

Effect of Passive Stretching Exercises Versus Post Isometric Relaxation Technique on Pain Intensity in Quadratus Lumborum Trigger Points on Lower Back Myofascial Pain Syndrome

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Abstract

Background: Myofascial pain syndrome (MPS) is a very common disorder affecting many muscles such as quadratus lumborum (QL) muscle which finally results in low back pain that disturb people lives.

Aim of Study: To compare between passive stretching exercises and post isometric relaxation (PIR) technique in treatment of QL trigger points in lower back MPS in pain intensity.

Patients and Methods: Thirty-two patients from both sexes, with age ranged between 30-45 years, and moderate disability 20%-40% diagnosed by an Orthopedist as chronic myofascial lower back pain participated in this study. They were allocated into two equal groups; group A received passive stretching exercises while group B received PIR technique. In addition, both groups received a combination consisted of traditional modalities in the form of infrared and ultrasound. All patients received three sessions per week for 4 consecutive weeks. Pain intensity was evaluated using the visual analogue scale.

Results: There were significant differences in group B as compared to group A.

Conclusion: The PIR technique and passive stretching exercises are effective in reducing pain intensity with a greater effect for the PIR technique for patients with lower back QL MPS.

Key Words: Myofascial pain syndrome — Quadratus lumborum — Post isometric relaxation — Passive stretching exercises.

Introduction

MYOFASCIAL pain syndrome (MPS) is considered the most common source of pain in patients with chronic non-specific neck pain. Myofascial trigger points (MTrPs) are considered discrete hy-

perirritable nodules located in a taut band of a muscle. They are usually palpable and tender during physical examination. There are two main types of MTrPs; first, active MTrPs that are characterized by spontaneous pain exacerbated by pressure. Second, latent MTrPs that have no spontaneous painful symptoms but pain can be elicited via pressure on them. Clinically, both types have muscle dysfunction, weakness, and limited mobility [1].

Myofascial pain also may affect back muscles and cause low back pain (LBP) and if not treated, it could be turned to chronic low back pain (CLBP). Chronic myofascial pain (CMP) is defined as a pain that persists for more than 3 months, or longer than the expected healing period; it represents one of the most common and costly musculoskeletal problems in modern society. Chronic low back pain is experienced by 70% - 80% of adults at some time in their lives [2].

Chronic myofascial pain is a poorly understood condition causing substantial disability and health care costs worldwide. To date, efforts to understand the pathophysiological mechanisms leading to chronic lumbar dysfunction have chiefly focused on structural pathology of the vertebrae and associated tissues neuropsychosocial factors and abnormalities of motor control [3]. The etiology of CMP is complex, and the causes are not clearly known; although some risk factors are implicated. For instance, it is well established that weakness and lack of motor control of deep trunk muscles, such as the lumbar multifidus (LM) and transversus abdominis (TrA) muscles, are common in LBP [4].

Individuals with CMP commonly present with decreased flexibility in the lumbar region, and a positive correlation between these 2 variables (back pain and flexibility), while the range of motion (**ROM**) of the frontal, transverse, and sagittal planes was clearly decreased [5]. Patients with CLBP also

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had reduced flexibility and mobility in all planes of motion, relative to controls [6]. Myofascial abnormalities may lead to connective tissue fibrosis, increased tissue stiffness and further movement impairment which may contribute to LBP chronicity [3].

Muscle energy technique (MET) is a form of soft tissue manipulation that uses patient-initiated, precisely guided and regulated isometric and/or isotonic contractions to enhance musculoskeletal function and pain. Post-isometric relaxation (PIR) represents a form of MET [7]. It is also a form of soft tissue stretching technique used by many health care professionals to lengthen both acute and chronic short muscles. Post-isometric relaxation is commonly used for patients with LBP to lengthen short hamstring muscles that can contribute to their low back pain [8]. It refers to the effect of the subsequent reduction in tone experienced by a muscle, or group of muscles, after brief periods during which an isometric contraction has been performed [9].

