DOI 10.36803/indojpmr.v14i2.522

ORIGINAL ARTICLE

Effectiveness of Elastic Taping Compared to Sham Taping on Upper Trapezius Muscle Elasticity in Patients with Myofascial Pain Syndrome

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ABSTRACT

Introduction: Elastic taping (ET) is believed to improve muscle elasticity in patients with myofascial pain syndrome (MPS); however, studies employing objective measurements of muscle elasticity remain scarce. This study aims to provide empirical evidence demonstrating that ET can objectively improve muscle elasticity.

Methods: This double-blind randomized clinical trial investigated the efficacy of ET versus sham taping on upper trapezius muscle elasticity and pain pressure threshold (PPT) in patients with MPS. Participants were assigned to ET using the inhibition technique or sham taping without stretch. Shear wave elastography (SWE) and PPT were measured pre-intervention, 20 minutes, and 24 hours post-intervention.

Results: The ET group demonstrated significant improvements in muscle elasticity (reduced SWE) and increased PPT at both 20 minutes and 24 hours ($p<0.05$). The sham group showed non-significant changes at 20 minutes ($p=0,122$) and partial improvement at 24 hours($p=0,019$). Between-group comparisons revealed statistically significant differences at both post-intervention time points ($p<0.05$).

Conclusion: ET proved effective as an adjunct to stretching, eliciting immediate and sustained benefits, and represents a non-invasive, easily applicable modality with potential for wide clinical use in upper trapezius MPS.

Keywords: myofascial pain syndrome, upper trapezius, elastic taping, shear wave elastography, pain pressure threshold

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INTRODUCTION

Myofascial pain syndrome (MPS) is a musculoskeletal disorder characterized by sensory, motor, and autonomic disturbances, including referred pain, reduced range of motion, and diminished muscle strength.[1, 2] These manifestations arise from myofascial trigger points (MTrPs), defined as palpable hyperirritable nodules within skeletal muscle[3]. MPS most frequently affects the upper trapezius, particularly in individuals of productive age, leading to decreased productivity and reduced quality of life.[4,5]

The pathophysiology of MTrPs involves sustained muscle fiber hypercontraction, reduced tissue elasticity, and altered mechanoreceptor activity—including the muscle spindle and Golgi Tendon Organ—affecting both the MTrP region and adjacent tissue.[6-8] Diagnosis remains largely clinical and subjective, relying on tenderness, referred pain, local twitch response, and restricted motion.[9] Shear wave elastography (SWE) has emerged as an objective imaging modality capable of quantitatively assessing muscle elasticity.[10-12]

Management of MPS includes pharmacological options (local anesthetics, steroids, NSAIDs, botulinum toxin) and non-pharmacological interventions such as stretching, physiotherapy, acupuncture, ultrasound, and elastic taping (ET).[5,13] Stretching reduces muscle stiffness and improves tissue viscoelasticity, although its effects are often transient.[14-16] ET provides mechanical and cellular effects—including muscle elongation, improved tissue elasticity, edema control, and fibroblast modulation—potentially prolonging the benefits of stretching.[17-19]

Although ET has been shown to reduce pain and improve muscle strength, objective evidence regarding its effect on upper trapezius elasticity remains limited.[20-23] This study compares ET with sham taping, as an adjunct to standard stretching, to provide evidence for a practical, non-invasive therapeutic intervention.

METHODS

This study was a double-blind randomized clinical trial designed to evaluate the effectiveness of ET compared with sham taping on upper trapezius muscle elasticity and pain pressure threshold (PPT) in patients with MPS. The study was conducted at the Department of Physical Medicine and Rehabilitation, Faculty of Medicine Universitas Indonesia – Cipto Mangunkusumo Hospital (FMUI–RSCM) from July 2024 to December 2024.

Participants were patients aged 18–59 years with a Visual Analog Scale (VAS) pain score of 1–7 who provided informed consent. Exclusion criteria included a history of trauma or surgery to the shoulder or neck, allergy to taping materials, infection or open wounds in the shoulder region, malignancy, deep vein thrombosis (DVT), myofascial pain treatment within the previous 2 weeks, other musculoskeletal disorders (e.g., fibromyalgia, frozen shoulder, impingement, scoliosis), and obesity. Subjects were recruited through consecutive sampling and randomly assigned to the ET or sham taping group. A minimum of 24 subjects per group (total 48), including a 20% anticipated drop-out rate, was required. Subjects were considered dropouts if they withdrew, failed to attend the 24-hour post-intervention assessment, or used analgesic medications during the study period.

Participants meeting the inclusion and exclusion criteria were consecutively recruited and provided written informed consent. Researcher A performed demographic and clinical assessments, including physical examination, identification of MTrP, and measurement of the PPT. PPT was measured with the participant seated in a neutral head position. The examiner applied perpendicular pressure on the identified MTrP using a pressure algometer (FPX 25, Wagner Pain Test™, Canada) and recorded the pressure value at the moment the subject first reported pain. The measurement was repeated three times, and the mean value was used for analysis (kg/cm^2).

