INFLUENCE OF EXTRACORPOREAL SHOCKWAVE THERAPY IN PATIENTS OF MECHANICAL NECK PAIN

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Abstract

Background: Extracorporeal shock wave therapy (ESWT) is a novel, beneficial, and non-invasive treatment technique. In a number of orthopaedic disorders, ESWT may be used in absence of surgical indications with comparable outcomes with surgery. ESWT is a popular adjunct to conventional therapy that has been demonstrated to reduce neck pain and pressure pain threshold. **Purpose:** The purpose of this study is to explore the effect of adding extracorporeal shockwave therapy to standradized physiotherapy on active cervical ROM (range of motion) in patients with chronic mechanical neck pain (CMNP) **Subject and Methods:** This study was a double-blinded (statistician and examiner), pretest-posttest controlled clinical trial. Subjects who met the selection criteria were divided randomly into 2 groups. Group A received only standradized physiotherapy in the form of stretching, isometric training, and a home program of postural correction. Group B received ESWT combined with standradized physiotherapy. The treatment last 4 weeks, two sessions per week, one session weekly for ESWT with standardized physiotherapy and other sessions for standardized physiotherapy alone. The outcome measure was active cervical range of motion using universal goniometer. **Results:** There was a significant effect of adding ESWT to standradized physiotherapy on active cervical ROM in patients with chronic mechanical neck pain ($p < 0.001$). **Conclusion:** These results suggested that Adding ESWT to the standradized physiotherapy program may be superior in improving active cervical range of motion compared to standradized physiotherapy alone in patients with chronic mechanical neck pain.

Key words: Chronic mechanical neck pain; Etracorporeal shock wave therapy; Cervical range of motion.

Introduction

Mechanical neck pain (MNP) is considered the second most popular musculoskeletal disorder following low back pain, about 75% of people have MNP **[1,2]**.

Patients with MNP suffer from pain, reduced pressure pain threshold, active trigger points (often in the upper portion of the trapezius), muscle spasm, limited range of motion and proprioceptive deficits causing disability and impaired life quality **[2,3,4,5,6,7,8]**.

Mechanical neck pain is a multifactorial condition that arises insidiously with many predisposing factors such as overhead manual activities, repetitive movements, huge physical effort, poor posture (e.g., with heavy smartphone and computer use) and psychosocial status with associated increased muscle tension **[1,2,3,9]**.

Several physical therapy modalities were used to treat MNP patients; nonetheless, mechanical neck pain is quite common, with most patients experiencing chronic and recurring symptoms after one year. Newer interventions as extracorporeal shockwave therapy may help to treat this condition well **[10,11,12]**.

Extracorporeal shockwave therapy has been shown to reduce neck pain, pressure pain threshold, and disability in patients with neck pain with sensitive trigger points. However, because the studies of neck pain are of low quality due to lack of blinding and small sample size its efficacy remains unconfirmed **[13,14]**.

The effectiveness of radial Extracorporeal shock wave therapy on myofascial condition is now the subject of more research, especially in the upper trapezius which needs further research to confirm its pain-relieving characteristics and its capability to promote tissue proliferation and repair **[15]**.

ESWT is a revolutionary, beneficial, and non-invasive treatment technique. In a number of musculoskeletal disorders, ESWT may take the role of surgery with negligible side effects and at least equivalent outcomes, depending on results of previous study reported that extracorporeal shock wave therapy (focused and radial) is better than conventional therapies in reducing neck pain and pain pressure threshold **[10, 16]**.

Range of motion and pain in terms of visual analogue scale and trigger points in the upper portion of the trapezius may be improved using mechanical intervention such as radial shock waves and dry needles **[17]**.

It has been found that ESWT can avoid the complications of surgical procedures on patients, and it's superior in effect to trigger point injection, dry needling and US, in terms of pain in myofascial pain syndrome patients **[18]**.

This effect might result from releasing the taut bands that cause Myofascial pain, a condition characterised by taut bands that restrict range of motion and cause pain in people with persistent, mechanical neck pain. Since these taut bands are a significant source of pain, the main objective of treatment for Myofascial strigger points is to break the cycle of pain by relaxing tense bands **[12]**.