Stretching exercises represent a good treatment modality with a great therapeutic effect on pain and ROM limitations of a musculoskeletal origin. They should be applied in physiotherapy programs for treatment of CLBP [10]. This study was conducted to find out if PIR technique is more effective in treating QL trigger points in lower back QL MPS and its effect on pain intensity.

Patients and Methods

Study design and sample size calculation: This study was conducted at the Outpatient Clinic, Belbies Central Hospital, Al-Sharkia Governorate, Egypt from May — September 2023, to compare between passive stretching exercises and PIR technique in treatment of lower back QL MPS in pain intensity. A two-armed pre-test post-test comparative study design was used in this study. Using G-power version 3.1.9.7 for windows and regarding t-test study, alpha level of 0.05, confidence interval 95% and effect size 1.36, the total sample size was 32 patients (sixteen in each group).

Inclusion criteria:

Participants were included in the study if they had lower back QL MPS. Duration of illness ranged between 3 and 12 months from the onset. They had functional limitations in performing certain activities of everyday living; dressing, lifting heavy objects, walking, running, sitting, standing, sleeping, etc.

Exclusion criteria:

Participants were excluded from the study if they suffered from myofascial back pain due to other problems such as traumatic injury or tumor or surgical intervention. Patients having MPS symptoms for duration of illness more than 12 months.

Patients preparation and randomization:

To avoid selection bias, the patients were randomly allocated by simple random method via choosing one of two wrapped cards representing the two experimental groups, which are:

- Group A: Received passive stretching exercises combined with traditional modalities in the form of infrared and ultrasound waves.
- Group B: Received PIR technique combined with traditional modalities in the form of infrared and ultrasound waves.

Assessment procedures:

Measurement of pain intensity using the visual analogue scale (VAS): Asking the patient to put a horizontal mark on a continuous 10cm line that represents his pain intensity, ranging from zero, which indicates no pain, or discomfort to 10, which indicates the worst possible pain he could feel [in. It has good validity and reliability for pain intensity measurement [12].

Treatment procedures:

1- Passive stretching exercises:

Stretching of QL was accomplished in two methods according to Hall [13] as follows:

Firstly, in side bending with the patient facing the therapist and the affected QL up, the patient's upper leg was moved towards the therapist (hip flexion), while pushing the patient's upper shoulders away in the opposite direction for 15-30 seconds and relax for at least 30 seconds. Then the process was repeated, but with standing on the other side of the table, such that the patient was facing away from the therapist. The upper leg was moved again towards the therapist (this time in hip extension) and the shoulders away in the opposite direction. In both cases, let gravity pull the leg towards the ground.

2- Post-isometric relaxation technique:

The PIR technique was applied according to Hall [13] as follows:

The arm on the affected side (ipsilateral arm) is lifted up to stretch the QL, while the leg on the affected side (ipsilateral leg) is turned medially. The crossed over leg is used to control the position of the leg on the affected side, pushing it medially downwards. The crossed over leg also provides resistance when isometric contraction is performed. To perform isometric contraction, the crossed-over leg pushes downward from 15-20% of maximum resistance while the medially turned leg attempts to move upwards and externally rotate. Then the therapist attempt to move the ipsilateral medially rotated leg to internally rotate to stretch the QL for 30 seconds.

3- Infrared radiation:

Both groups received Infrared radiation received for 30 minutes, at a distance of 65 centimetres, in a relaxed prone position [14].

4- *Ultrasound waves:*

Both groups received ultrasound in a continuous-wave mode to maximize thermal effect, a frequency of 1MHz was used, and an intensity between 1.5 and 2.5W/cm² for a period of 5 minutes. It was applied by moving the applicator in smooth overlapping sweeps or circles at rates of a few centimetres per second over areas of 25 to 100cm² [15,16].

Statistical analysis:

Data of all participants in the three groups were collected and included; age (years), weight (kg), height (cm), BMI (kg/m²), duration of illness (months), and gender. In addition, pre and post-treatment measurements of pain intensity (VAS). Level of significance for all tests was set at p-value 4:1.05. The statistical package for social sciences version 26 for windows (Armonk, NY: IBM Corp) was used for data statistical analysis.