Participants were randomly allocated by sealed-envelope method into the ET or sham taping group. In the ET group, BSN Leukotape K (5 cm × 5 cm, beige) was applied using an inhibition "Y" technique from insertion to origin with 25% tension, leaving a probe window over the marked region. In the sham group, the same tape was applied without tension nor direction of the tape attachment. All participants received standardized static stretching consisting of neck flexion, ipsilateral rotation, and contralateral lateral bending, held for 30s and repeated three times.

Muscle elasticity was measured by researcher B using shear wave elastography (SWE, in m/s) at the upper trapezius, with subjects seated and markers placed between C4 and the acromion. Ten regions of interest (ROI) were analyzed in the longitudinal plane. Measurements were taken at baseline, 20 minutes, and 24 hours post-intervention. SWE measurements were obtained using a LOGIQ P8 ultrasound system equipped with a 9–12 MHz linear transducer (GE Healthcare, Chicago, IL, USA). PPT was reassessed at the same time points. Researcher B, a trained musculoskeletal physiatrist, was blinded to group allocation.

Data was analyzed using IBM SPSS version 22. Initial analyses included descriptive statistics and data normality testing. Between-group differences were examined using the independent two-sample t-test for parametric data or the Mann–Whitney U test for non-parametric data, whereas within- group changes were analyzed using the paired t-test. Results were presented in tables or narrative form, with a significant level of $p<0.05$ and a 95% confidence interval.

This study was conducted after obtaining ethical approval from the Research Ethics Committee of the Faculty of Medicine, Universitas Indonesia. (KET-1798/UN2.F1/ETIK/PPM.00/02/2023.

RESULTS

The study subjects consisted of 50 patients diagnosed with upper trapezius myofascial pain syndrome who met the inclusion criteria and had no exclusion criteria. Baseline characteristics were conducted before assessing the effectiveness of the therapy program. The results of the baseline characteristics are shown in Table 1, which shows no significant differences in the baseline characteristics of the study subjects between the two groups, either in terms of age or gender.

Table 1. Characteristics of subjects

Characteristic	Stretching and Elastic Taping, n (%)	Stretching and Sham Taping, n (%)	P value
Age (mean ± SD)	31,20±2,483	30,64±2,396	0,421$^{\alpha}$
Gender			
Male	7 (28%)	4 (16%)	0,306$^{\beta}$
Female	18 (72%)	21 (84%)	
Upper trapezius baseline elasticity (SWE) (m/s)	4,27±0,87	4,03±1,03	0,382$^{\alpha}$
Pain pressure threshold baseline (PPT) (kg/cm^2)	28 (10-56)	31(10-59)	0,313$^{\gamma}$

α: Independent T-test
β: Chi-square, γ: Mann-Whitney U test

Table 2. Analysis of the Difference in Mean SWE Upper Trapezius Pre-intervention and post-intervention

Variables	Stretching and Elastic Taping	Stretching and Sham Taping	Mean Difference (CI 95%)	P value
Mean difference of upper trapezius elasticity pre and post 20-minute of intervention	-0,54±0,75	-0,29±0,91	-0,24 (-0,72-0,23)	0,309$^{\alpha}$
Mean difference of upper trapezius elasticity pre and post 24-hours of intervention	-0,56±0,89	-0,56±1,12	0,01 (-0,57-0,58)	0,982$^{\alpha}$

α: Paired T-test, *statistically significant, p<0,05

Table 3. Analysis of the Difference in Mean SWE Pre and Post in the Elastic Taping and Sham Taping Groups

	Elastic Taping	P- value	Mean Difference	Sham Taping	P- value	Mean Difference
Baseline (m/s)	4,27±0,87	**ref**	**ref**	4,03±1,03	**ref**	**ref**
20 minutes (m/s)	3,73±0,78	**0,002***$^{\alpha}$	0,54 (0,22-0,85)	3,74±0,80	0,122*$^{\alpha}$	0,29 (-0,08–0,67)
24 hours (m/s)	3,71±0,81	**0,001***$^{\alpha}$	0,56 (0,19-0,93)	3,46±0,78	**0,019***$^{\alpha}$	0,56 (0,10–1,03)

α: Paired T-test, *statistically significant, p<0,05

Table 4. Analysis of the Difference in Mean Pain Pressure Threshold (PPT) Pre-Intervention and Post-Intervention

Variable	Stretching and Elastic Taping	Stretching and Sham Taping	P value
PPT difference pre and post 20-minute of intervention	14 (4 – 34)	3 (-29-17)	**0,001***$^{\gamma}$
PPT difference pre and post 24-hours of intervention	5 (-2-38)	2 (-20-39)	**0,001***$^{\gamma}$

