Research Article

Effect of Myofascial Release Technique on Lumbar Fascia Thickness and Low Back Pain: A Clinical Trial

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ABSTRACT

Introduction: This study aims to evaluate the effect of lumbar myofascial release (MFR) technique on pain and thickness of the lumbar fascia tissue in patients with non-specific low back pain.

Materials and Methods: In this clinical trial, 20 subjects with non-specific low back pain were treated by MFR on the lumbar region at 4 sessions. Low back pain severity and thickness of the lumbar fascia tissue were assessed by ultrasonographic imaging before and after the intervention.

Results: Subjects showed significant reduction in lumbar fascia thickness (P=0.000) and low back pain severity (P=0.000).

Conclusion: The lumbar MFR technique is effective in patients with non-specific low back pain due to reducing the lumbar fascia thickness and low back pain.

1. Introduction

Low back pain (LBP) is a complex disease that causes significant disability [1-4]. It is known as one of the main musculoskeletal disorders, which can have a significant impact on the quality of life by reducing a person's performance [5]. Non-specific low back pain (NSLBP) is the most common form of low back pain [6]. Most studies have focused primarily on mechanisms such as vertebral structural factors, neuropsychological factors, and motor control as causes of NSLBP [7-18]. In recent studies, more attention has been paid to connective tissue disorders such as inflammation, fibrosis, adhesions, fat penetration and structural disorders of the lumbar fascia tissue [19-24]. Studies showed that fascia structures and dysfunctions of muscles in the lumbopelvic area have important role in LBP occurrence [25, 26]. Based on this theory, patients with LBP have increased lumbar fascia thickness than healthy individuals [27].

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Another theory is that superficial fascia is more prone to injury than other layers in patients with LBP [28]. The deep muscles of the back and fascia form a myofascial system like a corset that helps maintain the posture alignment [25, 26, 28-30]. Following LBP, the function of this corset-like myofascial system declines and leads to increased activity of superficial fascia. This increased activity affects the structural properties of the superficial fascia and lead to an increase in thickness of superficial fascia and a decrease in its flexibility [25, 26, 28-32].

Myofascial release (MFR) is a hands-on technique focusing on the restoration of altered fascia tissue function. In this method, tissue stretching is done by applying compressive forces to the specific region at a low-intensity level which can modify fascial restrictions and adjust the tension distribution in the fascial network [33]. The fascial restriction is any impediment to optimal gliding, at both macroscopic and microscopic fascial organizational levels [34]. MFR technique is used to restore tissue length, reduce pain, and improve function. MFR technique can improve the fascia tissue structure by affecting the alignment of collagen fibers; therefore, it seems that MFR technique can lead to improvement in fascial thickness [35].

Ultrasound imaging is a non-invasive method that allows the visualization of tissue structures by using the reflection of ultrasound waves from heterogeneous tissues. Ultrasonography can quantitatively evaluate the subcutaneous structures, connective tissues, and muscles in humans [36]. Limited studies have examined the biomechanical and structural changes of fascial tissue [37-39]. In this study, we used ultrasound waves to calculate the thickness of lumbar fascia tissue after lumbar MFR. This approach has been used in some studies to evaluate the thickness of fascial tissue in the lumbar region in healthy subjects [27, 40], but no study was found to examine the thickness of lumbar fascia after MFR in patients with NSLBP [32]. Therefore, the current study aims to evaluate the effect of lumbar MFR technique on the thickness of lumbar fascia using ultrasound imaging and on the pain severity in patients with NSLBP.

2. Materials and methods

Study participants

Twenty participants (10 men and 10 women) with NSLBP were included in this clinical trial. Participants signed an informed consent form prior to the study in the physiotherapy Department of Tarbiat Modares University. Inclusion criteria were: A pain score of 4-6 based on the visual analog scale (VAS) score, age 30-50 years, body mass index of 18.5-24.9, and having NSLBP confirmed by a specialist after examination and observation. Exclusion criteria were a history of spinal surgery or fractures and any neurological and orthopedic disorders that affect the lumbar region.

