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ORIGINAL ARTICLE

Effectiveness of mobilization therapy for treating cervical myofascial pain syndrome

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Purpose: The aim of this study was to investigate the initial effectiveness of cervical mobilization for treating cervical Myofascial Pain Syndrome (MPS).
Methods: A total of 46 subjects diagnosed with MPS were randomly allocated in two treatment groups. Hot pack, massage and a home exercise program were applied to both groups. Mobilization techniques were additionally applied to these modalities in the second group. All subjects were assessed before and after treatment for pain intensity, number and tenderness of trigger points, range of motion and disability.
Results: The groups were not different from each other at baseline ($p>0.05$). When compared with pre-treatment values, a significant decrease in pain complaints, increase in range of motion and reduce in disability was found in both groups after treatment ($p<0.05$). It was also found that the number and tenderness of trigger points were decreased in both groups.
Conclusion: The results of this study shows that combined physiotherapy applications including hot pack, massage and a home exercise program decrease the pain, number and tenderness of trigger point, and improve the range of motion and the disability caused by chronic neck pain in patients with cervical MPS. Adding cervical spine mobilization to this treatment protocol did not change patients' outcomes.
Keywords: Neck pain, Manual therapy, Conservative treatment.

Servikal miyofasiyal ağrı sendromunun tedavisinde mobilizasyon tedavisinin etkinliği

Amaç: Bu çalışmanın amacı, servikal miyofasiyal ağrı sendromunun (MAS) tedavisinde servikal mobilizasyonun anlık etkinliğini araştırmaktı.
Yöntem: MAS tanısı alan toplam 46 hasta rasgele olarak iki tedavi grubuna ayrıldı. Her iki gruba da hot pack, masaj ve ev egzersiz programı uygulandı. İkinci gruba bu modalitelere ek olarak servikal mobilizasyon teknikleri uygulandı. Tüm katılımcılar, ağrı şiddeti, tetik noktalarının sayısı ve hassasiyeti, eklem hareket açıklığı ve yetersizlik açısından tedavi öncesinde ve sonrasında değerlendirildi.
Bulgular: Başlangıçta gruplar birbirinden farklı değildi ($p>0,05$). Tedavi öncesi değerlerle karşılaştırıldığında, tedaviden sonra her iki grupta da ağrı yakınmalarında anlamlı iyileşme, eklem hareket açıklığında artma ve yeti yitiminde azalma saptandı ($p<0,05$). Ek olarak her iki grupta tetik nokta sayısında ve hassasiyetinde azalma bulundu ($p<0,05$).
Sonuç: Bu çalışmanın sonuçları, hot pack, masaj ve bir ev egzersiz programı içeren kombine bir fizyoterapi yaklaşımının servikal MAS'li hastalarda ağrıyı, tetik nokta sayısını ve hassasiyetini azalttığını, eklem hareket açıklığını ve kronik boyun ağrısından kaynaklanan yeti yitimini iyileştirdiğini gösterdi. Servikal omurga mobilizasyonunun tedavi protokolüne eklenmesi hastaların sonuçlarını değiştirmedi.
Anahtar kelimeler: Boyun ağrısı, Manuel tedavi, Konservatif tedavi.

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Myofascial Pain Syndrome (MPS) is one of the most common causes of muscle pain in medical practice, although its real prevalence is unknown in general population. It has been defined as a chronic pain syndrome accompanied by Myofascial Trigger Points (MTrPs) in one or more muscles or groups of muscles.[1] Trigger points can arise in any muscle group. However, the most common sites are in the muscles of the cervical and lumbar regions.[2] In cervical region, MTrPs may be found in the ligamentum nuchae, posterior cervical muscles, levator scapulae muscle, upper part of the trapezius muscle, sternocleidomastoid muscle and the scalene muscles.[3]

Local and referred pain, muscle strength deficits, mobility limitations are the main characteristics of the MPS.[4,5] Management of the MPS requires both general measures for treatment of the structural and systemic perpetuating factors, and specific measures for treatment of MTrPs.[6] The therapeutic modalities have been used frequently for palliation of symptoms and to prevent recurrence in patients with MPS. Thermotherapy, manual therapy, and electrotherapy are among the conventional physiotherapeutic treatment options for MPS.[6-10] Thermotherapy, in the form of moist heat, has been recommended for the treatment of the MPS because it helps to increase local circulation, loosen fascia and reduce muscle tone.[7] Massage is a common procedure used by therapists for MTrPs since it deactivates the trigger points, eliminates pain, restores mobility, improves circulation, relaxation, feeling of well-being and overall function, and reduces anxiety.[11-14] Another manual therapy approach used frequently in patients with MPS is the joint mobilization. It increases and restores the normal range of motion, produces a hypoalgesic effect as revealed by increased pressure pain thresholds.[15-18] Passive stretching of the muscle containing the MTrPs has also been recommended as a method of MPS treatment because it provides longer pain relief, elongates the muscle to its full normal length and restores range of motion.[7]

Commonly, all these treatment modalities are used in different combinations and are chosen based on the individual's needs and situation. However, there is little information available about the effectiveness of these combined treatment programs for the patients with cervical MPS.