γ*: Mann-Whitney U test,* * statistically significant, p<0,05

Table 5. Analysis of the Difference in Average PPT Pre and Post in the Elastic Taping and Sham Taping Groups

	Elastic Taping	P-value	Sham Taping	P- value
Baseline PPT	28 (10-56)	**ref**	31(10-59)	**ref**
20 menit	43 (14-70)	**0,001***$^{\delta}$	33 (15-56)	**0,033*** $^{\delta}$
24 jam	37 (20-69)	**0,001*** $^{\delta}$	37 (17-77)	**0,035*** $^{\delta}$

δ: Wilcoxon Test, * statistically significant, p<0,05

DISCUSSION

This study involved patients aged 18–59 years with upper trapezius myofascial pain syndrome, with a mean age of 30.9 ± 2.43 years, consistent with previous studies reporting mean subject ages ranging from 29.8 to 34 years.[6,11,14] Myofascial pain syndrome is more commonly observed in individuals of productive age due to work-related neck disorders, particularly in occupations requiring prolonged sitting and overactivation of the upper trapezius, which may contribute to muscle fiber degeneration, increased stiffness, tenderness, and alterations in muscle elasticity.[3,8]

Women represented 78% of the study population, consistent with literature indicating a higher risk of MPS in females, potentially influenced by hormonal factors such as estrogen and relaxion, which affect extracellular matrix remodeling, tissue stiffness, and fascial nociceptor sensitization. [16]

Elastic taping applied to the upper trapezius significantly improved muscle elasticity, with average SWE values decreasing by 12% at 20 minutes and 13% at 24 hours post-application. This reduction reflects decreased muscle stiffness and improved muscle adaptability to passive tension. Muscle elasticity measured through SWE represents the structural integrity of collagen and elastin fibers, key determinants of viscoelastic behavior. [8,9]

These post-intervention SWE changes indicate an adaptive tissue response to external mechanical stimulation provided by taping. The underlying mechanism involves stimulation of fascial mechanoreceptors, particularly Ruffini endings, which respond to slow stretch and shear forces. Their activation sends afferent input to the central nervous system, modulating autonomic balance by increasing parasympathetic tone, reducing sympathetic activity, and decreasing gamma motor neuron drive. These physiological effects promote muscle relaxation, reduce muscle tone, redistribute intramuscular pressure, and enhance local perfusion, reducing edema, adhesions, and stiffness. [2, 4]

Additionally, elastic taping imposes continuous mechanical pulling action on the superficial fascia, facilitating slow viscoelastic deformation and microstructural reorganization of collagen and muscle fibers. This mechanism contributes to measurable reductions in stiffness observed on SWE.[3,8] Prior research demonstrates that viscoelastic changes typically require 15–30 minutes to manifest, consistent with slow-adapting mechanoreceptor responses. [17]

Although sham taping also reduced elasticity, the onset of change occurred slower compared to elastic taping. This may relate to differences in stretch intensity: sham taping provides ~15% pre-stretch tension, whereas the inhibition taping technique uses ~25% stretch, generating stronger mechanoreceptor stimulation and faster tissue adaptation.[10,11] Higher stimulus intensity and longer exposure are associated with shorter afferent transmission latency and more rapid physiological responses. [2, 4]

Overall, elastic taping influences upper trapezius elasticity through neuromuscular modulation, fascial stimulation, redistribution of intramuscular pressure, and viscoelastic adjustments.

These findings provide objective evidence that elastic taping induces measurable physiological alteration in muscle mechanical properties beyond subjective pain relief, supporting its therapeutic role in MPS rehabilitation. [4, 11]

Elastic taping also significantly improved PPT at both 20 minutes and 24 hours compared with sham taping. The analgesic effects may involve reduced activation of subcutaneous nociceptors, stimulation of large-diameter afferent fibers (consistent with the Gate Control Theory), and enhanced blood and lymphatic circulation facilitating removal of pro-inflammatory mediators. [2, 4]

Similar to the natural properties of other sensory systems, mechanoreceptors may undergo habituation—a reduction in neural responsiveness to prolonged or repetitive stimuli—which may occur within hours when mechanical input is static or unidirectional. Nevertheless, stimulation from taping maintained its efficacy, as evidenced by the persistent improvements in SWE and PPT observed 24 hours after application.

CONCLUSION

The ET group demonstrated significant improvements in muscle elasticity (indicated by decreased SWE values) and increased PPT at both 20 minutes and 24 hours post-intervention. The sham taping group showed a nonsignificant reduction in SWE at 20 minutes but a significant reduction at 24 hours, along with increased PPT at both time points. Between-group comparisons revealed statistically significant differences in SWE and PPT values at both measurement intervals. It is proven in this study that elastic taping may serve as an effective non-invasive adjunct to stretching therapy in the treatment of upper trapezius myofascial pain syndrome, as application of ET is simple to perform, easily accessible, and safe, with no significant adverse effects observed throughout the course of this study.

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