Assessments

Participants were evaluated by ultrasound, before and after treatment sessions in the prone position. Two points in the thoracolumbar region were determined for ultrasound recording. These points were 2 cm away from the

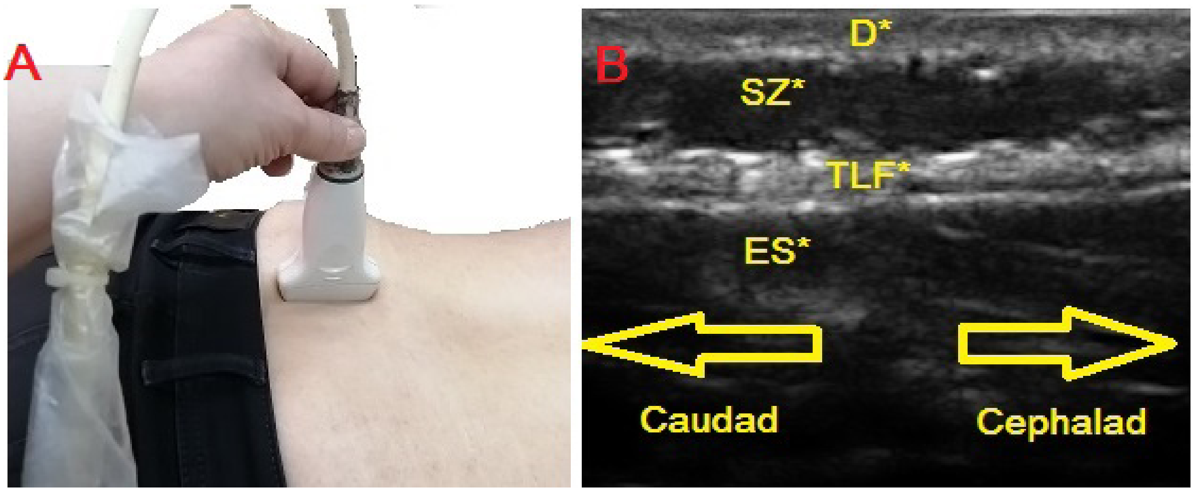

Figure 1. Ultrasound imaging of the thoracolumbar fascia

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(A) Ultrasonography in a prone position on a point 2 cm lateral to the midpoint at L2-L3 level at both sides. (B) The Ultrasound image, at ImageJ software.

*D: Dermis; *SZ: Subcutaneous Zone; *TFL: Thoracolumbar Fascia, *ES: Erector spinae

