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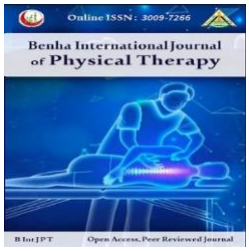

Original research

Effect of Extra Corporeal Shock Wave Therapy on Cervical Myofascial Pain Syndrome in Lactating Women

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Abstract

Background: Cervical Myofascial Pain Syndrome (MPS) represents a prevalent musculoskeletal condition characterized by muscle tenderness and the presence of myofascial trigger points (MTrPs), often affecting lactating women, impacting their ability to breastfeed and enjoy this intimate bonding experience with their infants. **Objective**: This study aimed to investigate the efficacy of extracorporeal shock wave therapy (ESWT) on cervical MPS in lactating women. **Methods**: Thirty lactating women, aged25-35 years, complaining of cervical myofascial pain were divided into two equal groups: control group (A) treated by postural correction exercises and instructions for lactation three times weekly for 4 weeks, andstudy group (B) treated by ESWT for 5 minutes once a week for four weeks in addition to the same postural correction exercises and instructions for lactation as for group (A). Evaluation was done pre- and post-treatment, including pain level assessment by Visual Analog Scale (VAS), pain pressure threshold (PPT) by pressure algometer, and cervical range of motion (ROM) by digital inclinometer.**Results**: Within groups, there was a significant decrease in VAS and a significant increase in PPT and all cervical ROM post-treatment compared with that of pre-treatment ($p<0.05$). Between groups, there was a significant difference in the mean values of VAS, PPT, and all cervical ROM except flexion and extension ($p<0.05$) in favor of the study group (B). **Conclusion**: ESWT demonstrated substantial benefits in alleviating pain, enhancing pain tolerance, and improving specific aspects of ROM in lactating women with cervical MPS.

Key word: Cervical Myofascial Pain Syndrome, Lactating Women, Shock Wave Therapy.

Introduction

Myofascial Pain Syndrome (MPS) represents a frequently encountered musculoskeletal disorder marked by focal muscle tenderness, referred pain, and palpable taut bands within muscles, primarily linked to myofascial trigger points (MTrPs) [1-2]. Cervical myofascial pain, in particular, often results from muscle overuse or trauma affecting the neck and shoulder support muscles [3]. Globally, neck pain—including cervical myofascial pain—ranks as the second most common occupational musculoskeletal condition. Risk factors contributing to its emergence include repeated tasks, suboptimal

positioning, vigorous efforts, sustained mechanical load, and psychological influences [4].

Breastfeeding, while essential for infant nutrition and associated with cognitive, behavioral, and mental health benefits for both mother and child [5], may also contribute to musculoskeletal discomfort. This discomfort is attributed to hormonal effects on musculoskeletal tissues as well as the biomechanical demands of childcare, particularly those associated with breastfeeding [6].

Lactating women are particularly vulnerable to developing MPS due to the repetitive movements involved in breastfeeding. Activities such as holding and positioning the infant, along with the motions required for latching and unlatching, can lead to fatigue and strain in specific muscle groups. This repetitive stress may be implicated in the formation of trigger points throughout the musculature of the neck, shoulders, arms, and back [7].

Various therapeutic modalities have been employed in the management of MPS, including both invasive techniques (e.g., dry needling, trigger point injections) and non-invasive approaches (e.g., pharmacological treatment, electrotherapy, and exercise therapy). Electrotherapy techniques such as interferential current, ultrasound, and transcutaneous electrical nerve stimulation (TENS), along with physical interventions like stretching, massage, and taping, have shown varying degrees of effectiveness [8].

Extracorporeal Shock Wave Therapy (ESWT) has recently garnered attention in the management of musculoskeletal pain. By delivering mechanical energy, ESWT promotes tissue repair and regeneration through microstructural and micro functional changes [9]. It enhances capillary blood flow, reduces muscle stiffness and tension, and alleviates pain by modulating nociceptor activity and nerve conduction [10].

Therefore, the present study aimed to investigate the efficacy of ESWT in the treatment of cervical MPS among lactating women.

Patients and Methods

Study Design

This study was designed as a randomized control trial (RCT) of lactating women with MPS. This study was conducted over four weeks between February and October 2023.

Before enrollment, researchers provided each potential participant with a detailed consent document that explained the study's objectives, methodologies, possible risks, and advantages. Written informed consent was required from all individuals before they could join the study voluntarily. The Faculty of Physical Therapy at Cairo University's Institutional Review Board granted ethical approval (P.T.REC/012/004409), and researchers registered the study protocol on clinicaltrial.gov using identifier NCT05878821.

Recruitment

Participants were recruited from the Departments of Physical Therapy and Gynecology & Obstetrics at the Specialized Qalyub Hospital. All participants were initially assessed by an orthopedic specialist to confirm eligibility. The criteria to establish a diagnosis of MPS depends on detection of many features in patient history as most patient suffer from local muscular pain and referred pain on physical examination taut band found in effected area. clinical signs indicate local twitch response, [8] autonomic changes like hyperhyrosis, temperature changes and dizziness [11].

The study included lactating multiparous women who met the following inclusion criteria: experiencing cervical myofascial pain beginning two months postpartum, with a parity of no more than three; aged between 25 and 35 years; and a body mass index (BMI) of less than 35 kg/m² [12]. Exclusion criteria encompassed women with diabetes, malignancies, or whose neck pain stemmed from additional medical issues such as instability or fractures in the spine, compression of the spinal cord, inflammatory conditions, infections of the spine, significant neurological deficits, congenital postural deformities, or osteoporosis.

