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Comparison of the effect of one week of myofascial self-release process and massage on pain and range of motion of neck in women with trapezius muscle trigger points

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Abstract

Background: Myofascial pain syndrome (MPS) is caused by sensitive spot in muscles that are known as trigger points (TPs) which can have complications that can affect person's quality of life. Massage and self-myofascial-release (SMR) are two non-invasive techniques which are used to reduce the side effects of TPs.

Aim: The present study is intending to compare the effect of the two mentioned techniques in reducing complications caused by TPs such as reduced ROM and pain in women with MPS of the trapezius muscle.

Materials and Methods: 45 women aged 20-25 years with active TPs in the trapezius muscle were randomly divided into two experimental groups and one control group. The research process was one week which consists of pretest, 5 days intervention and post-test. The variables included pain measured by OBER questionnaire and ROM of neck measured by goniometer.

Results: The results of the study showed that massage can have a significant effect on the ROM of neck including neck flexion (P= 0.00), extension (P= 0.00), left (P= 0.00) and right (P= 0.004) lateral flexion and left (P=0.00) and right (P= 0.04) rotation (P<0.05). Both massage and SMR interventions had a significant effect on reducing pain measured by OBER questionnaire (P<0.05).

Conclusion: Findings of this study showed that myofascial release massage can have better effects on increasing neck ROM. Both treatment modalities are useful in reducing pain. Based on the obtained results, we recommend that specialists use massage intervention instead of myofascial self-release (SMR) for individuals suffering from MPS and neck pain, in order to achieve quicker and more extensive results.

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1. Introduction

With the advancement of societies and industrialization, people's lifestyles have shifted towards inactivity and engaging in monotonous and repetitive activities. This gradually leads to shortening, stretching, or atrophy of muscles, resulting in weakness and abnormalities in the musculoskeletal structure, and consequently an increase in the prevalence of various musculoskeletal disorders among different segments of society. One of the most common musculoskeletal disorders is myofascial pain syndrome (MPS) [1]. This disorder is considered one of the most prevalent types of musculoskeletal pain occurring in the lumbar, cervical, and shoulder girdle regions [2].

According to statistics, 85% of the general population will experience this disorder at some point in their lives [3]. Trigger points (TPs) have been observed in all age groups, with the exception of infants [4]. MPS is a condition caused by sensitive nodules called trigger points (TPs) in stiff muscle tissue [5]. This pain syndrome can cause problems such as hyperalgesia, radiating pain [4], limitation of range of motion (ROM) [6] and proprioception disorders, followed by loss of coordination [7]. Autonomic features of MTrPs may encompass, among other things, vasoconstriction, vasodilation, lacrimation, and piloerection [8, 9, 10]. The exact mechanism that initiates this disorder is still unclear [5]; so, it's important to find a method to reduce the complications which caused by TPs.

The upper trapezius (UT) is the most frequently affected area for myofascial trigger points (MTrPs), with 78.8% of healthy individuals exhibiting latent trigger points (LTrPs) [11]. Reports indicate that the prevalence of shoulder muscles with active TPs is 78% for the infraspinatus, 58% for UT, and 50% for the middle deltoid. In contrast, the prevalence of LTrPs is 49% in the teres major and 38% in the UT [12].

In general, the function of the trapezius muscle is to provide stability and movement to the scapula. The upper fibers of this muscle are responsible for elevating the scapula, facilitating its upward rotation, and extending the neck. The middle fibers act as retractors of the scapula, while the lower fibers are responsible for depressing the scapula and assisting in its upward rotation. While this broad superficial muscle primarily serves a postural role, it actively influences movements such as lateral neck flexion, head rotation, shoulder elevation and depression, and internal rotation of the arm [13].

On the other hand, studies have shown the important role of the trapezius muscle in maintaining the stability of the scapula and its role in preserving the correct scapulothoracic rhythm. Extended overactivity of UT muscle, along with the presence of myofascial TPs, can lead to muscle fatigue, which may subsequently alter scapular kinematics and the associated muscular activities [14]. TPs in the trapezius muscle can clinically present as tension headaches, as well as pain in the neck, shoulders, and upper arms. This highlights the importance of treating TPs.

