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The effect of soft tissue mobilization on pain, disability level and depressive symptoms in patients with chronic low back pain

Effect of soft tissue mobilization in chronic low back pain

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Abstract
Aim: In this study, we aimed to investigate the effect of soft tissue mobilization on pain, disability level, depressive symptoms and to determine the effect of sociodemographic data on the recovery level of patients with chronic non-specific low back pain.
Materials and Methods: One hundred twenty-two participants (78 females, 44 males, mean age: 51.08 ± 10.78 years) were included in our randomized controlled study. Fifteen sessions (5 days a week; during 3 weeks) of conventional physiotherapy programme (hot-packs, TENS, therapeutic Ultrasound and exercise) were applied in both groups. Nine sessions (3 days a week; during 3 weeks) of soft tissue mobilization technique were performed additionally to the participants in Group 1. Pain intensity (Visual Analog Scale), disability level (Rolland Morris Disability Questionnaire), depressive symptoms (Beck Depression Scale) were examined before and after the treatment.
Results: Decrease in pain intensity, disability level, and depressive symptoms were statistically significant in both groups ($p < 0.001$) after the treatment. As delta scores were compared, the significant difference between pain intensity and disability level ($p < 0.05$) was observed whereas reduction in depression level was not significant ($p > 0.05$).
Discussion: Soft Tissue Mobilization provides an additional benefit to the Conventional Physiotherapy program in reducing pain intensity and disability level in patients with chronic non-specific low back pain.

Keywords
Soft Tissue Mobilisation; Chronic Low Back Pain; Disability

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Introduction

Low back pain (LBP) is a common health problem affecting 80% of people at some point in their lives [1]. This painful condition, which is still not well understood, causes very serious functional and economic losses [2]. LBP which is a rare symptom of serious pathology is the most expensive disease with direct medical treatment costs and indirect costs with absence from work, disability payments, and reduced productivity [3,4].

In addition to being a very common problem, the majority of back pain is of non-specific origin. Although 90% of people with non-specific LBP recover within a few weeks with or without treatment, 10% becomes chronic [5,6]. In this case, soft tissue healing does not occur at the expected time and the dysfunction becomes apparent [7]. In that situation, the target is to provide normal spinal function and prevent disability in these patients [6,8].

The pain-spasm-pain cycle is a protective reaction against injury in chronic back pain. Because of the injury, nociceptors around the damaged area are stimulated and cortical signals are sent through the spinal cord where the pain is perceived. Thus, the cortex sends signals to contract the surrounding muscles to protect the injured area. The micro-injuries are tried to be corrected by the body's autoregulatory mechanisms. If autoregulation is prolonged, muscle contraction reduces circulation, causing hypoxia and an increase in pain, muscle spasm [9]. Soft tissue techniques applied to reduce long-lasting muscle spasm provide mechanical tension to the tissue. This mechanical tension reorganizes the connective tissue, promotes circulation, promotes venous and lymphatic return, and releases endogenous opioids. As a result, musculoskeletal pain is reduced [10].

In this study, we aimed to investigate the effect of soft tissue mobilization (STM) on pain, disability level, and depressive symptoms in patients with chronic non-specific low back pain and to determine the effect of sociodemographic data on recovery level.

Material and Methods

Study Design and Participants

This study was conducted between March 2016 and July 2017 at Denizli State Hospital. Participants who were diagnosed as chronic non-specific back pain by a specialist physician were included inthe study. They were referred to a physical therapy clinic and those who were willing to were included in our study. The study protocol was approved by Non-Invasive Clinical Research Ethical Committee of the Pamukkale University Denizli, Turkey (08.03.2016/020). This study was supported by Pamukkale University Scientific Research Projects Department (2019KKP048).

The inclusion criteria were men and women aged from 20 to 65 years that had moderate LBP according to VAS for at least 3 months. The exclusion criteria were clinical findings indicating severe pathology according to a physical examination, a history of hemiplegia, spinal surgical procedure, malignancy, chronic inflammatory back pain, excessive osteoporosis, arthritis and bone diseases. They were withdrawn when the patients did not work ontheir own will or if they did not participate in the assessments.

One hundred forty of 311 participants diagnosed with non-specific low back pain were in compliance with the criteria of our study. The study was completed with 112 (78 Female; 44 Male) participants. Of the 112 patients included in the study, 65 were randomized to Group1, 57 to Group 2 (Figure 1). All participants signed the voluntary consent form.