Randomization and Dropout

Recruitment efforts yielded 50 individuals who were evaluated for study participation. Exclusions totaled 14 participants: 9 were ineligible based on study requirements and 5 voluntarily declined involvement. Equal allocation randomization distributed the remaining 36 participants between the treatment group (Group A, n=18) and control group (Group B, n=18). Subsequently,3 participants discontinued participation—1 from Group A and 2 from Group

B. In the analysis phase, 2 outliers were excluded from Group A and 1 outlier was excluded from Group B. Ultimately, data from 15 participants in each group were analyze

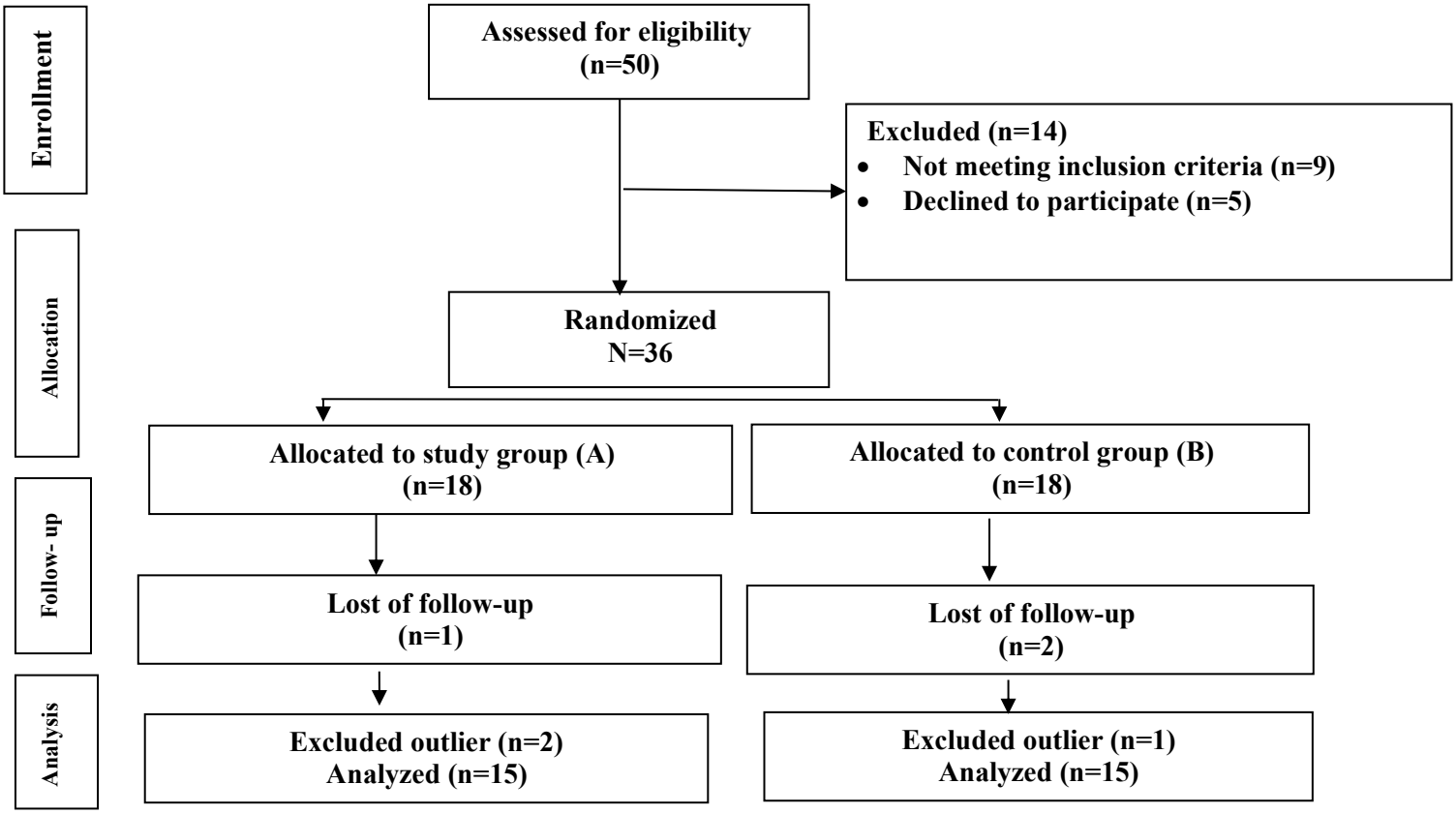

Fig. (1): Study Flow chart

Interventions

Thirty patients were recruited by the investigator from the Department of Physical Therapy & the Department of Gynecology & Obstetrics at Qualuob Hospital with a confirmed diagnosis of having cervical MPS.

The patients were randomly allocated into two groups:

Group (A) (control group) consisted of 15 women with cervical myofascial pain who received postural corrections exercises and instructions for lactation for three times weekly for 4 weeks, whereas group (B) (Shock wave group) consisted of 15 women with cervical myofascial pain, who were treated by shock wave therapy for five minutes, once weekly for 4 weeks combined with the same postural corrections, exercises and instructions for lactation as for group (A)

Postural correction exercises:

All female participants from Groups A and B underwent corrective posture training involving:

1- McKenzie methodology: Seven movement types were performed using static maximal force, completing 15-20 cycles with each cycle sustained for 7 seconds. Twenty-minute daily sessions occurred three times per week throughout a 4-week intervention [13]. The exercise progression was organized in this sequence [14]:

a. Cervical retraction enhanced by overpressure in sitting [15].
b. Neck extension movement while seated [16].
c. Head retraction with pressure augmentation in lying position [17].
d. Cervical extension performed in horizontal position [18].
e. Sideward neck flexion during sitting [19].
f. Rotational neck movement while seated [20].
g. Cervical flexion incorporating chin-in in seated posture [21].

2- Periscapular muscle strengthening focused on specific movement patterns including Y to W transitions. Lower trapezius, latissimus dorsi, and erector spinae muscles were targeted through the Y position, whereas the W position enhanced infraspinatus and teres minor strength [22].

