



SYSTEMATIC REVIEW: MYOFASCIAL SYNDROME

# Manual therapies in myofascial trigger point treatment: a systematic review

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Received 24 September 2003; received in revised form 20 November 2003; accepted 26 November 2003

## KEYWORDS

Myofascial pain;  
Myofascial trigger points;  
Pressure pain threshold;  
Systematic review

**Abstract** *Background and purpose:* Myofascial pain syndrome (MPS) is thought by some authors the main cause of headache and neck pain. MPS is characterized by Myofascial Trigger Points (MTrPs). However, there are not many controlled studies that have analyzed the effects of the manual therapies in their treatment. The aim of this systematic review is to establish whether manual therapies have specific efficacy in the management of MPS, based on published studies.

*Methods:* Data sources: PubMed (from 1975), Ovid MEDLINE (from 1975), Ovid EMBASE (from 1975), the Cochrane Database of Systematic Reviews, AMED (Alternative Medicine), Science Direct and PEDRO (Physiotherapy Evidence Database), databases were used to the searches.

*Study selection:* Clinical or Controlled trials in which some form of manual therapy treatment was used to treat MTrPs.

*Data extraction:* Two blinded reviewers independently extracted data concerning trial methods, quality and outcomes.

*Quality assessment:* Physiotherapy Evidence Database (PEDRO) quality score method was used in this review.

*Results:* Data synthesis. 7 studies were included in this review. One manual therapy treatment was investigated in 4 studies (one of them included a group treated with manual therapy combined with other physical medicine modalities); a combination of various manual therapies was investigated in 2 studies, and manual therapy combined with other physical medicine modality was investigated in 2 trials.

*Quality of the included studies:* Two papers obtained 6 points, another two scored 5 points, one scored 3 points, one scored 2 point and the remaining one scored 1 point.

*Discussion:* Results did not produce any rigorous evidence that some manual therapies have an effect beyond placebo in treatment of MPS. Some of the studies reviewed confirmed that MTrP treatment is effective in reducing the pressure pain threshold, and scores on visual analogue scales. Pressure pain threshold and visual analogue scale were the outcome measures most used in the analyzed studies. MPS is

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characterized by restricted range of motion (ROM), which suggests the need to include ROM measurements in future studies.

*Conclusions:* The principal conclusion of this review is that there have been very few randomized controlled trials that analyse treatment of MPS using manual therapy. The second conclusion is that the hypothesis that manual therapies have specific efficacy, beyond placebo, in the management of MPS is neither supported nor refuted by research to date. Controlled trials are needed to investigate whether manual therapy has an effect beyond placebo on MTrP management.

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## Introduction

Myofascial pain syndrome (MPS) is thought by some authors to be the main cause of headache and neck pain (Grosshandler et al., 1985). There are also many epidemiologic studies suggesting that MPS is an important source of musculoskeletal dysfunction (Fricton et al., 1985; Skootsky et al., 1989; Gerwin, 1995). A study of musculoskeletal disorders in Thailand found that MPS was the primary diagnosis in 36% of 431 patients with pain arising within the previous week (Chaiamnuay et al., 1998). Although these studies show that MPS has a high prevalence, there is much controversy relating to clinical aspects of MPS (Bohr, 1996; Quintner and Cohen, 1994). MPS is characterized by Myofascial Trigger Points (MTrPs). A trigger point can be located in fascia, ligaments, muscles, and tendons; however, MTrPs are also found in skeletal muscles and/or their fascia. A MTrP is a hyperirritable spot, associated with a taut band of a skeletal muscle that is painful on compression or stretch, and that can give rise to a typical referred pain pattern as well as autonomic phenomena (Simons et al., 1999).

MTrPs are typically located by physical examination and palpation. The diagnosis of a MTrP is accomplished by physical exploration by an experienced therapist, who must take into account the physical signs demonstrated (Simons et al., 1999), including: presence of a palpable taut band in a skeletal muscle; the presence of a hypersensitive tender spot in the taut band; palpable or visible local twitch response on snapping palpation, and/or needling of the MTrP (Hong, 1994); a 'jump' sign; the presence of the typical referred pain pattern of the MTrP; restricted range of motion (ROM) of the affected tissues; muscular fatigue and autonomic phenomena. However, the reliability of these criteria has been questioned (Nice et al., 1992; Njoo, 1994; Wolfe et al., 1992; Gerwin et al., 1995).

