritable bowel syndrome.

^a All subjects had more than one comorbid condition.