Results

Before analyzing the collected data, they were screened for all assumptions regarding the used tests for statistical analysis like normality assumption via Shapiro-Wilk test using histograms with the normal distribution curve that showed each dependent variable was normally distributed and not violates the parametric assumption. In addition, homogeneity of variance was tested via Levene's test that revealed all data showed no violations of the assumptions of equality of variance with p-value >0.05. Presence of univariate or multivariate outliers was tested using Mahalanobis distance that showed all data have no outliers, and finally, assurance that there is no multicollinearity through correlation analysis. All the findings of these tests were a pre-requisite that allowed us to conduct parametric analysis for the collected data.

A- Comparing the mean values of age, weight, height, BMI, and duration of illness for all patients in both groups using MANOVA test revealed that there were no significant differences between them in age (p=0.49), weight (p=0.77), height (p=0.94), BMI (p=0.86), and duration of illness (p=0.68), (Table 1). Comparing the gender distribution for all patients in both groups using Chi-square test, there were no significant differences with no relation between them (p=0.89), (Table 1).

B- *Within group comparison of pain intensity in each group:*

Comparing the pre and post-treatment mean values of pain intensity in Group A and Group B using repeated measures MANOVA test, there were significant differences (p=0.0001).

Comparing the pre-treatment mean values between both groups using one-way MANOVA test,

there were no significant differences between them (p43.79).

Comparing the post-treatment mean values between both groups using one-way MANOVA test, there were no significant differences between them (p43.0001), (Table 2, Fig. 1).

Table (1): Demographic data.

Demographic	Mean ± SD		P-value	Sig.
	Group A	Group B		
Age (years)	37.81±4.14	36.75±4.42	0.49	NS
Weight (kg)	78.5±6.18	79.13±5.58	0.77	NS
Height (cm)	171.56±8.04	171.75±6.71	0.94	NS
BMI (kg/m ²)	26.69±3.34	26.88±2.42	0.86	NS
Duration of illness (months)	5.62±2.31	6.02±2.81	0.68	NS
<i>Gender:</i>				
Males (%)	8 (50)	6 (37.5)	0.89	NS
Females (%)	8 (50)	10 (62.5)		

SD: Standard deviation. x²: Chi-square. p-value: Probability value.

Table (2): Pairwise comparison between groups.

Post-treatment	Mean ± SD		P-value	Sig.
	Group A	Group B		
Pain intensity	4.88±1.02	3.31±0.95	0.0001*	S

p-value: Probability value. Sig.: Significance. S: Significant.

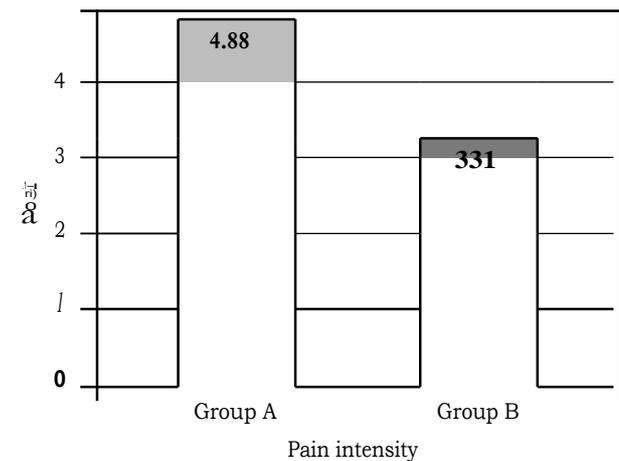


Fig. (1): Pairwise comparison between groups.

Discussion

The current study was conducted to compare between passive stretching exercises and PIR technique in treatment of lower back QL MPS in terms of pain intensity.