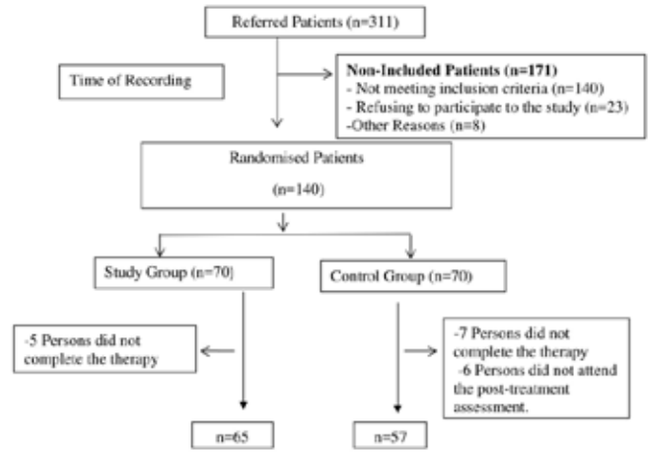

Figure 1: Flow chart of the study population

Assessment Scales

Pre- and post-treatment assessments of participants were made by a physiotherapist with 10 years of experience in musculoskeletal pain. The treatments were made by another physiotherapist with 27 years of experience and working in the field of manual therapy for 10 years. The physiotherapist was unfamiliar with the assessment outcomes.

Soft Tissue Evaluation: The physiotherapist performed a manual soft tissue assessment on each patient. Palpation revealed pain, spasm, and tension in the iliolumbar ligament, thoracolumbar fascia, lumbar paravertebral muscles, Quadratus lumborum and iliopsoas muscles.

Pain Assessment: Pain intensity was assessed via VAS which is 10 cm in length (0: no pain, 10: unbearable severe pain).

Disability Level: It was assessed via Roland-Morris Disability Questionnaire. The Turkish validity and reliability study of this questionnaire was conducted by Küçükdeveci et al. in 2001 [10]. The questionnaire consists of 24 items. Each item is answered as yes (1 point) or no (0 points). The total score ranges from 0 to 24. High score refers to a high level of disability and inadequacy in functional activities.

Depressive Symptoms: The Beck Depression Scale was used. This Likert-type scale consists of 21 symptom categories. Each symptom category is assessed with scores ranging from 0 to 3. The highest score is 63. Individuals who get 17 points and above were reported to have severe depressive symptoms that would require treatment. The validity and reliability of this scale were conducted by Hisli [11].

Treatment Procedure

Participants were divided into 2 groups according to the order of treatment. Group 1 formed the study group (CP+STM), Group 2 formed the control group (CP). At the first session, brief information on protecting was handed out to all patients before the treatment.

Conventional Physiotherapy Programme:

a) Hot Packs were applied for 20 min to the lumbar region as a superficial heat agent in order to create a heating effect on superficial tissues.

b) TENS (Transcutaneous Electrical Nerve Stimulation). Conventional TENS was administered as an electrotherapy agent to inhibit pain. It was applied with 100 Hz frequency and 50 μs transition time, with 7×9 cm size plate electrodes for 20 min.

c) Therapeutic Ultrasound. It has been applied for 5 min, 1 MHz frequency with a probe 4 cm2 in diameter to create a heating effect in deep tissues and to provide relaxation in the connective tissue. US was administered to lumbar paravertebral muscles at a dose of 1.5 watts / cm2.

d) Therapeutic Exercises. Strengthening and stretching exercises for the abdominal, back, and lower extremity muscles (20 minutes) were started after the 5th session within the scope of active treatment. A total of 10 sessions of exercise therapy were administered, 10 repetitions 3 times a day under the supervision of the physiotherapist.

Administired exercises:

- Strenghtening abdominal muscles;
- Stretching the hip flexors;
- Strengthening back muscles;
- Cat-Camel exercise in four kneeling position;
- Stretching hamstring muscles

Fifteen sessions of the CP program have been administered 5 days a week for 3 weeks.

Soft Tissue Mobilisation programme

STM Program involving stretching the thoracolumbar fascia, neurological stretching to quadratus lumborum muscle, friction massage to paravertebral muscles, psoas major muscle and iliolumbar ligament was applied for 20-25 min until muscle relaxation was obtained.

