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Original Research Article

Comparative Efficacy of Extracorporeal Shockwave Therapy (ESWT) Versus Ultrasound Therapy (UST) in Myofascial Pain Syndrome

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Abstract:

Myofascial pain syndrome (MPS) is a common cause of musculoskeletal pain, accounting for 20% to 95% of cases in medical and pain management clinics. It is often characterized by myofascial trigger points (MTrPs) in the neck, shoulder, or back muscles, leading to significant discomfort and reduced functionality. These hyperirritable spots in muscle fibers, when mechanically stimulated, cause local and referred pain. Despite the unclear pathophysiology, overuse injuries, oxygen and nutrient deficiencies, and involuntary muscle contractions are considered contributing factors. Diagnosis relies on physical examination and patient history, with digital palpation being the primary method for identifying MTrPs. This study aimed to compare the efficacy of extracorporeal shock wave therapy (ESWT) with exercises versus ultrasound therapy (UST) with exercises as treatments for MPS. Sixty patients with MPS in the neck, shoulder, or back muscles were enrolled in a prospective metacentric study. Patients were randomized into two groups: 36 received ESWT, and 24 received UST. Both groups underwent their respective treatments followed by stretching and strengthening exercises. Pain and tenderness were assessed using the Visual Analog Scale (VAS) and the Tenderness Grading Scale (TGS) before treatment and four weeks later. Results indicated a greater reduction in pain and tenderness in the ESWT group compared to the UST group. The ESWT group showed a 55.3% reduction in VAS scores and a 57.9% improvement in TGS scores, while the UST group exhibited a 22.7% reduction in VAS scores and a 24.3% improvement in TGS scores. Minor adverse events were reported in both groups, but no serious adverse events occurred. In conclusion, ESWT combined with exercises demonstrated superior efficacy in reducing pain and tenderness in MPS patients compared to UST combined with exercises. Early initiation of stretching exercises contributed to better long-term outcomes and a lower recurrence of pain and discomfort. Effective recognition and prompt treatment of MPS are crucial for alleviating symptoms and improving patient quality of life.

Keywords: ESWT, Myofascial pain, Myofascial pain syndrome, UST, Ultrasound therapy, Extra Corporeal Shock Wave, Extra Corporeal Shock Wave Therapy.

Introduction

Myofascial pain syndrome (MPS) which has a high prevalence causes pain and dysfunction in the musculoskeletal system, and this affects a large percentage of individuals seeking treatment for musculoskeletal pain. It is estimated that MPS accounts for 20% to 95% of patients presenting with musculoskeletal pain in general medical clinics and pain management centres [1,2].

MPS is characterized by trigger points (TrPs) located in the neck, shoulder or back muscles leading to discomfort and loss of function. There are several treatment methods available for MPS including use of trigger point injections, physiotherapy modalities, stretching exercises and other interventions. These palpable nodules when stimulated mechanically will cause local or referred skeletal muscle pain besides visible local twitch response [3,4]. Hence termed as myofascial trigger points (MTrPs) are hyperirritable areas within the skeletal muscles that contain palpable nodules on taught bands associated with muscle fibers.

Therefore, new studies suggest that reduced oxygenation occurs due to damaged muscular fibres from excessive usage which also causes lack of nutrition for them thus these elements leading to involuntary contractions of the muscles and development of MTrPs have been identified. [5] Female sex is one of the main factors responsible for incidence rate of developing MPS. [6]

Every muscle has a distinct evoked referred pain pattern that the patient is accustomed to if they are an active MTrP. In the absence of a lab test or imaging technique, the physical examination and patient history are the only methods used to diagnose MTrPs. The usual method for identifying MTrPs is digital palpation. Significant intrinsic palpation ability, authoritative training, and substantial clinical experience are necessary for the diagnostic competence.

In a recent study [7], it was confirmed that this technique is a reliable method for detecting MTrPs in shoulder muscles. Although prevalence studies are sparse [1,8,10], based on clinical experience, MTrPs seem to be associated with shoulder pain, disability, and dysfunction [11,12]. Till date, little is known about the impact of MTrPs on pain and functioning in patients with shoulder disorders [13]. MTrPs may significantly add to the clinical picture of shoulder discomfort because they refer pain to the shoulder. There are various treatments for MTrPs such as dry needling, local injection, and ischaemic compression, stretching exercises, massage, many physiotherapy modalities and others [14,16]. This study focuses on evaluating the outcomes of two novel therapeutic approaches, namely extracorporeal shock wave therapy (ESWT) with exercises versus ultrasound therapy (UST) with exercises as primary treatment options for MPS.

Materials and Methods

Sixty patients (16 females and 34 men) who had been clinically diagnosed with MPS in the neck, shoulder, or back muscles participated in a multicentric prospective study. Two sets of patients were randomly selected, with 36 patients in the first group and 24 patients in the second. The physical characteristics of both groups, such as age, sex, gender, and pain duration, were nearly identical. Additionally, the nature of the condition, current treatment choices, and potential outcomes were discussed with the patients.