It has been hypothized its effect due to excessive stmulation of nocieceptors, enhance blood flow, reduce muscle tension, destroying non myelinated fibers selectively, lowering amount of substance P in target tissue and dorsal gangelia, angiogenesis of new blood vessels **[19,20,21,22]**. Both dry needle and ESWT applications may improve pain levels (assessed with VAS) and ROMs in patients with active trigger points in the upper trapezius muscle **[17]**. It was determined that ESWT and conventional treatment programmes were beneficial for patients with mechanical neck pain by reducing pain intensity and neck disability index (NDI) and improving neck range of motion. The improvement was similar in both groups without any significant difference between them. To treat patients with mechanical neck dysfunction, they can therefore be used alternately **[19]**. Previous literature compared traditional ultrasound therapy, and ESWT plus active exercises (animal simulation) exercise and ESWT with exercises showed superiority in pain reduction, improved cervical joint ROM, and strengthening of muscles **[23].** This effect may be due to the ESWT effect on enhancing blood circulation in capillary blood vessels, which reduce muscle tension, and pain **[24]**. For patients with cervical myofascial pain syndrome, low-level laser therapy (LLLT) and extracorporeal shockwave therapy have similar short-term effects on pain alleviation, reduction of pressure pain threshold, and improvement of cervical flexion and extension range of motion. There is no significant difference between the two treatments **[25]**.

The purpose of this study is to explore the effect of adding extracorporeal shockwave therapy to standradized physiotherapy on active cervical ROM in patients with chronic mechanical neck pain (CMNP).

MATERIALS, AND METHODS

Study design

This study was a double-blinded (statistician and examiner), pretest-posttest controlled clinical trial. Statistician was blinded to group allocation because groups were coded in sheet of results.

Participants

Fifty-two patients with chronic mechanical neck pain refered from othopedic surgeon were diagnosed with chronic Mechanical neck pain for selection critera, subjects were included in this study after being informed about the study aim and signing the consent. the study conducted at the outpatient clinic of physiotherapy, faculty of physical therapy, Benha University from July 2023 to March 2024. Measurement procedures, treatment procedures, and the study's goal was explained to each participant before participation in the study. The Ethical Committee for Scientific Researches of the Faculty of Physical Therapy, Cairo University, approved the study with approval number NO:(P.T.REC/012/004700).

Inclusion criteria

- The patients (both males and females) with chronic mechanical neck pain for more than three months.
- The patient ages were between 18 and 29 years old **[26]**.
- The patient had at least one taut band at upper fibers of trapezius as described in assessment procedures
- The patient numeric pain rating score (NPRS) was 3 to 8 out of 10.

Exclusion criteria:

- If the patient treated for neck or shoulder pain during the last three months
- Had neck or shoulder operation during the last two years
- Had any structural pathology of the cervical spine, such as disc, prolapse, spinal stenosis, or cervical spondylosis
- Had traumatic history, instability, spasmodic torticollis
- Had cardiovascular, respiratory, or allergic disease, neck osteoarthritis
- Had homeostatic disorders, Fibromyalgia, shoulder conditions (tendinosis, bursitis, capsulitis), rheumatic diseases
- Severe psychiatric and mental illness and other illnesses that limit physical loading, pregnant women, patients with VBI and vertigo **[27]**.

The study subjects were randomly assigned into two group A and group B (ratio 1:1) using a computer-generated random data sheet using www. random. Org.

Group A received only standradized physiotherapy in the form of stretching, isometric training, and a home program of postural correction.

Group B received ESWT combined with standradized physiotherapy. The treatment last 4 weeks, two sessions per week, one session weekly for ESWT with standardized physiotherapy and other sessions for standardized physiotherapy alone**.**

Assessment procedure

Assessment equipment: Standard goniometer was used to assess cervical range of motion (CROM). When measure using UG the reliability intra rater and inter-rater was high to very high., the intra-rater reliability ranged from 0.80 to 0.99 and the inter-rater reliability from 0.71 to 0.94 **[28]**. Cervical ROM can be assessed using a cervical range of motion

(CROM) goniometer, both standard goniometers and inclinometers with acceptable reliability and validity **[29].** Patients were informed to provide the examiner with the specific instant at which pressure changed into pain. After that, the test was repeated three times, with a minimum 30-second gap between each test, and the average was calculated and the whole procedure was repeated on the opposite side **[7,13,30]**. The cervical range of motion (in all directions) was measured using a standard goniometer (Baseline Plastic Goniometer - 360 degrees head - 12 inches). Participants were seated upright and asked to actively move their neck in each direction three times. This method is valid and reliable for the assessment of the cervical range of motion **[31,32]**.