Statistical analyses

Continuous variables were expressed as mean ± standard deviation (SD) and categorical variables as number and percent. Independent samples t-test and One Way Analysis of Variance (ANOVA) were used for comparisons among groups. The paired samples t-test was used for comparing dependent groups. All statistical analyses were performed using SPSS 24.0 and p-value less than 0.05 was considered statistically significant.

Results

This study included 78 female and 44 male participants with a mean age of 51.08±10.78 years. Demographic characteristics of the participants according to groups were as follows: the mean age of the participants in Group I and II was 49.98±9.77 and 53.47±11.45 years respectively. BMI of the participants in Group I and II was 27.98±4.02 and 28.10±5.51 respectively. In Group 1, 56% of the participants were female, whereas in Group 2, 28.1% of the participants were male.

After the treatment, there was a statistically significant decrease in pain intensity, disability level, and depressive symptoms in both groups ($p < 0.001$) (Table 1).

Pre- and post-treatment delta scores between groups were investigated and there was a significant difference in pain intensity and disability level in favor of Group 1 ($p < 0.05$). Depression levels were similar in both groups ($p > 0.05$) (Table 2).

When the effects of sociodemographic parameters on healing

Table 1. Intra-Group comparison of pain intensity, depressive symptoms, and disability status at pre- and post-treatment

	Group I				p*	Group II				p*
Variables	Pre-Treatment		Post-Treatment			Pre-Treatment		Post-Treatment		
	X	SD	X	SD		X	SD	X	SD	
VAS activity	6.88	2.44	3.08	2.21	0.0001	6.68	2.38	4.52	2.59	0.0001
					t=12.11					t=6.96
BDI	11.10	7.69	8.21	7.94	0.0001	12.54	8.51	10.36	8.12	0.011
					t=5.36					t=2.61
RMDI	13.98	6.69	9.28	6.16	0.0001	14.53	5.48	12.08	5.94	0.0001
					t=6.50					t=4.67

VAS: Visual Analog Scale; BDI: Beck Depression Inventory; RMDI: Roland-Morris Disability Index; SD: Standard Deviation: *: Paired Sample t-test

Table 2. Inter-Group comparison of delta scores

	Group I		Group II			
Variables	Δ	SD	Δ	SD	p*	%95 CI
VAS activity	3.72	2.60	2.39	2.49	0.005	0.40 – 2.25
BDI	2.89	4.34	2.17	6.27	0.460	-1.19 – 2.63
RMDI	4.69	5.40	2.84	3.63	0.042	0.069 – 3.60

VAS: Visual Analog Scale; BDI: Beck Depression Inventory; RMDI: Roland-Morris Disability Index; SD: Standard Deviation: *: Independent Sample t-test; Δ: variable difference between pre- and post- treatment

Table 3. Comparison of demographic parameters and main outcome measures

Variables	Group I			Group II		
	VAS	BDI	RMDI	VAS	BDI	RMDI
	Δ(SD)	Δ(SD)	Δ(SD)	Δ(SD)	Δ(SD)	Δ(SD)
Age (year)						
20-45	3.28(2.19)	3.5(2.96)	4.84(5.47)	1.76(2.36)	5.31(7.22)	2.23(3.44)
46-65	3.85(2.78)	2.21(5.02)	4.58(5.43)	2.13(2.30)	1.46(5.59)	3.05(3.71)
p*	0.390	0.248	0.860	0.622	0.050	0.487
BMI (kg/cm²)						
18.5-24.9	2.9(2.41)	2.46(5.62)	3.24(3.8)	2.41(2.18)	0.92(4.94)	2.33(2.38)
25-29.9	3.10(2.66)	3.03(5.62)	4.30(5.4)	2.11(2.93)	1.68(6.56)	3.42(4.07)
>30	2.66(2.55)	2.10(4.42)	3.58(4.4)	1.75(1.74)	3.10(4.81)	2.47(3.96)
p**	0.737	0.702	0.625	0.715	0.527	0.649
Gender						
Female	3.15(2.68)	1.97(4.35)	4.37(5.46)	1.57(2.25)	2.02(6.24)	2.82(3.74)
Male	4.20(2.27)	3.77(4.10)	5.12(5.40)	3.33(1.94)	3.61(6.14)	2.91(3.42)
p	0.107	0.101	0.612	0.016	0.429	0.937
Education level(year)						
8↓	3.08(2.57)	2.82(4.99)	5.51(5.82)	2.10(2.35)	2.76(5.40)	2.78(3.87)
9 and ↑	4.5(2.29)	2.62(2.99)	3.52(4.62)	1.83(2.19)	1.38(8.31)	3.0(2.97)
p	0.034	0.863	0.177	0.723	0.491	0.859
Smoking habit						
Yes	3.02(2.21)	3.81(3.18)	3.40(4.78)	3.15(2.16)	1.83(5.60)	2.25(2.59)
No	3.72(2.61)	2.51(4.50)	4.97(5.53)	1.68(2.10)	2.60(6.42)	3.02(3.91)
p	0.428	0.369	0.408	0.053	0.711	0.524