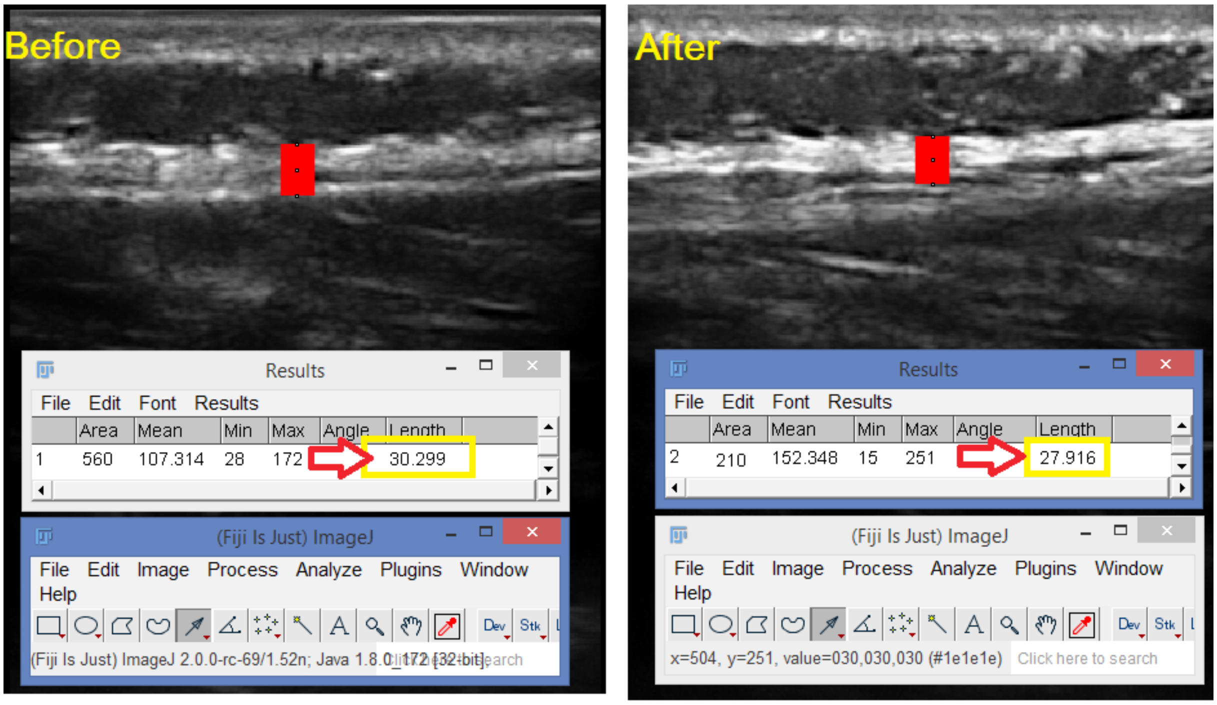

Figure 2. The images before and after the MFR taken from the right side at the L2-L3 level in ImageJ software. Note: Red area shows the thoracolumbar thickness

spine. The L2-L3 level was used for ultrasonographic examination of the lumbar fascia. At this level, the fascia planes are mostly parallel to the skin. At the upper levels, the fascia planes are more affected by the muscles of the thoracic region, while the lower fascia planes are more affected by the gluteal fat pad, which causes more variation in the angle between the skin surface and the thoracolumbar fascia. The thoracolumbar fascia was evaluated over the mass of the erector spinae muscles at L2-L3 level, 2 cm lateral to the spinous process. During the ultrasound imaging, great care was taken to apply no tension on the tissue (Figure 1A) [27].

The subjects underwent ultrasound examination using a clinical ultrasound system (Sonix Touch, Ultrasonix Medical Corporation, Canada) with a 5-14 MHz linear array, L14-5/38. The transducer (Ultrasonix Medical Corporation, Canada) with a footprint of 6.24 was targeted on points that were located 2 cm lateral to the midpoint in the L2 and L3 vertebrae on both sides of the spine. All images provided by routers using monotone settings had a frequency of 14 MHz and a depth of 5 cm which can provide an optimal image quality for subcutaneous structures. Images were analyzed in ImageJ version 1.50h software (National Institutes of Health, USA) which has high validity [41]. After recording the ultrasound images (before and after the intervention), the images were analyzed by ImageJ software and different areas were identified (Figure 1B). Then, the points with specific echogenicity and specific coordinates were marked on images and the thickness of fascia tissue was measured in ImageJ software (Figure 2). The VAS was used to assess LBP severity before and after the MFR technique session [42].

Intervention

Participants treated by MFR techniques in the lumbar region at 4 sessions, two times per week [43, 44]. The patient was asked to sit in a chair and slowly lean forward when the therapist starts applying the MFR technique. Using the metacarpophalangeal joints, the therapist performed the MFR from the mid-thoracic to the pelvis area along the spine. This maneuver was conducted five times, each lasted for about 90 seconds (Figure 3). In the next step, the patient was asked to lean forward and put the elbows on the knees. The therapist used the fingertips of both hands to apply MFR technique along the erector spinae muscles on both sides of the spine in the thoracic and upper back regions. This maneuver was done in three positions: Leaning forward only, leaning forward while turning to the right, and leaning forward while turning to the left. This maneuver was repeated five times, each lasted for about 90 seconds (Figure 4)[28].

Figure 3. The first MFR technique performed while the patient was asked to slowly lean forward

Statistical analysis

Statistical analysis was conducted in IBM SPSS v. 16 software. Kolmogorov-Smirnov test was used to determine the normal distribution of data. An independent sample t-test was used to compare baseline scores in both groups, paired t-test was used to compare within-group changes, and Pearson correlation test we used to assess the relationship between pain and fascia thickness. Statistical significance level was set at 0.05.

Results

Participants were 20 subjects (10 men and 10 women) with a Mean±SD age of 36.37±10.56 years whose demographic characteristics are presented in Table 1. Kolmogorov-Smirnov test results showed all have normal distribution ($P>0.05$). The thickness of the lumbar fascia (Figure 4) and pain severity were compared using paired t-test (Table 2).The relationship between pain relief and lumbar fascia thickness was examined by Pearson correlation test (Table 3).