Additional exercises incorporated L to W movements [23] and scapular retraction techniques [24]. Progressive strengthening protocols involved three sets of 10-15 repetitions (Swain et al., 2023). Then Pectoralis flexibility was performed using a foam roller, this movement was repeated for 10 repetitions, allowing the foam roller to aid in opening and stretching the chest muscles effectively [25].

3- Ergonomic training for lactation positions included in the study encompasses various techniques aimed at optimizing comfort and effectiveness during breastfeeding. Participants were instructed on several positions, including:
    - Seated positioning protocols required chair adjustments to establish flat foot positioning on the floor. Thigh alignment remained parallel to ground level with knees maintained at 90-degree angles [26].
    - Cradle position, patients placed their baby on their side, resting on the shoulder and hip at nipple level [27].
    - Cross-cradle position involved sitting upright with armrests, holding the baby across the body in a tummy-to-tummy position, and using the opposite arm to support the breast being fed [27].
    - Supine lying position required women to lie on their backs with supportive pillows, allowing the baby to lie prone on their body facing the breast [28].
    - Football position, used for sore nipples, involved aligning the baby longitudinally along the maternal forearm, situating the infant's legs caudally to the supporting arm, and applying the opposite hand for breast support [29].
    - Side-lying position, recommended for babies more comfortable in a lying position, had patients lie on their side with the baby facing them and directing the baby's head towards the breast [30].

These positions were taught to all participants to ensure optimal posture and comfort during breastfeeding, thereby potentially improving lactation outcomes and maternal comfort.

Shock wave therapy

Lactating women in group B received shockwave therapy once a week for four weeks using Shockwave device;SW9-C model from China. This device operates on AC 220-230 V, 50/60 Hz with a power of 282 VA. Patients were positioned comfortably, and the device was set according to established parameters: Energy Flux Density (EFD) at 0.25 ml/mm² and 1000 shocks per each trigger point per session [31]. The treatment targeted the upper trapezius trigger point area affected by MPS, ensuring consistent device-to-skin distance and proper activation to deliver shocks evenly across the treatment area [32].Throughout the session, patients were monitored for any discomfort or adverse reactions, with treatment duration adjusted between 2 to 5 minutes as needed [33].

Pain level assessment:

Pain intensity was rated utilizing the Visual Analog Scale (VAS), a widely utilized and validated numerical pain rating tool. The VAS comprises a 10 cm horizontal line marked at 0.01 cm intervals, with one end indicating "no pain" (scored as 0) and the opposite end representing the "worst imaginable pain" (scored as 10) (Begum & Hossain, 2019; Aggarwal et al., 2018). Pain intensity was categorized into four levels, corresponding respectively to the following numerical ranges: 0 indicating no pain; 1 to 3 representing mild pain; 4 to 7 reflecting moderate pain; and 7 to 10 denoting severe pain. The VAS has demonstrated strong validity and reliability across a variety of clinical settings and patient populations, including those in postoperative care [34].

Each participant was asked to place a mark on the line, signifying the intensity of pain they perceived. The distance from the "0" anchor point to the participant's mark was measured in millimeters, and this value was recorded as the individual's pain score on the VAS [35].

Pressure-pain thresholds assessment:

The FPK 60 Analog Pressure Algometer was employed to measure pressure pain thresholds (PPT) in the upper trapezius muscle. This portable

and precise instrument is designed to detect pressure-induced pain and display quantitative results. It consists of several integrated components, including a pressure sensing unit, analog-to-digital (A/D) converter, data analysis unit, and a visual display module. The device is equipped with a start button and functionality for switching between sleep and operational modes. It presents both numerical readings and graphical representations, including a reference line that increases in a controlled and consistent manner [36].

Measurements were taken at a standardized anatomical site—midway between the seventh cervical vertebra (C7) and the acromial angle—targeting specific muscle quadrants, as defined by Barbero et al. [11]

Participants were positioned in a comfortable and relaxed posture prior to assessment. The algometer was calibrated according to the manufacturer's guidelines before each assessment. Pressure was applied incrementally at a rate of 1 kg/cm² to the identified MTrPs on the trapezius muscle. Participants were instructed to indicate the onset of pain either verbally or by raising a hand. Each measurement was performed three times to ensure reliability and consistency, with the average value recorded for analysis [23].

Cervical range of motion (ROM) assessment:

A digital inclinometer was employed to measure the cervical spine's ROM before and after the intervention, providing precise and objective data on joint inclination and mobility [37]. This device enables accurate quantification of cervical movement in multiple directions, including flexion, extension, right and left lateral flexion, and right and left rotation. The use of the inclinometer facilitates the evaluation of treatment efficacy by documenting any improvements or alterations in cervical spine mobility over time.

During the assessment, participants were instructed to maintain a relaxed and neutral posture and to perform each movement without exerting force, in order to ensure measurement accuracy and minimize discomfort [38]. The inclinometer was securely positioned on the participant's head, typically stabilized using a headband or firm manual support against the forehead, with the zero-point aligned with the cervical spine's initial neutral position [39].

Each cervical movement was performed smoothly and within the participant's comfort range to avoid strain or injury [40]. ROM values were recorded in degrees for each direction of movement, and any limitations or discomfort observed during specific motions were documented accordingly [41].

Statistical analysis

Sample size determination utilized G*POWER statistical software (version 3.1.9.2; Universität Kiel, Germany) based on VAS measurements from Kamel et al., 2020. Analysis indicated 15 participants per group were required. Calculations employed α=0.05, β=0.2, effect size=1.1, and allocation ratio N2/N1=1.

Subject characteristics between groups were compared using unpaired t-tests. Delivery type comparisons employed Chi-squared tests. Data distribution normality was verified through Shapiro-Wilk testing. Levene's test assessed variance homogeneity between groups. Mixed MANOVA examined treatment effects on VAS, PPT, and neck ROM. Bonferroni correction was applied for post-hoc multiple comparisons. Statistical significance was established at $p < 0.05$. SPSS version 25 for Windows (IBM SPSS, Chicago, IL, USA) conducted all statistical analyses.