The aim of this study was to investigate the immediate effectiveness of cervical mobilization for treating cervical MPS. This study was designed to test the hypotheses that adding cervical mobilization to combined physiotherapy application decrease pain, disability, number and tenderness of trigger point and increase range of motion.

METHODS

Sample size and participants

This study was performed after the Human Ethics Committee at the Başkent University, Turkey approved the study (KA06/196). The sample size calculation was performed based on the minimal detectable change on the pain visual analog scale (VAS). Data from a previous study indicates that the standard deviation of VAS-pain scores in patients with neck pain was 23.8 mm.[19] For the present study, 20% of the maximum score of the VAS-pain was considered to be the minimal detectable change. With this assumption, to achieve 80% power using two-tailed tests at the 0.05 level of significance, the sample size for each treatment group was determined to be 14 patients. The initial sample size was increased by 60% in order to overcome the dropout problem, giving a total sample size of 23 subjects for each group.

Patients who had neck pain complaint for a minimum of the previous 3 months and met the criteria defined by Simon et al in 1999 were included in the study.[4] Selection of the subjects was restricted to those aged 18-60 years.

Patients having a history or signs of cervical arthrosis, discal hernia, cervical vertebral fracture, radiculopathy, or myelopathy, primary and secondary osteoporosis, Meniere's disease, the cognitive disorders, chronic fatigue syndrome, primary headaches, cancer, neck surgery and also patients have used the systemic use of corticosteroids within the previous 3 months, and had received any other form of specific intervention for their neck before the last 6 months of the study were excluded from the study.

The diagnosis of cervical MPS was determined by a physician. The fibromyalgia diagnosis was ruled out by the 1990 American College of Rheumatology's classification criteria for fibromyalgia.[20] After the procedures and purpose of the study was explained to the patients, signed written informed consent was obtained from all patients prior to study entry. They were instructed not to take any nonsteroidal anti-inflammatory drugs or any analgesic medication during the course of their participation in the study.

Intervention

The patients were randomly assigned into two treatment groups. The randomization procedure was performed with the aid of a computer program (Random Allocation Software, V.1.0).[21] The patients in both groups received 20 minutes of hot pack application, following 10 minutes Swedish massage daily for 10 days, and a home exercise program. The patients in the Group 2 were also treated with cervical mobilization techniques described by Cyriax.[22,23] Subjects had not previously experienced any manual therapy of the cervical spine and were informed about the study before treatments. The elements of the cervical mobilization package were: bridging, manual traction, anterior-posterior glide under traction, and lateral glide. Bridging and manual traction were applied for 3-5 times of 30 seconds separated by 60 second rest periods during first five treatment sessions. In addition to these techniques during the other half of the treatment sessions, we applied anterior-posterior glide under traction and lateral glide in the same duration, periods, and frequencies.

The home exercise program included shoulder and head posture exercises and passive stretching of the muscle groups which were assessed. All patients were carefully instructed how to carry out home exercise program, and were asked to perform these exercises three sets of 10 repetitions daily. The patients' compliance to the home exercise program was documented at the beginning of all physiotherapy sessions. All patients were treated and guided by the same physiotherapist.

Measurements

A treatment blinded and experienced physiotherapist assessed patients at baseline, and at the end of the therapy. We obtained information about the socio-demographic characteristics and descriptive variables consist of age, highest year education, and brief medical history included duration of pain complaint and additional symptoms. Pain intensity was used as the primary outcome measure. Patients were asked to place a vertical mark on a 10-cm horizontal line to indicate the amount of pain they experienced and recorded in millimeters from no pain.[24] Total number and tenderness of active MTrPs, cervical ROM measurements, and the Neck Pain and Disability Scale (NPDS) scores were used as secondary outcome measures. The assessor physiotherapist bilaterally palpated the sternocleidomastoid, trapezius, semispinalis capitis, longissimus capitis, semispinalis cervicis, cervical multifidus and rotators, splenius cervicis and capitis, suboccipital and levator scapulae muscles for clinical characteristics of a total of 46 MTrPs as described by Simons et al.[25] The presence of active MTrPs was evaluated according to the diagnostic criteria described by Simons et al.[4,26] Tenderness in MTrPs was evaluated and recorded using a score from 0 to 3: 0, indicating increased consistency but where palpation produced no pain; 1, increased consistency but the patient indicated only pain after being asked; 2, increased consistency and the patient spontaneously expressed pain; 3, increased consistency and the patient withdraw from the palpation (jump sign).[27]