Simons et al. (1999) and Gerwin et al. (1997) recommend that the minimum acceptable criteria

for the presence of an active trigger point diagnosis involves the combination of the presence of:

1. a palpable taut band,
2. an exquisite tender spot in the taut band,
3. patient's recognition of pain as 'familiar',
4. pain on stretching the tissues.

Further work is underway relative to MTrP clinical examination (Russell, 1999). Readers might usefully explore current thinking on these issues via papers by Sciotti et al. (2001), as well as Gerwin et al. (1997).

The formation of a MTrP may result from a variety of factors, such as a severe trauma, overuse, overstress (Rubin, 1981), psychological stress (McNulty et al., 1994) and joint dysfunction (Kuan et al., 1997). The mechanism of activation of the MTrP is not clearly understood. Recent studies have hypothesized that the pathophysiology of MPS and the formation of MTrPs result from injured or overloaded muscle fibers, leading to involuntary shorting and loss of oxygen and nutrient supply, with increased metabolic demand on local tissues (Han and Harrison, 1997; Hong and Simons, 1998). Furthermore, adaptive lengthening and eccentric strain of the muscle may represent other mechanisms for activation of MTrPs (Simons et al., 1999). Currently, research continues to explore the nature of MTrPs (Simons, 2001; Simons and Hong, 2002; Shah and Phillips, 2003).

The aim of physical therapy treatment is to reduce the pain and restore normal function. Most physical therapy treatments of MPS are targeted at deactivation of MTrPs. Physical therapy techniques can be divided into 3 categories:

1. Manual therapies: ischemic compression, spray and stretch, strain and counterstrain (Jones, 1981; D'Ambrogio and Roth, 1997), muscle energy techniques (Chaitow, 2001), trigger point pressure release (Lewit, 1991), transverse friction massage (Cyriax and Cyriax, 1992).
2. Needling therapies (Cummings and White, 2001).

3. Other techniques: thermotherapy (Lee et al., 1997), ultrasound therapy (Gam et al., 1998), laser therapy (Pöntinen and Airaksinen, 1995).

Hey and Helewa (1994) concluded, following a literature review of MPS treatment, that no reported treatment had been more efficacious than control intervention. Not many controlled trials have been published analyzing the effects of the manual therapies. To establish whether manual therapies have specific efficacy in the treatment of MPS, and to update the literature to include recent papers, we undertook a systematic review.

## Methods

### Data sources

During 2003 computerized literature searches were performed searching for clinical/controlled trials and reviews of manual therapy treatment of MPS caused by MTrPs, using the following databases:

PubMed (from 1975), Ovid MEDLINE (from 1975), Ovid EMBASE (from 1975), the Cochrane Database of Systematic Reviews, AMED (Alternative Medicine), Science Direct and PEDRO (Physiotherapy Evidence Database).

Search terms used were: MPS OR MTrP OR musculoskeletal disorders, combined with manual therapy treatment, strain/counterstrain, spray and stretch therapy, ischemic compression, ischemic pressure, massage therapy, physical therapy, myofascial release therapy, muscle energy techniques, trigger point pressure release, and transverse friction massage.

When database facilities permitted, searches were limited to clinical or controlled trials.

### Study selection

Papers were included if they described clinical or randomized controlled trials in which some form of manual therapy treatment (strain/counterstrain, ischemic compression, transverse friction massage, spray and stretch, muscle energy technique) was used to treat MTrPs. Comparative trials were included if at least 1 group had a form of manual therapy treatment.

### Data extraction

Data were extracted independently by two blinded reviewers, using a specially designed form. Differences were resolved by discussion between all the authors. All authors participated previously in the

design and the original idea of the review. For each study, the following details were extracted: inclusion and exclusion criteria, design, randomization, description of dropouts and blinding, outcome measures, details of the intervention used and results.

## Quality assessment

There are many methods of achieving a quality score. In a previous systematic review of needling therapies in the management of MPS (Cummings and White, 2001), Jadad's principles were used (Jadad et al., 1996):

- 1 point for a study that is described as randomized.
- If the method of randomization is appropriate 1 point, if the method is inappropriate 1 point is deducted.
- 2 points if the assessor and subjects are blinded (one respectively), and another point if dropouts and withdrawals are described.
- Clinical trials with 3 or more points, from the maximum score of 5, were considered of higher quality.