In general, treatment methods for releasing TPs are divided into two categories, invasive and non-invasive methods including dry and wet injections [15] (injection of non-steroidal anti-inflammatory drugs [16], muscle relaxants, botulinum toxin [17], etc.), stretching and pressure techniques [15], acupuncture [18], biofeedback [19], muscle energy techniques, TENs [20], massage therapy [21], meditation and relaxation exercises

[22], tai chi [23], nutritional interventions and probiotic consumption [5].

Although some of the mentioned methods can have a quick pain relieving effects, but some of their side effects, such as addiction and abuse [5], are so tremendous that it is better to use alternative methods with less danger in order to get rid of complications of this disorder [24].

One of the most popular methods in recent years, with fewer side effects, is massage [25]. Massage can have positive effects on various conditions, such as mental stress, anxiety, and pain [26]. This method causes relaxation through the neural valve control mechanism and the release of endorphins, as well as by increasing blood flow and as a result, reducing ischemia [4] (on involuntary contractions that occur in the area of TPs). This increase of blood flow can rise muscle nutrition accumulation and metabolism, helping to remove waste materials such as lactic acid faster [27].

Another method that has been introduced and noticed in recent years is myofascial self-release (SMR). This method claims that it can have the same results as massage, but due to the individuality of the method, it is also possible to implement related techniques at home without supervision [28]. Furthermore, SMR is better in economical point of view for clinics which don't have the possibility to provide spa conditions; as a result, all people can use release techniques during their rehabilitation program [29]. SMR is commonly utilized by individuals who engage in physical activities and serves as a valuable resource for physiotherapists during their treatment of patients. Additionally, it benefits athletes across various sports and at all competition levels [30, 31]. The primary goal of incorporating SMR into a collection of therapeutic methods or training tools is to enhance ROM and alleviate muscular soreness following training sessions [32, 33]. While there are still no broad studies related to SMR, but based on various researches conducted in relation to it, many benefits have been mentioned for this method, including its effect in increasing the ROM [34], accelerating recovery after sports activity [35] and also pain reduction which caused by TPs [28].

Based on mentioned considerations and prevalence of MPS and its economic and social costs, the variety of treatment methods, as well as the popularity of SMR and massage besides, and the lack of research in relation to the comparison of the effectiveness of these two protocols, in this study we aim to compare SMR and massage therapy to evaluate the most effective technique in reducing TPs complications such as reduced ROMs of the neck and pain in woman with TPs on their trapezius muscle.

2. Materials and Methods

2.1. Participation

The present research is semi-experimental in nature and practical in purpose due to the inability to control all variables, the presence of pre-tests and post-tests, and the selection of participants through a purposive method. The study population consists of female university students aged 20 to 30 years who have TPs in the trapezius muscle. The inclusion criteria of the subjects include: having active TPs in the trapezius muscle (according to Simon's indices) [5], not having any medical treatment related to the pain of TPs during the research period, not using an exercise program or any related activities which could have effect on TPs complications during the research period, female gender, not suffering from Fibromyalgia [36], no pregnancy, no history of surgery and

disorder in the cervical and thoracic spine, no skin diseases and open wounds, no sensitivity to massage oils, no abnormal cervical spine (normal range of cervical spine lordosis is between 31 to 40 degrees), a non-athlete person, not having high mental stress. Also, if people did not participate in the pre-test and post-test phases, more than two sessions absent or expressed dissatisfaction with the continuation of the process at any stage, person must be excluded from the study.

2.2. Instrument

The effect of two selective methods of releasing the TPs of the trapezius muscle on ROM of the neck, pain has been investigated. For this purpose, in order to measure people's pain level, the VAS and OBER questionnaire was used.

In order to measure the ROM of flexion, extension (Figure 1), lateral bending and rotation of the neck [37], the SH5105 14-inch 360-degree goniometer was used.