Results

- Subject characteristics:

Subject characteristics for Groups A and B are presented in Table 1. Age, weight, height, BMI, and delivery type showed no statistically significant differences between groups ($p > 0.05$).

Effect of treatment VAS, PPT and neck ROM:

Mixed MANOVA analysis demonstrated significant treatment-time interaction effects ($F = 6.13$, $p = 0.001$). Treatment exhibited significant main effects ($F = 2.92$, $p = 0.02$), while time also showed significant main effects ($F = 168.96$, $p = 0.001$).

The study utilized a Mixed MANOVA design to examine the effects of treatment and time on various variables. The significant interaction effect of treatment and time indicated that the relationship between the two variables was not consistent across all levels. Additionally, there were significant main effects of time and treatment,

suggesting that both factors independently influenced the outcomes.

Within group comparison

Both treatment groups experienced significant VAS score reductions (p = 0.001) and PPT score elevations (p = 0.001) when comparing post-treatment to pre-treatment measurements. Percentage modifications in Group A reached 29.18%, 47.95%, and 65.64% for VAS, right PPT, and left PPT respectively, whereas Group B achieved 50.54%, 82.51%, and 89.7% respectively (Table 2).

Cervical ROM measurements increased significantly post-treatment in both groups relative to baseline (p > 0.001). Group A demonstrated percentage increases of 14.79%, 36.93%, 18.99%, 22.73%, 15.19%, and 20.02% for flexion, extension, right bending, left bending, right rotation, and left rotation respectively. Group B exhibited increases of 23.32%, 38.67%, 26.95%, 31.70%, 31.72%, and 39.88% respectively (Table 2-3).

Between group comparison

Pre-treatment assessments showed no statistical significance between groups for VAS (p = 0.46), right PPT (p = 0.97), left PPT (p = 0.89), flexion (p = 0.41), extension (p = 0.39), right bending (p = 0.36), left bending (p = 0.33), right rotation (p = 0.33), and left rotation (p = 0.61).

Post-treatment inter-group analysis revealed Group B demonstrated significantly superior VAS reduction (p = 0.01), bilateral PPT enhancement (right: p = 0.001; left: p = 0.006), and bilateral bending/rotation improvements (p = 0.001) for all measures) compared to Group A (p < 0.01). However, flexion (p = 0.28) and extension (p = 0.27) ROM showed no significant differences between groups post-treatment (p > 0.05). (Table 2-3).

Table 1. Comparison of subject characteristics between group A and B:

	Group A	Group B			
	Mean ±SD	**Mean ±SD**	**MD**	**t- value**	**p-value**
Age (years)	30.46 ± 2.61	29.86 ± 2.77	0.6	0.61	0.54
Weight (kg)	69.46 ± 8.07	71.89 ± 7.06	-2.43	-0.87	0.38
Height (cm)	163.13 ± 3.92	162.40 ± 3.01	0.73	0.57	0.57
BMI (kg/m²)	26.10 ± 2.81	27.29 ± 2.97	-1.19	-1.12	0.27
Number of children	2.4 ± 0.63	2.53 ± 0.74	-0.13	-0.52	0.6
Type of delivery, n (%)					
Cesarean	9 (60%)	10 (67%)			
Normal	6 (40%)	5 (33%)	(χ^2 = 0.14)		0.71

SD, standard deviation; MD, mean difference; χ^2, Chi squared value; p value, probability value

Table 2. Mean VAS and PPT pre and post treatment of group A and B:

	Pre treatment	Post treatment			
	Mean±SD	Mean±SD	MD	% of change	p value
VAS					
Group A	7.06 ± 1.27	5 ± 1.46	2.06	29.18	0.001
Group B	7.40 ± 1.18	3.66 ± 1.39	3.74	50.54	0.001
MD	-0.34	1.34			
	p = 0.46	***p = 0.01***			
PPT of right side (kg)					
Group A	3.42 ± 0.57	5.06 ± 0.82	-1.64	47.95	0.001
Group B	3.43 ± 0.65	6.26 ± 0.56	-2.83	82.51	0.001
MD	-0.01	-1.2			
	p = 0.97	***p = 0.01***			
PPT of left side (kg)					
Group A	3.26 ± 0.59	5.4 ± 0.76	-2.14	65.64	0.001
Group B	3.3 ± 0.79	6.26 ± 0.84	-2.96	89.70	0.001
MD	-0.04	-0.86			
	p = 0.89	***p = 0.006***			

SD, Standard deviation; MD, Mean difference; p value, Probability value

Table 2. Mean VAS and PPT pre and post treatment of group A and B:

	Pre treatment	Post treatment			
	Mean±SD	Mean±SD	MD	% of change	p value
VAS					
Group A	7.06 ± 1.27	5 ± 1.46	2.06	29.18	0.001
Group B	7.40 ± 1.18	3.66 ± 1.39	3.74	50.54	0.001
MD	-0.34	1.34			
	p = 0.46	***p = 0.01***			
PPT of right side (kg)					
Group A	3.42 ± 0.57	5.06 ± 0.82	-1.64	47.95	0.001
Group B	3.43 ± 0.65	6.26 ± 0.56	-2.83	82.51	0.001
MD	-0.01	-1.2			
	p = 0.97	***p = 0.01***			
PPT of left side (kg)					
Group A	3.26 ± 0.59	5.4 ± 0.76	-2.14	65.64	0.001
Group B	3.3 ± 0.79	6.26 ± 0.84	-2.96	89.70	0.001
MD	-0.04	-0.86			
	p = 0.89	***p = 0.006***			

SD, Standard deviation; MD, Mean difference; p value, Probability value

Discussion

In the present study, both experimental groups (Group A and Group B) exhibited significant reductions in VAS scores and increases in PPT on both sides following treatment. However, Group B demonstrated a more pronounced reduction in VAS scores and a greater increase in PPT compared to Group A, indicating a superior analgesic effect and enhanced pain tolerance. While no significant differences in cervical ROM were observed between the groups pre-treatment, post-treatment measurements revealed that Group B experienced more substantial gains in ROM, particularly in right and left bending and rotation. This suggests that the intervention administered to Group B had a greater impact on improving cervical mobility.