VAS: Visual Analog Scale; BDI: Beck Depression Inventory; RMDI: Roland-Morris Disability Index; SD: Standard Deviation; *:Mann-Witney U Test; **:Kruskal-Wallis Test

levels were compared, in Group 2, pain intensity in male patients was further reduced ($p < 0.01$), while in patients between the ages of 20 and 45 years, a greater improvement was observed in symptoms of depression ($p < 0.05$). In Group I, pain intensity was found to be higher in participants with education level of 9 years or more ($p < 0.05$) (Table 3).

Discussion

In our study, it has been identified that STM has provided additional benefits to the traditional physiotherapy program in terms of pain intensity, disability level, and depressive symptoms. In patients who underwent conventional physiotherapy, we found that the pain intensity decreased more among male patients and depressive symptoms improved more among patients between 20-45 years of age. Among patients who were applied soft tissue mobilization, pain was found to decrease more in those with higher levels of education. Manual therapy is frequently used in the treatment of chronic LBP in recent years [10,12,13,14]. STM techniques in manual therapy applications described in the literature are muscle energy technique, trigger point relaxation, myofascial relaxation and post isometric relaxation technique [16]. We applied STM program including myofascial relaxation, friction, and neurological stretching methods in our study. STM techniques provide restructuring of the connective tissue, increase circulation, accelerate venous and lymphatic return, and reduce the musculoskeletal pain by allowing endogenous opioids to be secreted [15]. Based on these physiological principles, we planned this study with the hypothesis that STM would reduce pain. The results of our study indicated that pain intensity has decreased in both groups after treatments. Analyzing delta scores between groups, it was seen that the decrease in pain intensity was greater in the group in which STM was applied. In a similar study, myofascial relaxation technique in addition to physiotherapy has been shown to reduce pain intensity, range of motion, and disability in patients with chronic LBP [17]. Myofascial relaxation technique also reduced pain severity and increased the quality of life in patients with fibromyalgia [18]. The STM program including muscle energy technique, trigger point release, and myofascial release technique, has been shown to improve pain intensity, back mobility, and functional outcome scores [10].

In the literature, there are studies in which the effectiveness of manual therapy methods are investigated in patients with chronic low back pain and manual therapy has been found to improve pain intensity, function, spinal mobility and increase return to work [10,12,19,20].

In our study, it was observed that STM has an additional benefit in reducing pain intensity and disability in the CP program. Aure et al. showed that improvement was greater and the rate of return to work was high in patients with chronic LBP with manual therapy practices [14]. Geisser et al. [12] reported that a specific exercise program in conjunction with muscle energy technique was effective in chronic LBP. Kovacs et al. found that as pain decreases, there were positive changes in disability level and quality of life in chronic LBP [21]. Comparing delta scores we observed that the level of disability decreased more in the STM-administered group. We think that improvement in the disability level is the result of making daily activities more easy due to decreased pain intensity.

During myofascial treatments, the hands-on application stimulates the sympathetic system. Endorphins release and stimulate relaxation response. Anxiety level decreases. Myofascial release is achieved. This treatment helps to reduce depressive symptoms due to pain and muscle spasm [22]. It has been shown that myofascial relaxation therapy is effective in decreasing the disability, sleep quality, and depression level in older adults with chronic LBP [23]. In our study, we improved the depressive symptoms in both groups after the treatment. No further improvement was achieved in the study group (STM+CP) in terms of symptoms of depression. We attribute this to the fact that patients' emotional problems are not only caused by muscle spasms and pain but also by many other factors.

The limitation of our study is the lack of long-term follow-up results.

As a result, it has been shown that STM improves tissue healing, releases the fascia, and reduces muscle spasms. Thus, the pain decreased and the function increased.

Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Animal and human rights statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.

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Conflict of interest

None of the authors received any type of financial support that could be considered potential conflict of interest regarding the manuscript or its submission.

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