Figure 1. Assessment neck extension range of motion

Figure 2. Assessment neck lateral flection ROM

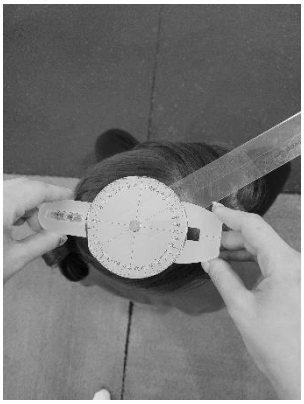

Figure 3. Assessment neck rotation ROM

In assessing the ROM for neck flexion while the individual is seated with a straight back, the goniometer axis is placed on the external ear, with the stationary arm perpendicular to the ground and the movable arm aligned with the base of the nasion. The individual then bends their head forward until they feel the end of the ROM, or until further bending causes the torso to flex.

In assessing the ROM for neck extension, the goniometer placement is similar to the previous case; the only difference is that the endpoint of the assessment occurs just before the torso begins to extend in response to neck extension [38].

In measuring the ROM for lateral flexion, the axis of the goniometer is placed over the C7 vertebra, with the stationary arm aligned with the thoracic vertebrae and the movable arm aligned with the posterior prominence and the midline of the head. Lateral flexion of the neck continues until compensatory trunk flexion is no longer observed.

In assessing head rotation, the axis of the goniometer is positioned at the center of the skull, with the stationary arm perpendicular to an imaginary line drawn between the right and left acromion processes. The movable arm is aligned with the nose, and head rotation continues until the torso begins to rotate.

2.3. Procedure

2.3.1. Massage protocol

The implementation protocol of the massage was developed by researcher and was used after the pilot study was carried out on it. The protocol used was 5 massage sessions; the first session of which lasted 10 min, and then the gradual increase in time continued. The last session of massage intervention lasted 25 min. The process of warming up and cooling down during the massage sessions was done using stroking and friction techniques at the beginning and end of the sessions. In the areas of the TPs in trapezius muscle, pressure techniques were performed for 60 to 120 sec [39, 40] with some repetitions using knuckles and slight vibration. The gradual increase of the load in each session was done by focusing on increasing the time of applying pressure techniques or changing the pressure through applying pressure by palm in the initial sessions to the tips of the thumbs in order to apply more piercing pressure.

2.3.2. Self-release protocol

The implementation protocol of self-release is similar to the massage protocol in terms of the length of the sessions and it starts from 10 min in the first session and increases to 25 min in the final sessions. The warm-up process was 5 min at the beginning of each session, and then SMR was done using a tennis ball and foam roll on trapezius muscle. In the initial sessions, the intervention was done only with foam roll in time intervals of 3 sets of 20 sec on trapezius muscle (the areas for performing the foam rolling process range from just below the scapula (around the T10-T11 spinal vertebra) to the vertebrae C7), and over time, the time interval of the intervention increased, and the tennis ball (over at TPs found on trapezius muscle mostly at upper angel of scapula and trapezius muscle insertions at sub occipital regions; Figure 5) was also added in order to apply more penetrating pressure in the areas of the TPs.

Figure 4. SMR by foam roll

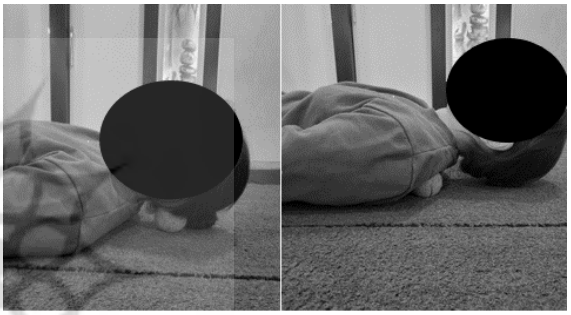

Figure 5. SMR by tennis ball

2.4. Statistic

SPSS 26 was used for data analysis. At the level of descriptive statistics, mean, standard deviation and frequency distribution tables related to demographic characteristics (height, weight and BMI) and in the inferential statistics section of Shapiro Wilk tests to check the normality of the data and ANOVA test to compare the average adjusted values and Bonferrini's post hoc test were used to compare the adjusted averages of the research groups two by two. The significance level of the tests was considered 0.05.