An index-score was calculated from the sum of the scores. The active cervical range of motion (ROM) measurements was taken in two planes (flexion/extension, lateral bending) using a universal goniometer.[28] Prior to the measurements; each subject performed three repetitions of flexion and extension in order to increase compliance of the soft tissue of the neck. The subjects were given a two-minute time interval between each measurement. The assessor physiotherapist took three measurements for each cervical movement. The mean of three values was recorded for each ROM measure. The Turkish version of the NPDS was used to measure neck pain and related disability.[29,30] The NPDS consists of 20-items that explore pain intensity; its interference with vocational, recreational, social, and functional aspects of living, and as well as the presence and extent of associated

emotional factors. Each item has a 10-cm visual analogue scale. It has six major divisions divided in equal intervals by vertical bars. Midpoints for each interval are marked with two dots (half a point on a vertical slash). Scoring of each item varies along a continuous scale from 0 to 5. The NPDS score is the sum of the item scores.

Statistical analysis

Statistical analyses were carried out using the Statistical Package for the Social Sciences (SPSS) for Windows (Version 13.0). The demographic and clinical characteristics of the participants were described by means and standard deviations (SD) or frequencies and percentages according to the type of variable.

The chi-square test was used to determine whether or not there were significant differences between frequency distributions. The Wilcoxon Ranks Sum and Mann-Whitney U tests were used to compare primary and secondary outcome measures within groups for paired and unpaired data, respectively. To evaluate the meaningfulness of pre- to post-treatment change, we calculated within-group effect size (ES) statistics.

An effect size (Cohen's d) was calculated as the difference in means divided by the pooled variance for the group and presented with 95% confidence intervals (CI). The effect size was interpreted as defined by Cohen: 0.20 or less is a small effect, 0.20 to 0.50 is a moderate effect, and 0.80 or greater is a large effect.[31] The significance level for statistical analyses was set at $p<0.05$ (2-tailed)

RESULTS

The socio-demographic characteristics of the study groups are shown in Table 1. The two groups were similar with respect to age, gender, highest education years and occupation status ($p>0.05$). As shown on the table 2, no significant difference was detected between the groups in the baseline values of the primary and secondary outcomes ($p>0.05$).

Within both study groups, the Wilcoxon test revealed statistically significant improvements for both primary and secondary outcome measures at post-treatment ($p<0.05$) (Table 3). The mean VAS at rest reduced by 3.5 points (ES 1.54) for the patients' in-group 1, and 3.6 points (ES 1.75) for the patients in group 2. The mean VAS at activity reduced by 3.6 points (ES 1.62) for the patient's in-group 1, and 2.9 points (ES 1.32) for the patients in group 2. During the treatment period, there were no reports from the patients of any side effect or adverse reaction, which could be related to treatment protocols.

DISCUSSION

In this study, it was aimed to determine the effectiveness of cervical mobilization applications on MPS patients. The main findings of the study was that both conservative physiotherapy application and adding cervical mobilization to combined physiotherapy applications were effective in decreasing pain, number and tenderness of trigger point, disability caused by neck pain and increasing the range of motion.

In our study, the comparisons of pre- to post-treatment values of the pain intensity revealed that changes differed from chance expectations in both groups. Reduction of the pain intensity has been widely accepted as a cardinal outcome measure in physiotherapy. However, it is well known that statistical significance is not a direct indicator of size of effect, but rather it is a function of sample size, effect size and p level.[32,33] In terms of the magnitude of change, our results revealed that the point estimates of pre-post effect sizes for VAS-pain were large and in a positive direction for both groups. These large effect sizes might suggest that combined physiotherapy application were effective for pain relief in patients with MPS. But the addition of cervical mobilization techniques did not decrease pain caused by MPS. Our results are in line with the international literature on this subject, suggesting manipulative techniques has a similar efficacy on pain to other treatments.[34-38]

In our study, there was a significant improvement in the number and tenderness of trigger points in both groups. On the other hand, the addition of cervical mobilization was not superior to the physiotherapy application. This finding is another consequence of the fact that mobilization is not more effective than combined physiotherapy. In our study, our findings regarding the number of TP and its

Table 1. Socio-demographic characteristics of the study groups.

	Group 1 (N=23) Mean±SD	Group 2 (N=23) Mean±SD	p value
Age (years)	37.7±11.6	44.0±11.8	0.079†
Body mass index (kg/m²)	24.38±4.28	25.05±3.83	0.460†
Gender (Male/Female) (n (%))	2/21 (9/91)	6/17 (26/74)	0.243‡
Highest education years	12.7±4.2	12.0±5.9	0.593†

†: Mann Whitney U test; ‡ : Fisher Exact Test.