Role of Postural Exercises

Postural exercises are designed to optimize musculoskeletal alignment, particularly of the spine, shoulders, and neck. These exercises correct postural imbalances and muscle weaknesses, thereby reducing strain on the cervical region and promoting optimal alignment. Improved postural mechanics can significantly reduce stress on myofascial tissues, alleviate pain, and enhance ROM [42; 13].

Furthermore, postural correction involves targeted activation and coordination of specific muscle groups, such as the deep neck flexors, scapular stabilizers, and core muscles. Strengthening these muscles enhances cervical stability and neuromuscular control, leading to improved biomechanics, reduced muscle imbalance, and decreased pain [43; 44]. Postural exercises also improve proprioception—awareness of body positioning in space—through balance and coordination training, further aiding in pain reduction and increased ROM [45].

Lactation Instruction and Ergonomics

Lactation education provides women with evidence-based guidance on breastfeeding techniques, positioning, and ergonomic self-care strategies. Proper breastfeeding posture reduces strain on the neck and shoulders, helping to prevent or alleviate musculoskeletal symptoms [46]. Charette et al. [47] emphasized that awareness of proper posture is critical in avoiding shear posture—characterized by lateral trunk displacement and thoracic rotation—which can exacerbate neck and upper back pain during breastfeeding.

A study by Afshariani et al. [48] demonstrated that ergonomic education significantly improved mothers' postural assessments and reduced reported musculoskeletal discomfort during the postpartum period. Additionally, early prenatal education in breastfeeding techniques has been shown to lower the incidence of complications such as nipple trauma and enhance postpartum musculoskeletal well-being [49].

Supporting Evidence for Postural Interventions

Several studies support the efficacy of postural exercises in managing cervical myofascial pain. Pillastrini et al. [50] reported that Global Postural Reeducation (GPR) significantly reduced pain and disability in individuals with chronic neck pain, with lasting effects observed up to six months post-intervention. The study proposed that GPR enhances deep cervical flexor muscle recruitment and provides psychological benefits by promoting relaxation and positive postural experiences.

Similarly, Iaroshevskyi et al. [51] found that combining postural correction with trigger point therapy led to greater long-term improvements in pain and life quality among patients with forward head posture and chronic neck-shoulder MPS.

Efficacy of Shockwave Therapy

Shockwave therapy contributes to pain relief by stimulating sensory nerve fibers and mechanoreceptors, thus modulating pain perception [52]. It promotes tissue remodeling through mechanical energy, which triggers collagen synthesis, angiogenesis, and the release of growth factors—facilitating healing and reducing inflammation [53]. Additionally, shockwaves inactivate trigger points by disrupting taut muscle bands and enhancing blood flow [54].

Shockwave therapy has been suggested to have anti-inflammatory effects. It can reduce the production of pro-inflammatory substances and inhibit the activation of inflammatory pathways, there by mitigating the inflammatory response associated with MPS. By modulating inflammation, shockwave therapy may contribute to pain reduction and improved ROM [55].

Shockwave therapy is believed to stimulate the release of endogenous opioids, which are natural pain-relieving substances in the body [56].

ESWT improves blood circulation, reduces muscle tension and alleviates pain by interfering with nociceptor stimulation.it achieves these effects by selectively targeting non- myelinated fibers and reducing the levels of substance p, a neuropeptide involved in pain signaling [57].

Shock waves create microstructural modifications while promoting blood vessel formation, enhancing perfusion in oxygen-deprived tissues, reducing inflammatory responses, improving cellular differentiation, expediting tissue repair, and relieving pain through pain signal modification [58].

Several studies have reported positive effects of shockwave therapy on pain and range of motion (ROM) in cervical myofascial pain syndrome, supporting its efficacy in this condition. Specifically, studies have shown that shockwave therapy can lead to significant pain reduction and improvements in cervical ROM in lactating women [57].

According to Crevenna et al. [59], shock wave therapy delivers therapeutic benefits efficiently in terms of time and financial resources while facilitating the body's own healing capacities.

Numerous studies confirm the efficacy of ESWT in minimizing pain and improving cervical ROM in individuals with MPS. For instance, Király et al. [53] reported comparable improvements in pain and function between ESWT and laser therapy. Ali et al. [55] demonstrated superior outcomes in patients receiving three ESWT sessions compared to those receiving only one. Ji et al. [56] observed significant VAS score improvements in patients treated with semiweekly low-intensity ESWT sessions, attributing the benefits to altered pain substance concentrations and enhanced perfusion.

However, some studies present mixed findings. Rahbar et al. [54] found that while ESWT exhibited greater effectiveness than ultrasound in reducing pain intensity, both treatments produced comparable outcomes in pain pressure thresholds and disability scores. Such inconsistencies highlight the need for standardized treatment protocols regarding ESWT dosage, frequency, duration, and application sites.

Comparative and Combined Treatment Approaches

Several studies have explored the combination of ESWT with other therapeutic modalities. Cho et al. [62] found that combining ESWT with stabilization exercises yielded greater pain relief than ESWT alone. Lee et al. (2023) demonstrated that integrating ESWT with sling exercises improved cervical alignment and ROM more effectively than sling exercises alone.

Despite the predominance of positive findings, Avendaño et al. [63], in a systematic review, reported no significant differences in outcomes between ESWT and other interventions such as dry needling, laser therapy, and exercise, suggesting the need for more high-quality randomized controlled trials.