3. Results

The results of the present study showed that both massage and SMR interventions can significantly reduce pain caused by TPs measured by VAS, BPI, and Ober

questionnaires (P<0.001) in relation to shoulder extension ROM Right (P=0.068) and left (P=0.420). None of the interventions had a significant effect, on the other hand, in right lateral flexion movements (P<0.001) and left (P=0.026), left (P=0.026) and right rotation (P=0.026), extension (P=0.028) and neck flexion (P=0.028) and right internal rotation (P=0.041) right arm external rotation (P=0.006), left internal rotation (P=0.006) and left arm external rotation (P<0.001) massage had a significant intra-group and inter-group effect. In right (P=0.003) and left (P=0.001) abduction and right (P<0.001) and left (P=0.007) flexion, SMR had a significant effect. On the other hand, the results of the study showed that both interventions had a significant effect on improving the score of the DASH (P<0.001).

4. Discussion

MPS is a type of musculoskeletal pain syndrome that is caused by the presence TPs [5]. Myofascial release massages are among the most important methods in reducing side effects caused by TPs [25]. Massage can have a positive effect on various conditions, including mental stress, anxiety and pain [26]. Another method that has been introduced and noticed in the last few years is SMR.

The present study aims to compare two techniques of SMR and massage on complications caused by TP in women with trapezius muscle MPS.

The results of this research showed that performing 5 sessions of myofascial massage and self-release protocol has a significant effect on reducing the pain of people with TPs measured by Ober tests.

Bingölbali et al. (2024) assessed the impact of deep massage on pain, disability due to TPs, ROM, and quality of life in individuals with MPS. The results of the study showed that the massage group had greater improvement in NPDS, VAS scores, and ROM in extension, flexion, lateral flexion, and neck rotation. In contrast, the control group showed improvement only in flexion [41].

Doğancalı et al. (2023) conducted a study comparing the effects of SMR alone or combined with core exercises on pain and functional capacity in individuals with non-specific low back pain. The results of the study indicated a significant reduction in pain (measured by VAS) and functional capacity scores [42].

In fact, several reasons can be mentioned to explain the effectiveness of SMR processes and massage in reducing the pain of TPs in MPS, among them the change in elasticity that occurs as a result of the thixotropic properties of soft tissue [33], piezoelectric effects [43], releasing fascia adhesions [43], cellular responses to pressure [43], stimulation of tissue fluid flow [43], neuronal inhibition, release of TPs [43].

Table 4. Description of research variables

Variable	Group	Phase	Mean
Height (m)	Control	Pre test	165.33
	Massage		165.33
	Self-myofascial release		164.47
Weight (kg)	Control	Pre test	63.06
	Massage		64.04
	Self-myofascial release		64.06
BMI (kg/m^2)	Control	Pre test	23.43
	Massage		23.46
	Self-myofascial release		23.63

Table 5. ANCOVA test results to compare the adjusted mean

	sig	F	Mean square	Degrees of freedom	Sum of squares		Effect size
OBER	0.001	13.783	1197.793	1	1197.793	Pre test	0.252
	0.000	39.375	3421.937	2	6843.874	Group	0.658
			086.907	41	3563.174	Error	
				45	79547.250	Total	
Neck flexion	0.000	78.876	5125.131	1	5125.131	Pre test	0.658
	0.021	4.277	277.888	2	555.775	Group	0.173
			64.977	41	2664.069	Error	
				45	85744.000	Total	
Right neck lateral flexion	0.004	9.458	533.346	1	533.346	Pre test	0.187
	0.013	4.830	272.378	2	544.756	Group	0.191
			56.390	41	2311.987	Error	
				45	68272.000	Total	
Left lateral neck flexion	0.000	39.496	1434.743	1	1434.743	Pre test	0.491
	0.027	3.952	143.572	2	287.143	Group	0.162
			36.327	41	1489.391	Error	
				45	67320.000	Total	
Left neck rotation	0.008		7.749	1	576.084	Pre test	0.159
	0.030		3.836	2	570.357	Group	0.158
			74.339	41	3047.916	Error	
				45	210613.000	Total	
Right neck rotation	0.004	0.708	55.925	1	55.925	Pre test	0.017
	0.005	5.993	473.674	2	947.348	Group	0.226
			79.036	41	3240.475	Error	
				45	196332.000	Total	
Neck extension	0.000	146.685	9365.670	1	9365.670	Pre test	0.782
	0.000	11.602	740.746	2	1481.493	Group	0.361
			63.849	41	2617.797	Error	
				45	149796.000	Total	

In an example of the process of creating the above effects, it can be said that increasing tissue temperature after applying pressure cause thixotropic changes, followed by easier release and reduction of adhesions on the surface of the tissue.