In this systematic review, the Physiotherapy Evidence Database (PEDRO) quality score method has been used:

- Random allocation: 1 point.
- Concealed allocation: 1 point.
- Baseline comparability: 1 point.
- Blinded assessors: 1 point.
- Blinded subjects: 1 point.
- Blinded therapist: 1 point.
- Adequate follow-up: 1 point.
- Intention to treat analysis: 1 point (Hollis and Campbell, 1999).
- Between group comparisons: 1 point.
- Points estimates and variability: 1 point.
- Possible total: 10 points.

## Results

### Data synthesis

The searches revealed 20 relevant trials, 11 of which were subsequently excluded, because there was not any form of manual therapy treatment in the methodology used. Another 2 clinical trials (Halkovich et al., 1981; Lewit and Simons, 1984) were excluded because musculoskeletal dysfunction, not MPS, was analyzed. In the first study (Halkovich et al., 1981) normal subjects were

analyzed. Although musculoskeletal dysfunction might be a synonym of MPS in some cases, in the second trial (Lewit and Simons, 1984) patients were diagnosed for muscle-tension shortening, and muscle tenderness. Furthermore, authors did not describe the minimum acceptable criteria for MTrPs diagnosis, i.e. presence of a spot tenderness in a palpable taut band in a skeletal muscle, and patient recognition of the referred pain (Simons et al., 1999; Gerwin et al., 1997). Finally, the authors decided to exclude these trials because the inclusion criteria were not homogeneous with the other 7 papers.

### Description of included clinical trials

The 7 trials that met the inclusion criteria of this review described different manual therapy treatment modalities: ischemic compression, spray and stretch, deep pressure soft tissue massage, massage combined with exercise, active head retraction and retraction/extension exercises (as described by Robin McKenzie), occipital release, myofascial release, and strain/counterstrain technique.

It became clear that the trials could be classified into 3 categories:

1. only one manual therapy treatment;
2. a combination of various manual therapies;
3. manual therapy combined with another physical medicine modality.

Use of just one manual therapy treatment was investigated in 4 trials (Jaeger and Reeves, 1986; Hanten et al., 1997; Hong et al., 1993; Hou et al., 2002); a combination of various manual therapies in 2 studies (Hanten et al., 2000; Dardzinski et al., 2000), and manual therapy combined with another physical medicine modality in 2 studies (Gam et al., 1998; Hou et al., 2002). Many parts of the body

were represented, but in all the trials, neck and shoulder pain were involved, specifically upper trapezius and levator scapulae muscles.

### Quality of the included trials

Two papers obtained 6 points each (Gam et al., 1998; Hong et al., 1993), another two scored 5 points each (Hou et al., 2002; Hanten et al., 2000), one scored 3 points (Hanten et al., 1997), one scored 2 point (Jaeger and Reeves, 1986) and the remaining one scored 1 point (Dardzinski et al., 2000). Table 1 summarizes the details of the PEDRO scale scored of these trials.

### Outcomes

- Table 2 summarizes some details of the 7 studies that were included in this review. Spray and stretch technique was used in 2 studies (Jaeger and Reeves, 1986; Hong et al., 1993).
- Soft tissue massage was used in another 2 trials (Gam et al., 1998; Hong et al., 1993).
- Ischemic compression technique was analyzed in an other 2 (Hou et al., 2002; Hanten et al., 2000).
- Occipital release, active head retraction and retraction/extension exercises as described by Robin McKenzie (Hanten et al., 1997), strain/counterstrain (Dardzinski et al., 2000) and myofascial release (Hou et al., 2002), were studied in 1 trial each.
- Only 2 studies attempted to test the specific efficacy (efficacy beyond placebo) of various manual therapies in the treatment of MPS (Gam et al., 1998; Hanten et al., 1997). These studies found no difference between interventions.