Study Limitations

As with any clinical investigation, this study has limitations. Generalization of results is constrained by the comparatively limited cohort size (fifteen subjects per group). While researchers performed sample size computations, a larger cohort may have yielded more robust conclusions. Additionally, the study lacked extended follow-up assessments, restricting understanding of the interventions' long-term efficacy. The reliance on subjective outcome measures, such as the VAS for pain assessment, introduces potential bias. Incorporating objective assessments in future studies could strengthen the evaluation of treatment outcomes.

Conclusion:

The study demonstrated that ESWT significantly alleviates pain, enhances pain tolerance, and improves specific aspects of ROM in lactating women with cervical MPS. The treatment group, which received ESWT along with postural corrections, exercises, and lactation instructions, showed greater improvements in VAS scores, PPT, and ROM compared to the control group, which only received postural corrections, exercises, and lactation instructions. These findings highlight ESWT as an effective adjunctive therapy for managing cervical MPS in lactating women. Clinically, incorporating ESWT into treatment protocols could provide better pain relief and functional improvement, enhancing overall quality of life. Future research should investigate the long-term effects of ESWT, involve larger sample sizes, and explore combining ESWT with other therapeutic modalities to optimize treatment outcomes.

References:

1) Shah JP, Danoff JV, DeSai MJ, Parikh S, Nakamora LY, Phillips TM. Biochemical Association with Pain and Inflammations Are Elevated in Sites Near to and Remote from active Myofascial Trigger Points. Arch Phys Med Rehabil. 2008; 89: 16-23.

2) Jeon JH, Jung YJ, Lee JY, Choi JS, Mun JH, Park WY, Seo CH, Jang KU. (2012) The Effect of Extra Corporeal Shock Wave Therapy on Myofascial Pain Syndrome. Ann Rehabil Med, 2012 Oct; 36 (5): 665-674.

3) Duyur CB, Genc H, Aituntus V. Disability and Related Factor in Patients with Chronic Cervical Myofascial Pain. Clin Rhea Matol. 2009; 28: 647-659.

4) Cromie JE, Robertson VJ, Best No, Best Mo. Work Related Musculoskeletal Disorders in Physical Therapists: Prevalence Severity, Risks and Responses. Phys Therapy. 2000; 80:335-336.

5) Raju TN. Breastfeeding Is a Dynamic Biological Process Not Simply a Meal at The Breast. Breastfeed Med. 2011 Oct.; 6 (5): 257-259 .

6)Borg-Stein, J., & Dugan, S. A. (2007). Musculoskeletal disorders of pregnancy, delivery and postpartum. Physical medicine and rehabilitation clinics of North America, 18(3), 459-476.

7)Charette, C., & Théroux, L. (2019). Musculoskeletal Impairment: Causes of Pain with Breastfeeding Insight into 11 Cases. Breastfeeding medicine: the official journal of the Academy of Breastfeeding Medicine, 14(8), 603–608 .

8) Tough EA, White AR, Richards S, Campbell J. (2007). Variability of criteria used to diagnose myofascial trigger point pain syndrome-evidence from a review of the literature. Clin J Pain.:23(3):278-86.

9) Wang, R., Li, X., Zhou, S., Zhang, X., Yang, K., & Li, X. (2017). Manual acupuncture for myofascial pain syndrome: a systematic review and meta-analysis. Acupuncture in medicine : journal of the British Medical Acupuncture Society, 35(4), 241–250 .

10)Zimmermann R, Cumpanas A, Miclea F, Janetshek G. (2009) Extra Corporeal Shock Wave Therapy for The Treatment of Chronic Pelvic Pain Syndrome in Males: Aranobmised, Double Blind, Placebo. Contr-Veal Study. Eururol.; 5b: 418-424.

11) Barbero, M., Cescon, C., Tettamanti, A., Leggero, V., Macmillan, F., Coutts, F., & Gatti, R. (2013). Myofascial trigger points and innervation zone locations in upper trapezius muscles. BMC musculoskeletal disorders, 14, 1-9.

12) de Araujo Cazotti, L., Jones, A., Roger-Silva, D., Ribeiro, L. H. C., & Natour, J. (2018). Effectiveness of the Pilates method in the treatment of chronic mechanical neck pain: a randomized controlled trial. Archives of physical medicine and rehabilitation, 99(9), 1740-1746.

13) Kim, T. W., An, D. I., Lee, H. Y., Jeong, H. Y., Kim, D. H., & Sung, Y. H. (2016). Effects of elastic band exercise on subjects with rounded shoulder posture and forward head posture. Journal of physical therapy science, 28(6), 1733-1737.

14) Abd Elmeged, N. A., Ibrahim, A. H., Labib, A. M., Ahmed, A. R., Mohamed, G. I., & Kamal, H. A. (2021). Effect of mckenzie exercises on functional neck disability in females with dowager's hump. Egypt. J. Appl. Sci, 36, 163-182.

15) Kang, J. I., Baek, S. Y., & Jeong, D. K. (2019). Effects of McKenzie exercise on the neck muscles fatigue, and neck disability index in chronic neck pain patients. Journal of the Korean Society of Physical Medicine, 14(4), 93-101.

16) Diab, R. H., Hamed, R. H., & Mustafa, I. M. (2016). Efficacy of McKenzie protocol on non-specific neck pain. Int J Physiother Res, 4(5), 1631-38 .

17) Neeraj, K., Shiv, V., Kumar, N., & Sharma, N. (2016). To Compare the Effect of Strenthening Neck Exercise and Mckenzie Neck Exercise In Neck Pain Subject. ResearchGate .

18) Arshad, N., Ahmad, A., Ali, B., Imran, M., & Hayat, S. (2020). Comparison between McKenzie extension and neck isometric exercises in the management of nonspecific neck pain: a randomized controlled trial. Khyber Medical University Journal, 12(1), 6-9.