Figure 4. The second MFR technique performed for transverse release of paraspinal muscles in three positions

Table 1. Demographic information of the participants

Characteristics	Mean±SD
Age (y)	40.10±5.90
BMI (kg/m²)	23.82±2.32
Height (cm)	1.71±0.20
Weight (kg)	70.25±12.85

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Table 2. Results of paired t-test for fascial thickness and pain severity

Variables	Mean±SD		P
	Before Intervention	After Intervention	
RFT	37.90±1.77	35.45±2.39	0.000
LFT	37.16±1.38	34.80±1.82	0.000
Pain severity	5.55±0.51	3.25±0.85	0.000

RFT: Fascia Thickness on Right Side of Spine, LFL: Fascia Thickness on Left Side of Spine.

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4. Discussion

In this study, the thickness of lumbar fascia tissue was examined by ultrasound before and after the MFR technique. Previous studies have shown that ultrasonography has good sensitivity and specificity for the examination of the fascia [45-52]. The results of the present study showed that the MFR techniques could reduce the lumbar fascia thickness and pain severity in patients with NSLBP. Previous studies have indicated the effect of MFR techniques on pain relief in various body areas [43, 53, 54]. Fede et al showed that the severity of pain in patients with LBP was associated with an increase in inflammatory factors in the lower back [55]. Accumulation of inflammatory substances in the lumbar region tends to increase muscle tension which leads to pressure on the nociceptors and increases the pain [56]. Ajimsha et al. showed that MFR improves blood circulation, eliminates the chemical causes of inflammation, and ultimately reduces muscle tension and pain. The pain and spasm associated with myofascial pain syndrome due to chronic LBP may cause functional limitations. In this case, MFR can reduce pain and spasm, and increase performance [57]. According to Longworth, MFR can cause increased local heat and parasympathetic activity [56].

In our study, after MFR techniques, patients reported a decreased pain in their lower back region. Moreover, ultrasound examination revealed a decrease in lumbar fascial thickness after treatment sessions. The improvements seen after MFR are probably due to the stretching of the elastic component of fascial, shearing of the cross-links that can be developed at the nodal points of the fascia, and the change in the viscosity of ground substance from a more solid to a gel state. This change in viscosity increases the production of hyaluronic acid and the gliding of fascial tissue. Moreover, there is a positive effect on the spindle cells, the Golgi tendon organs of the musculotendinous component, and the tone of the peripheral, autonomic, and central nervous systems [58]. It is observed that the gentle tractioning forces applied to the fascial restrictions will elicit heat from a vasomotor response that increases blood flow to the af-

Table 3. Results of Pearson correlation test for relationship between fascial thickness and pain severity

Variable	Statistical Values	RFT	LFT
Pain	Pearson correlation coefficient	0.680	0.620
	Sig.	0.010	0.002

RFT: Fascia thickness on right side of spine, LFL: Fascia thickness on left side of spine.

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fected area, which will enhance lymphatic drainage of toxic metabolic wastes, realign fascial planes, and most importantly, reset the soft tissue proprioceptive sensory mechanism. This last activity seems to reprogram the central nervous system, enabling the patient to perform a normal, functional range of motion without eliciting the nervous pain pattern [59]. The results of our study showed a significant relationship between decreased pain and lumbar fascial thickness.

One of the limitations of the present study was the impossibility of blinding the participants to the treatment procedure. Moreover, it was difficult to standardize certain parameters in MFR, such as the amount and direction of exerted pressure by the therapist. In general, this is may be a limitation for all manual therapies. Furthermore, due to the limitations caused by the COVID-19 pandemic, it was difficult to transfer patients from home to the clinic. It was not possible to follow-up the patients by ultrasonography. In further studies, it is recommended to use a long-term follow-up period to further examine the persistence of fascia tissue changes.

5. Conclusion

The lumbar MFR can reduce the lumbar fascia thickness and pain in people with NSLBP.

Ethical Considerations

Compliance with ethical guidelines

All ethical principles were observed in this article. The participants were informed about the study purpose and processes; they were assured of the confidentiality of their information and were free to leave the study at any time. The study was approved by the Ethics Committee of Biomedical Research at Tarbiat Modares University (Code: IR.MODARES.REC.1398.126) and registered by the Iranian Registry of Clinical Trials (ID: IRCT20200423047173N1).

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Authors' contributions

Data curation, Writing original draft preparation, Investigation, Software: Hassan Tamartash; Conceptualization, Methodology, Editing & Review, Visualization, Supervision: Farid Bahrpeyma; Validation, Supervision, Software: Manijhe Mokhtari-dizaji

Conflict of interest

The authors declared no conflict of interest.

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