**Table 1** Pedro score rated details of the studies included in this review.

Study	Random alloc.	Conce. alloc.	Basel. comp.	Blind assessors	Blind subjects	Blind therapist	Follow up	Intention to treat analysis	Between-group comp.	Points estimates and varia.	Total score
Gam (1998)	Yes	Yes	Yes	No	No	No	Yes	No	Yes	Yes	6/10
Jaeger (1986) <sup>a</sup>	No	No	No	Yes	No	No	No	No	No	Yes	2/10
Hanten (1997)	Yes	No	No	No	No	No	No	No	Yes	Yes	3/10
Hong (1993) <sup>a</sup>	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Yes	6/10
Hou (2002) <sup>a</sup>	Yes	Yes	Yes	No	No	No	No	No	Yes	Yes	5/10
Hanten (2000)	Yes	No	Yes	No	No	No	Yes	No	Yes	Yes	5/10
Dardzinski (2000) <sup>a</sup>	No	No	No	No	No	No	Yes	No	NO	No	1/10

Alloc. = allocation; Basel. comp. = baseline comparability; Conce. = concealed; Comp. = comparisons; Varia. = variability; <sup>a</sup>Pedro score rated by the authors of the review.

**Table 2** Manual therapy clinical trials included in this systematic review.

Study	Design	Pedro scale	Mtrp examined	Number patients	Treatment applied (n patients)	Outcome measures	Number sessions	Follow up	Results
Gam AN (1998)	RCT	6/10	Neck and shoulder pain	58	(A)US + massage + exercise (B) Sham US + mass. + exercise (C) Control	VAS scale, daily analgesic usage, tenderness	8 (2 weekly/4 weeks)	6 months	No significant differences in VAS and analgesic usage. A and B causes significantly less tenderness ( $p < 0,05$ ) than C. There are significant differences ( $p < 0,01$ ) in VAS and PPT after treatment
Jaeger B (1986)	Clinical trial	2/10 (rated by authors)	Neck pain (upper trapezius and levator scapulae muscles)	20	Spray & stretch	VAS scale, PPT	1	—(Immediate effects)	No significant differences ( $p < 0,01$ ) in VAS and PPT after treatment
Hanten W (1997)	RCT	3/10	Cervical and scapular pain	60	(A) Occipital release (B) Active head retraction & retraction/extension (C) Control	PPT	1	—(Immediate effects)	No significant differences between interventions
Hong C (1993)	RCT	6/10 (rated by authors)	Upper trapezius muscle	98	(A) Spray & stretch (B) Deep pressure soft tissue massage (C) Other therapies	PPT	1	—(Immediate effects)	Deep pressure soft tissue massage was more effective than other modalities
Hou C (2002)	RCT (Not placebo group)	5/10 (rated by authors)	Upper trapezius muscle	119	(A) Ischemic compress. (B) Isch. Compr. + interferential current + myofascial release (C) Other therapies	PPT, PPTol., VAS scale, cervical range of motion	1	—(Immediate effects)	
Hanten W (2000)	RCT (Not placebo group)	5/10	Neck and back pain	40	(A) Ischemic compress. + stretch (B) Active exercises	VAS scale, PPT, percentage of time in pain over 24 hours	5 days (2 treatment daily)	—(Immediate effects of 5 sessions)	A superior to B in reducing the VAS scale & PPT. No differences for percentage of time in pain.
Dardzinski JA (2000)	Clinical trial	1/10 (rated by authors)	Chronic myofascial pain syndrome and fibromyalgia	20	Strain/counterstrain + body flexibility and stretching techniques performed by the patient	Range of motion, posture, tenderness	2–10 sessions	6 months	50–75% immediate resolution of symptoms. Partial improvement was maintained for 6 months

RCT = randomized controlled trial; PPT = pressure pain threshold; PPTol = pressure pain tolerance; VAS = visual analogue scale.

## Discussion

### Findings

The principal finding of this review is that there are a few randomized controlled trials that analyse treatment of MPS using manual therapy. Results did not demonstrate any rigorous evidence that some manual therapies, such as active head retraction and retraction/extension exercises (Hanten et al., 1997), or ultrasound combined with massage and exercise (Gam et al., 1998), have an effect beyond placebo in MPS treatment. The most urgent requirement for further research is to establish the efficacy, beyond placebo, of different manual therapies that therapists are using in daily practice for treatment of MPS. The main conclusion of this systematic review is consistent with that of Hey and Helewa (1994): no reported treatment had been more efficacious than control intervention. Some of the trials that were evaluated in this review confirmed that MTrP treatment is effective in reduce the pressure pain threshold, and visual analogue scale scores (Jaeger and Reeves, 1986; Hou et al., 2002; Hanten et al., 2000).