The existing theories that describe the effect of myofascial release include: pain gate control theory, intrapersonal attention, parasympathetic response of the autonomic nervous system and serotonin release [29]. The pain gate control theory states that sensory stimuli such as pressure, in the nervous system pathways transmit stimuli such as pain faster than others. The pressure stimulus, which is faster, intervenes in the process of transferring pain-causing stimuli to the brain, thus opening the gate of brain pain perception [29].

Intrapersonal attention refers to the level of attention a person receiving a massage. It has been claimed that human attention to touch reduces the perception of pain by the brain [29]. The stimulation of the parasympathetic response reduces the release of stress hormones, reducing anxiety, depression and pain [29]. The release of serotonin prevents the

transmission of harmful stimuli to the brain. Other inhibitory neurotransmitters such as endorphins may also be released following the application of pressure through the therapeutic method [29].

The results of the present study showed that after 5 sessions of massage intervention and SMR on the trapezius muscle in women with myofascial syndrome, the massage protocol can significantly increase the ROM of the lateral flexion of the neck on the right and left sides, neck extension, neck flexion, and neck rotation.

Sadeghnia et al. (2023) conducted a study to compare the immediate effects of friction massage, ultrasound therapy, and whole-body vibration on the treatment of active TPs in the trapezius muscle. The results of the study indicated that all three interventions could improve the pressure pain threshold in the neck and ROM. However, the participants in the vibration group reported a greater reduction in pain based on the VAS criterion [44].

Bukhari et al. (2020) compared the effects of ischemic pressure techniques and friction massage on pain, ROM, and disability in the areas of TPs in the neck and upper body. The results of the present study showed that ischemic pressure techniques had a greater impact on reducing pain and disability in the studied areas compared to friction massage. However, in terms of ROM, both interventions had an equally positive effect [45].

However, some articles have reported results that are inconsistent with the findings of the present study and the previously mentioned studies. For example, in a study conducted by Shahrokhi et al. (2020) aimed at comparing massage and stretching exercises in improving pain, ROM in the neck, and disability following MPS of the UT muscle on 30 patients. The results indicated that the stretching exercise group showed greater improvement in pain, ROM, and reduction in disability compared to the massage group [46].

Actually, TPs occur not only in muscle fibers but also in fascia tissue. Damage to the fascia tissue can cause disturbances in different ways [47]. Restriction of movement in the fascia tissue reduces the process of shock absorption by this tissue, peripheral trapping of vessels and nerves, and loss of ROM throughout the body [48]. The functional role of fascia may be disrupted following repeated injuries, physical trauma, and inflammation, as a result of which traumatized fascial tissue leads to disruption of the body's natural biomechanics, increased tension in the system, and myofascial pain and reduced ROM.

On the other hand, during the massage techniques, the muscle tissue and tendons are under tension and pressure. This tension and pressure can have an inhibitory effect on the organs of the Golgi tendons, which causes the start of autogenic reflex of the muscle, and as a result, increases the reflation and, in the end, improves the length and ROM of the muscle [49].

5. Conclusion

The results of the present study showed that one week of myofascial massage and SMR process can have a positive effect on a person's pain caused by myofascial TPs in the trapezius muscle, which was measured by OBER questionnaire. On the other hand, the results of this research showed that massage can have a significant effect on improving the ROM of the neck in flexion, extension, right and left rotation, right and left lateral flexion. As a result, it is suggested to use the massage in order to reduce complications caused by trapezius muscle TPs effecting neck era.

Conflict of interest

The authors had no conflict of interest in this study.

Authors contribution

All authors contributed to the original idea, study design.

Ethical considerations

The authors have completely considered ethical issues, including informed consent, plagiarism, data fabrication, misconduct, and/or falsification, double publication and/or redundancy, submission, etc. Ethical principles in this research, including obtaining the consent of the subjects to participate in the research process and maintaining their personal information, and the permission of the ethics committee IR.SBU.REC.1402.067 and registration in the clinical trial system IRCT20230914059432N1.

Data availability

The dataset generated and analyzed during the current study is available from the corresponding author on reasonable request.

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