36 in the first group received seven cycles of ESWT treatment, whereas 24 patients in the second group received UST treatment. Following pain alleviation, stretching and strengthening activities were initiated in both groups. Prior to beginning treatment and four weeks later, clinical assessments of pain threshold and intensity were conducted using the visual analogue scale (VAS) and the tenderness grading scale (TGS).

VAS (Fig 1) is a measurement instrument that tries to measure a characteristic or attitude that is believed to range across a continuum of values and cannot easily be directly measured [17]. It is often used in epidemiologic and clinical research to measure the intensity or frequency of various symptoms [18].

The “tenderness grading scale” (Table 1) is a proposed grading system for the soft tissue tenderness [19].

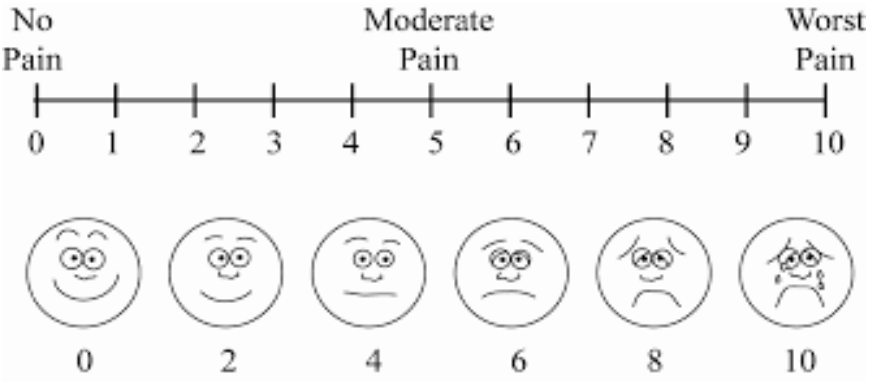

Figure 1: Tenderness grading scale

Table 1: Tenderness grading Scale

Tenderness grade	Severity of symptom
0	No tenderness
1	Tenderness to palpation with- out grimace or flinch
2	Tenderness with grimace and or flinch to palpation
3	Tenderness with withdrawal (+ "Jump sign")
4	Withdrawal (+ "Jump sign") to non-noxious stimuli (i.e.superficial palpation, pin prick, gentle percussion)

Inclusion Criteria

Those patients who fulfilled the following criteria were included in the study:

1. Age group 20-60 years.
2. Had normal physical and neurological examination results.
3. A well-defined, tender, hypersensitive, palpable nodule located within a taut band of the neck, shoulder or back muscles.
4. A local twitch response elicited by snapping palpation of the MTrP.
5. Chronic pain > 6 months duration.

Exclusion criteria

Those patients with the following comorbid conditions/ treatment history were excluded from the study:

1. Responding to medical treatment.
2. Using analgesics/antidepressants regularly.
3. Pregnant women with known allergies against local anaesthetics.
4. History of malignancy.
5. History of cervical and cranial surgery.
6. Signs of cervical disc prolapse, systemic disorder or migraine.
7. Anaemia and bleeding diathesis.
8. Major psychiatric disorders (major depression etc).
9. Patients who used antipsychotic, antidepressant and anti-epileptic drugs within the previous 3 months.
10. Neuromuscular dysfunction.
11. Uncontrolled hypertension, hypothyroidism or hyperthyroidism.

Treatment Protocol

Patients in the first group underwent therapeutic Ultrasound therapy (U/S head size: 1 cm, continuous mode, variable intensity according to pain threshold but generally within 1.5 watts/cm2, Range: 0.1 to 1.5 watts/cm2, Treatment time: 5 minutes). The other group underwent ESWT (500 impulses to the taut band and 200 impulses to the surrounding area at 0.056 mJ/mm2 daily). Stretching exercises were initiated once the patient's symptoms had improved after three days of medication. Both therapies were maintained for seven days. After the eighth day, the patients were recommended to begin a home-based stretching exercise program to be done two to three times a day. Additionally, patients were instructed not to take any painkillers. Additionally, all patients were instructed to apply light cold compressions to avoid post-exercise soreness. Patients were reviewed after 4 weeks.

Transdermal patch or tablet diclofenac sodium was used for two to three days in cases where the medication did not relieve the pain or made it worse. 21 patients in the first group and 27 cases in the second group used some type of analgesic (tablet/transdermal) patch for pain relief.

Results

MS Excel was used to enter the data, while SPSS version was used for analysis. At baseline and after four weeks, the mean, standard deviation, and median were determined using summary statistics for VAS and TGS scores. To determine if there were any differences in patient allocation between groups A and B based on gender, the chi-square test of independence was used. The difference in VAS and TGS scores between the two groups' baseline and four weeks after therapy was examined using the unpaired t-test for means. 95% significance level was used for both statistical tests. There was no significant association of gender wise distribution of patients in group A and group B.