### Outcome measures

We believe that measurements of the effects of treatment of MTrP are necessary for clinical and experimental purposes. Fischer has proposed the use of a pressure threshold meter (algometer), as a means of quantitative documentation of MTrPs, and for quantifying the effects of the physical therapy treatment (Fischer, 1987; Fischer, 1988). Pressure pain threshold and visual analogue scale scores were the outcome measures more used in the analyzed trials (see Table 2).

The reliability of the pressure pain threshold measurement using a pressure threshold meter (algometer) has been studied in previous research (Takala, 1990; Ohrbach and Gale, 1989). Reeves et al. (1986) demonstrated the effectiveness of the algometer as a reliable and valid measure of MPS sensitivity.

Cervical ROM was another outcome measure, used in 2 trials (Hou et al., 2002; Dardzinski et al., 2000). Additionally, one of the excluded studies (Halkovich et al., 1981) analyzed the effectiveness of the spray and stretch technique, versus passive stretch, in 30 normal volunteers. In that study the authors reported that patients who received spray and stretch technique had a greater improvement in the ROM than patients who received passive stretch alone. However, patients of this trial were normal subjects and they were not diagnosed as having MTrPs. MPS is characterized by restricted ROM, which highlights the need to introduce ROM measurement in future studies of this sort.

### Limitations

The lack of general agreement as to appropriate diagnostic criteria for physical examination of MTrPs has been an increasingly serious impediment to more widespread recognition of MPS and of appropriate studies of the effectiveness of treatment. Simons and Travell's diagnostic criteria included: presence of a palpable taut band, an exquisite tender spot in the taut band, patient's recognition of pain as 'familiar', and pain on stretching the tissues. (Simons et al., 1999). The reliability of these criteria has been questioned (Nice et al., 1992; Njoo, 1994; Wolfe et al., 1992; Gerwin et al., 1995, 1997; Sciotti et al., 2001).

Table 3 summarizes MTrPs physical characteristics.

Simons et al. (1999) and Gerwin et al. (1997) recommend that the minimum acceptable criteria

**Table 3** Interrater reliability of examinations for myofascial trigger points' physical characteristics.

Study	Palpable taut band	Tender spot in the taut band	Local twitch response	Referred pain pattern	Jump sign	Pain recognition	Mean
Nice D (1992)	—	—	—	0.38	—	—	0.38
Njoo K (1994)	0.49	0.66	0.09	0.41	0.70	0.58	0.49
Wolfe F (1992)	0.29	0.61	0.16	0.40	—	0.30	0.35
Gerwin R (1997)	0.85	0.84	0.44	0.69	—	0.88	0.74
Total Mean	0.54	0.70	0.23	0.47	0.70	0.59	—

All data expressed the kappa values of the interrater reliability obtained in these studies.

Mean = mean of the total kappa value obtained for the physical examination of myofascial trigger point in each study.

Total mean = mean of the kappa value for each physical sign of myofascial pain syndrome.



for MPS diagnosis is the combination of the presence of a spot tenderness in a palpable taut band in a skeletal muscle and patient recognition of the referred pain. In the present review 4 of the 7 trials included described these minimum criteria (Gam et al., 1998; Hong et al., 1993, 2000; Dardzinski et al., 2000). Only 1 paper reported all criteria, including local twitch response (Hong et al., 1993). We included one trial that included both a fibromyalgia population and chronic myofascial pain (Dardzinski et al., 2000). Furthermore, it was suggested that, in one of the included studies, that patients were assessed for 'tender points' (as used in fibromyalgia assessment) and not trigger points (Hanten et al., 1997). Exclusion of these trials would not have altered the conclusions of this review.

## Conclusion

The principal conclusion of this review is that there are only a few randomized controlled trials that analyse treatment of MPS using manual therapy. The second conclusion is that the hypothesis that manual therapies have specific efficacy beyond placebo in the management of MPS caused by MTrPs, is neither supported nor refuted by the research to date. However, some of the trials analyzed confirmed that treatment of MTrPs is effective in reducing pressure pain sensitivity. Because improvements occurred in some groups in which MTrPs were treated using different manual therapies (spray and stretch, deep pressure, soft tissue massage and ischemic compression), further studies are required to investigate whether manual therapy has an effect beyond placebo, with emphasis on the use of adequate treatment techniques.

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