19) Abdel-Aziem, A. A., Mohamed, R. R., Draz, A. H., Azab, A. R., Hegazy, F. A., & Diab, R. H. (2022). The effect of McKenzie protocol vs. deep neck flexor and scapulothoracic exercises in subjects with chronic neck pain–a randomized controlled study. European Review for Medical & Pharmacological Sciences, 26(9.(

20) Pillastrini, P., Castellini, G., Chiarotto, A., Fasciani, F., Marzioni, F., Vanti, C., Bertozzi, L., & Gianola, S. (2019). Comparative effectiveness of conservative and pharmacological interventions for chronic non-specific neck pain. Medicine, 98(33), e16762 .

21) Sarigiovannis, P., & Hollins, B. (2005). Effectiveness of manual therapy in the treatment of non-specific neck pain: a review. Physical Therapy Reviews, 10(1), 35–50 .

22) Spitz, R. W., Bell, Z. W., Wong, V., Yamada, Y., Song, J., Buckner, S. L., Abe, T., & Loenneke, J. P. (2020). Strength testing or strength training: considerations for future research. Physiological Measurement.

23) Park, K. M., Cynn, H. S., Yi, C. H., & Kwon, O. Y. (2013). Effect of isometric horizontal abduction on pectoralis major and serratus anterior EMG activity during three exercises in subjects with scapular winging. Journal of Electromyography and Kinesiology .

24) Hwang, M., Lee, S., & Lim, C. (2021). Effects of the proprioceptive neuromuscular facilitation technique on scapula function in office workers with scapula Dyskinesis. Medicina, 57(4), 332.

25) Rosa, D. P., Borstad, J. D., Pogetti, L. S., & Camargo, P. R. (2017). Effects of a stretching protocol for the pectoralis minor on muscle length, function, and scapular kinematics in individuals with and without shoulder pain. Journal of Hand Therapy .

26) Corlett, E. N. (2009). Ergonomics and sitting at work. Work, 34(2), 235-238.

27) Ojukwu, C. P., Okpoko, C. G., Ikele, I. T., Ilo, I. J., Ede, S. S., Anekwu, N. E., Okemuo, A. J., Anekwu, E. M., Ugwu, S., & Ikele, C. N. (2022). Neck Muscles' Responses to Cradle, Cross-cradle and Football Breastfeeding Hold Positions in Nursing Mothers: A Preliminary Study. Nigerian Journal of Clinical Practice.

28) Patel, S., & Gaur, A. (2023). Comparison of Cradle Breastfeeding Position with Cross Cradle Breastfeeding Position in Term Newborns on Their Weight Pattern. Research Square (Research Square .(

29) Wang, Z., Liu, Q., Min, L., & Mao, X. (2021). The effectiveness of the laid-back position on lactation-related nipple problems and comfort: a meta-analysis. BMC Pregnancy and Childbirth .

30) Puapornpong, P., Raungrongmorakot, K., Laosooksathit, W., Hanprasertpong, T., & Ketsuwan, S. (2017). Comparison of Breastfeeding Outcomes Between Using the Laid-Back and Side-Lying Breastfeeding Positions in Mothers Delivering by Cesarean Section: A Randomized Controlled Trial. Breastfeeding Medicine.

31) Ogden, J.A., Toth-Kischkat, A., & Schultheiss, R. (2001). Principles of shock wave therapy. Clinical orthopaedics and related research, 387, 8-17.

32) Kamel, F. H., Basha, M., Alsharidah, A., Hewidy, I. M., Ezzat, M., & Aboelnour, N. H. (2020). Efficacy of extracorporeal shockwave therapy on cervical myofascial pain following neck dissection surgery: a randomized controlled trial. Annals of Rehabilitation Medicine, 44(5), 393-401.

33) Rompe, J. D., Riedel, C., Betz, U., & Fink, C. (2001). Chronic lateral epicondylitis of the elbow: A prospective study of low-energy shockwave therapy and low-energy shockwave therapy plus manual therapy of the cervical spine. Archives of Physical Medicine and Rehabilitation .

34) Skovlund, E., & Breivik, H. (2016). Analysis of pain-intensity measurements. Scandinavian Journal of Pain.

35) Escalona-Marfil, C., Coda, A., Ruíz-Moreno, J., Riu-Gispert, L. M., &Gironès, X. (2020, February 12). Validation of an Electronic Visual Analog Scale mHealth Tool for Acute Pain Assessment: Prospective Cross-Sectional Study. Journal of Medical Internet Research.

36) Fenton, B. W., Palmieri, P. A., Durner, C., & Fanning, J. (2009). Quantification of abdominal wall pain using pain pressure threshold algometry in patients with chronic pelvic pain. The Clinical journal of pain, 25(6), 500-505.

37) Hanks, J., & Myers, B. (2023,). Validity, Reliability, and Efficiency of a Standard Goniometer, Medical Inclinometer, and Builder's Inclinometer. The International Journal of Sports Physical Therapy .

38) Wilson-Smith, A. R., Muralidaran, S., Maharaj, M., Pelletier, M. H., Beshara, P., Rao, P. J., Pearce, L. M., Wang, T., Mobbs, R. J., & Walsh, W. R. (2022). Validation of a novel range of motion assessment tool for the cervical spine: the HALO© digital goniometer. Journal of Spine Surgery .

39) Al-Yassary, M., Billiaert, K., Antonarakis, G. S., &Kiliaridis, S. (2021, October 7). Evaluation of head posture using an inertial measurement unit. Scientific Reports .

40) Du, Q., Bai, H. M., & Zhu, Z. (2023, April 8). Intelligent Evaluation Method of Human Cervical Vertebra Rehabilitation Based on Computer Vision. Sensors .

41) Jung, B., Black, A. C., & Bhutta, B. S. (2023). Anatomy, head and neck, neck movements. In StatPearls [Internet]. StatPearl Publishing.