Table 2: Male and female

Group	Male	Female
A	41.7%	58.3%
B	46.2%	53.8%

Table 3: Summary and Analysis of Mean VAS Score at various timelines

	Group A(N=36)	Group B(N=24)
Mean (SD)	6.75 (1.052)	6.52 (1.194)
Median	7	7
Maximum, Minimum	9,5	8,5
Mean (SD)	5.17 (0.845)	5.08 (0.812)
Median	5	5
Maximum, Minimum	7,3	6,4
Mean	1.58	1.44
Median	2	2
Maximum, Minimum	3,0	4,1

Table 4: Summary and Analysis of Mean TGS Score at various timelines

	Group A(N=36)	Group B(N=24)
Mean (SD)	2.08 (0.554)	2.08(0.759)
Median	2	2
Maximum, Minimum	3,1	3,1
Mean (SD)	1.64	1.48
Median	2	2
Maximum, Minimum	3,0	2,0
Mean	0.44	0.60
Median	00	1
Maximum, Minimum	1,0	1,0

There were no significant differences between the two groups in terms of age, gender distribution, and baseline scores for the Visual Analog Scale (VAS) and Tenderness Grading Scale (TGS) ($p>0.05$).

Pain Reduction

Pain intensity was assessed using the Visual Analog Scale (VAS) at baseline and at the 4-week follow-up. The ESWT group demonstrated a significantly greater reduction in VAS scores compared to the UST group.

The percentage reduction in VAS scores was significantly higher in the ESWT group (55.3%) compared to the UST group (22.7%) ($p < 0.001$).

Tenderness was evaluated using the Tenderness Grading Scale (TGS) at baseline and at the 4-week follow-up. The ESWT group showed a significantly greater improvement in TGS scores compared to the UST group.

The percentage improvement in TGS scores was significantly higher in the ESWT group (57.9%) compared to the UST group (24.3%) ($p < 0.001$).

Both therapies were generally well tolerated by patients. Minor adverse events such as transient pain and erythema were reported in 4 patients (16.7%) in the ESWT group and 5 patients (13.9%) in the UST group. No serious adverse events were reported.

Discussion

The MPS is also known as a local pain syndrome of a kind that is frequently accompanied with the presence of trigger points for myofascial pain, mostly concerned with referred pain and local tenderness. The overall prevalence of neck and shoulder pain has been estimated at 13%, whereas its lifetime prevalence rate is about 50%. [21] MPS is characterized by localized and radicular pain. There are no specific diagnostic criteria for MPS.

However, electrodiagnostic and morphological findings have not been widely used in clinical practice primarily because they are expensive to acquire or involve considerable delays in patient management like electrodiagnostics and biopsy. This therefore, makes it more difficult to find a permanent solution, especially in relation to chronic MTrPs and obscure underlying pathology. Different conservative treatment options for mechanical neck pain have been evaluated in the literature with mixed results. At present, there is no generally accepted strategy of therapy however this differs from alternative conservative approaches as they are all aimed at diminishing symptoms and facilitating movement recovery. [22] Medications, heat and cold modalities, electrotherapy, stretch and spray techniques, acupuncture, local injections, massage as well as exercise are some among the most common ways to treat Myofascial Pain Syndrome (MPS).

There are few published studies that have compared ESWT with US therapy in the treatment of active MTrPs. This study showed an immediate decline in pain and discomfort after both treatments but was more significant in ESWT group.

Srbely and Dickey applied therapeutic US to a set of muscles for 5 minutes using a frequency of 1 MHz at an intensity level of 1.0 W/cm2 in a continuous wave mode.23 The control group received non-therapeutic dose of US (5 minutes, 1 MHz, 100 mW/cm2 continuous wave model). This suggests that therapeutic use of US can significantly reduce MTrPs sensitivity of the trapezius muscle while non-therapeutic use cannot. In relation to diminished sensitivity to MTrPs we support this article.

For MTrPs that are persistent, high power ultrasound is advised as a clinical treatment. The assumption of thermal and mechanical effects by ultrasound was discovered to be the cause of pain alleviation in the literature supporting its usage.

Conclusion

It is crucial to know that patients experiencing MPS may suffer from neck and upper limbs pain and stiffness. There are several treatment methods which are available but at the present in this case there is no highly effective one. Indeed, for both groups, as soon as they had started the treatments, pain, and suffering reduced, but for the ESWT group, this appeared to be more advantageous. These exercises if begun early have also been

associated to improved results in the long run besides buffer against pains and discomforts coming back. The specific condition known as MPS pain must be recognized early and treated immediately, as it is curable.

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