It was hypothesized that there are no significant differences between passive stretching exercise and PIR technique on pain intensity in patients with

lower back QL MPS. The results of this study reject this hypothesis as there were significant differences between passive stretching exercise and PIR technique in post-treatment pain intensity in favour of the PIR technique ($p=0.0001$).

The results of PIR technique in reducing pain intensity level can be explained as PIR refers to the subsequent reduction in tone of the agonist muscle after isometric contraction. This occurs due to the stretch receptors, called Golgi tendon organ, that are located in the tendon of the agonist muscle. These receptors react to over stretching of the muscle by inhibiting the further muscle contraction. In more technical terms, a strong muscle contraction against equal counterforce triggers the Golgi tendon organ. The afferent nerve impulse from the Golgi tendon organs enters the dorsal root of spinal cord and meets with an inhibitory motor neuron [17].

Furthermore, the analgesic effect of PIR could be explained by both spinal and supra-spinal mechanisms; Activation of both muscle and joint mechanoreceptors occurs during an isometric contraction. This leads to sympatho-excitation evoked by somatic efferents and localized activation of the periaqueductal grey that plays a role in descending modulation of pain [18].

The findings of this study are in line with Ellythy [18] and Ellythy [19] who found significant differences in reduction of pain intensity after application of PIR technique for patients with chronic low back pain. In addition, Samir et al. [20] compared PIR and positional release technique (PRT) and found that both of them are effective in reducing pain intensity but without statistical significant difference for patients with CLBP.

On the other hand, the findings of this study differ from Shenouda [21] who found that there were no significant differences between passive stretching exercise and PIR technique in reduction of pain intensity for patients with chronic cervical spondylosis .

Conclusion:

Passive stretching exercises and PIR technique are effective in reducing pain intensity for patients with lower back QL MPS with a greater effect for the PIR technique.

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تمارين الإطالة السلبية مقابل تقنية الاسترخاء ما بعد الانقباض على شدة الألم في نقاط الزناد الرباعية القطنية في متلازمة ألم اللقافة العضلية أسفل الظهر

الخلفية: الألم العضلي الليفي اضطراب شائع يصيب عضلات متعددة مثل العضلة الرباعية القطنية، والذي ينتج عنه في النهاية ألم أسفل الظهر يزعج حياة الناس.

الهدف: أجريت هذه الدراسة للمقارنة بين تمارين الإطالة السلبية وتقنية الاسترخاء ما بعد الانقباض في علاج الألم العضلي الليفي أسفل الظهر في العضلة الرباعية القطنية في شدة الألم.

العيننة والطرق: شارك في هذه الدراسة أثنان وثلاثون مريضاً من كلا الجنسين، تم تشخيصهم من قبل طبيب العظام بالألم العضلي الليفي المزمن أسفل الظهر. وقد تراوحت أعمارهم بين ٣٠ إلى ٤٥ عاماً، وكان لديهم مستوى إعاقة وظيفية متوسط بين ٢٠٪ و ٤٠٪ حسب مؤشر أو سويستري للإعاقة. تم توزيعهم على مجموعتين متساويتين: المجموعة أ تلقت العلاج بتمارين الإطالة السلبية بينما المجموعة ب تلقت العلاج بتقنية الاسترخاء ما بعد الانقباض. بالإضافة إلى ذلك، تلقت كلتا المجموعتين مزيج من الوسائل التقليدية في شكل الأشعة تحت الحمراء والموجات فوق الصوتية. وقد تلقى جميع المرضى بثلاث جلسات أسبوعياً لمدة أربعة أسابيع متتالية. وقد تم قياس شدة الألم باستخدام المقياس البصرى التناظرى.

النتائج: وجدت اختلافات معتبرة في قيم متوسطات بعد العلاج بين المجموعتين لصالح مجموعة العلاج ب.

الخلاصة: تقنية الاسترخاء ما بعد الانقباض لها تأثير أعظم من تمارين الإطالة السلبية في تقليل شدة الألم لمرضى الألم العضلي الليفي أسفل الظهر في العضلة الرباعية القطنية.