42) Abdollahzade, Z., Shadmehr, A., Malmir, K., &Ghotbi, N. (2017). Effects of 4 week postural corrective exercise on correcting forward head posture. Journal of Modern Rehabilitation, 11(2), 85-92.

43) Kulkarni, P., Ryajade, A., & Yadav, T. S. (2022). Effect of Postural Correction Exercises in Postnatal Kyphosis. Journal of Coastal Life Medicine, 10, 220-225.

44) Letafatkar, A., Rabiei, P., Alamooti, G., Bertozzi, L., Farivar, N., & Afshari, M. (2020). Effect of therapeutic exercise routine on pain, disability, posture, and health status in dentists with chronic neck pain: a randomized controlled trial. International archives of occupational and environmental health, 93, 281-290.

45) Sheikhhoseini, R., Shahrbanian, S., Sayyadi, P., & O'Sullivan, K. (2018). Effectiveness of therapeutic exercise on forward head posture: a systematic review and meta-analysis. Journal of manipulative and physiological therapeutics, 41(6), 530-539.

46)WHO,(2023).Breastfeeding.https://www.who.int/health-topics/breastfeeding#tab=tab_1

47)Charette, C., &Théroux, L. (2019). Musculoskeletal Impairment: Causes of Pain with Breastfeeding Insight into 11 Cases. Breastfeeding medicine : the official journal of the Academy of Breastfeeding Medicine, 14(8), 603–608 .

48) Afshariani, R., Kiani, M., & Zamanian, Z. (2019). The influence of ergonomic breastfeeding training on some health parameters in infants and mothers: a randomized controlled trial. Archives of Public Health, 77, 1-10.

49) Gao, H., Wang, J., An, J., Liu, S., Li, Y., Ding, S., ... & Chen, Y. (2022). Effects of prenatal professional breastfeeding education for the family. Scientific Reports, 12(1), 5577.

50) Pillastrini, P., Castellini, G., Chiarotto, A., Fasciani, F., Marzioni, F., Vanti, C., Bertozzi, L., & Gianola, S. (2019, August). Comparative effectiveness of conservative and pharmacological interventions for chronic non-specific neck pain. Medicine, 98(33), e16762 .

51)Iaroshevskyi, O. A., Morozova, O. G., Logvinenko, A. V., &Lypynska, Y. V. (2019). Non-pharmacological treatment of chronic neck-shoulder myofascial pain in patients with forward head posture. WiadomosciLekarskie (Warsaw, Poland: 1960), 72(1), 84-88.

52)Speed, C. (2014). A systematic review of shockwave therapies in soft tissue conditions: focusing on the evidence. British journal of sports medicine, 48(21), 1538-1542.

53) Király, M., Bender, T., & Hodosi, K. (2018). Comparative study of shockwave therapy and low-level laser therapy effects in patients with myofascial pain syndrome of the trapezius. Rheumatology international, 38(11), 2045-2052.

54) Rahbar, M., Samandarian, M., Salekzamani, Y., Khamnian, Z., &Dolatkhah, N. (2021).

Effectiveness of extracorporeal shock wave therapy versus standard care in the treatment of neck and upper back myofascial pain: a single blinded randomised clinical trial. Clinical Rehabilitation, 35(1), 102-113.

55) Király, M., Bender, T., & Hodosi, K. (2018). Comparative study of shockwave therapy and low-level laser therapy effects in patients with myofascial pain syndrome of the trapezius. Rheumatology international, 38(11), 2045-2052.

56) Rompe Koren, Y., & Kalichman, L. (2018). Deep tissue massage: What are we talking about?. Journal of Bodywork and Movement Therapies, 22(2), 247-251.

57) Ali, G. Ü. R., İrfan, K. O. C. A., Karagüllü, H., ALTINDAĞ, Ö., Madenci, E., TUTOĞLU, A., ... & IŞIK, M. (2014). Comparison of the effectiveness of two different extracorporeal shock wave therapy regimens in the treatment of patients with myofascial pain syndrome. Archives of Rheumatology, 29(3), 186-193

58) Hausdorff, J. M., Schweiger, A., Herman, T., Yogev-Seligmann, G., & Giladi, N. (2008). Dual-task decrements in gait: contributing factors among healthy older adults. The Journals of Gerontology Series A: Biological Sciences and Medical Sciences, 63(12), 1335-1343.

59) Crevenna, R., Mickel, M., Schuhfried, O., Gesslbauer, C., Zdravkovic, A., & Keilani, M. (2021). Focused extracorporeal shockwave therapy in physical medicine and rehabilitation. Current Physical Medicine and Rehabilitation Reports, 9, 1-10.

60) Kuo, Y. R., Wang, C. T., Wang, F. S., Chiang, Y. C., & Wang, C. J. (2009). Extracorporeal shock-wave therapy enhanced wound healing via increasing topical blood perfusion and tissue regeneration in a rat model of STZ-induced diabetes. Wound Repair and Regeneration, 17(4), 522-530.

61)Ji, H. M., Kim, H. J., & Han, S. J. (2012). Extracorporeal shock wave therapy in myofascial pain syndrome of upper trapezius. Annals of rehabilitation medicine, 36(5), 675-680.

62) Cho, Y. S., Park, S. J., Jang, S. H., Choi, Y. C., Lee, J. H., & Kim, J. S. (2012). Effects of the combined treatment of extracorporeal shock wave therapy (ESWT) and stabilization exercises on pain and functions of patients with myofascial pain syndrome. Journal of physical therapy science, 24(12), 1319-1323.

63) Avendaño-López, C., Megía-García, Á., Beltran-Alacreu, H., Serrano-Muñoz, D., Arroyo-Fernández, R., Comino-Suárez, N., & Avendaño-Coy, J. (2023). Efficacy of Extracorporeal Shockwave therapy on pain and function in Myofascial Pain Syndrome: A systematic review and meta-analysis of randomized clinical trials. American Journal of Physical Medicine & Rehabilitation, 10-1097.