Table 2. Baseline values of the primary and secondary outcomes.

	Group 1 (N=23) Mean±SD	Group 2 (N=23) Mean±SD	p value
Pain intensity (Visual Analogue Scale, cm)			
Rest	4.6±2.8	4.9±2.4	0.513
Activity	5.4±2.6	4.6±2.9	0.316
Cervical range of motion (degree)			
Flexion	60.3±12.4	59.4±9.9	0.392
Extension	67.9±13.1	58.5±14.9	0.799
Right side bending	39.2±7.1	38.8±8.8	0.974
Left side bending	41.7±11.1	39.7±8.2	0.326
Trigger point count	5.9±5.3	5.9±5.9	0.689
Trigger point tenderness score	11.9±12.9	9.6±9.5	0.610
Neck Pain and Disability Scale score	38.8±16.9	37.9±16.6	0.801

Table 3. Changes in the primary and secondary outcome measures from pre- to post-treatment.

	Group 1			Group 2			
	Change	p value†	ES	Change	p value†	ES	p value*
Pain intensity (VAS, cm)							
Rest	3.5±2.5	<0.001	1.54	3.6±2.3	<0.001	1.75	0.907
Activity	3.6±2.2	<0.001	1.62	2.9±2.7	<0.001	1.32	0.729
Cervical ROM (degree)							
Flexion	8.8±11.3	<0.001	0.80	3.4±8.8	0.046	0.38	0.005
Extension	7.7±11.7	0.004	0.75	4.9±9.5	0.031	0.37	<0.001
Right side bending	2.4±5.7	<0.001	1.05	3.0±7.9	0.013	0.38	0.059
Left side bending	6.7±6.9	<0.001	0.74	5.3±7.8	0.004	0.69	0.553
Trigger point count	2.4±3.1	<0.001	0.52	2.9±4.5	0.008	0.63	0.344
Trigger point tenderness score	5.5±7.4	<0.001	0.78	5.2±7.9	0.011	0.70	0.934
NPDS's score	27.1±15.5	<0.001	1.83	20.0±17.5	<0.001	1.23	0.442

VAS: Visual Analogue Scale. ROM: Range of motion. NPDS: Neck Pain and Disability Scale. ES: Effect size.
†: Wilcoxon Ranks Sum test. *: Mann Whitney U test.

tenderness were similar to those of the studies performed in the literature and the results of the studies including massage and exercise therapy. [13,27]

The applied combined therapy consisting of heat therapy, massage application and stretching exercise relaxes muscle with the trigger point. Thus both pain and tenderness are diminished and trigger point phenomena cannot be created by palpation after treatment.[27,39]

Another finding of this study is that the limitation of cervical range of motion is one of the main disabling factors affecting the daily life of patients with MPS. For this reason, it is aimed to reduce the movement limitations with applied treatment programs in MPS. In our study, there were significant improvements in active neck flexion, extension, lateral flexion and left and right rotation range of motion after treatment in mobilization group. It was determined that adding cervical mobilization had the greatest effect on neck flexion, extension and right rotation movements in the evaluation of the effect size. In the control group, treatment was found to be less effective in reducing motion restriction. Therefore, it can be said that mobilization applications have a positive effect in eliminating limitations of range of motions in the patients with MPS. The main reason for this result is the hypoalgesic effect created by combined treatment [17] as well as the effect of mobilization, which is defined as a low-velocity and small- or large-amplitude movement applied anywhere within a joint, on joint motion restriction. [40,41]

Pain, sensitivity and limitation of range of motions are the main causes of disability in subjects suffering from chronic neck pain. [2,3] It is expected to improve disability by removing disorders with applied therapies. In our study decreased pain, sensitivity and movement limitations resulted in an improvement in disability in both groups after treatment. From the point of view of effect sizes, it has found that mobilization application has further reduced the disability. Studies have shown that manipulative therapy applications combined with exercise are more effective in improving pain-induced disability compared to sole exercise programs.[42,43]

Limitations

Although the power analysis indicated that the sample size was adequate, a larger sample size could have provided more robust results. Another limitation to our study may be that we do not have placebo control groups and the long-term follow up data for our treatment groups.

Conclusion

In sum, the analysis of data of the present study shows that combined physiotherapy applications including hot pack, massage and a home exercise program decrease the pain, number and tenderness of trigger point, and improve the range of motion and the disability caused by chronic neck pain. Adding cervical spine mobilization to this treatment protocol did not change patients' outcomes. Further studies with follow-up and with placebo control groups are needed to draw a definitive conclusion.

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