Neck flexion and extension

The external auditory meatus is covered by the axis as it measures cervical flexion and extension. The moveable arm is perpendicular on the fixed arm and positioned vertically along the imaginary axis that runs from the external auditory meatus to the bridge of the nose. The stationary arm is positioned vertical on ground. The patient was asked to flex and extend his head, and the range of flexion and extension was assessed in degrees **[33]**.

Neck side-bending

The axis is positioned at the middle of the sternal line that runs between the acromion processes for lateral flexion, and the movable arm is oriented at the most prominent part of the nose. The stationary arm on the imaginary horizontal line passes between two acromions. The patient requested to complete side-by-side cervical lateral flexion and measures **[33]**.

Neck Rotation

The axis is positioned over the center of the patient’s head, the moving arm positioned at the tip of the nose, fixed arm parallel to an imaginary line going between the acromion process. The patient was asked to rotate his neck and measurements were taken **[33]**.

All ptients in this study had one trigger point in right upper fibers of trapizus, some had another in left upper trapizus and no one had more than 2 trigger points.

Treatment procedures

Intervention equipment: Extracorporeal shockwave therapy (Gymna-Uniphy NV Pasweg 6A |/B-3740 Bilzen, Belgium Radial extracorporeal shockwave therapy) (R-ESWT) pneumatic type machine.

Procedure: The treatment last 4 weeks, two sessions per week, one session weekly for ESWT with standardized physiotherapy and other sessions for standardized physiotherapy alone**. [7,34]**.

Standradized physiotherapy

Stretching exercises

The following sequence of exercises was used: stretching for the upper trapezius towards lateral flexion without flexion, extension or rotation, holding each position for 30 seconds. Stretch was applied five times in each direction. Lastly, do ten chin tucks for twenty seconds as a neck-straightening exercise, each stretching session takes roughly ten minutes **[20**].

Isometric muscle training

The patient was asked to press his head against the therapist's hand in each of the six directions; cervical flexion, extension, rotation to right and left sides, and side bending to the right and left sides while seated upright **[21, 22]**. The therapist or patient himself exerted resistance on the forehead, occiput, right antrolateral side of forhead, left antrolateral side of forhead, right head, and left head. The exercise frequency was two sets of five repetitions with a ten-second hold per repetition.

Postural correction home program

Patients received instruction on the following:

1. **Sitting**: Frequently change your sitting posture and take a few steps about your house or office. Shoulders should not be rounded or drawn backwards; instead, they should be relaxed. Gently stretch your cervical and upper back muscles every hour during sitting to help release muscle tension. Keep your elbows near your body at all times. They have to be bent at an angle of 90 to 120 degrees. Ensure that your back is properly supported; if the backrest of your chair isn't strong enough to support the curve of your lower back, use a back pillow or another type of back support.

2. **Standing:** with proper posture (stand tall and straight, keep your shoulders tucked back, tuck your tummy in, place most of your weight on the balls of your feet, maintain a level head, and let your arms hang loosely at your sides).

3. **Sleeping:** Your head cushion should be both comfortable and supportive of your neck's natural curve. An excessively high cushion may strain the muscles in your neck, shoulders, and back by lifting your neck. Select a cushion that maintains the neck's alignment with the lower back and chest. You should be able to adjust your pillow so that you may sleep in various positions.

Additionally, they received instructions on how to engage their deep neck muscles (e.g., chin in or nodding exercises). They were required to carry out this at home, repeat session exercises at home and patients were instructed to do stretching exercise for upper fibers of trapizus similar to that in sessions five times a week as a home routine.

Patients in the experimental group (B) received ESWT with radial prob once a week for four weeks **[35,36,37,38,39]**. The ESWT was applied using the following treatment parameters: 2,000 pulses, intensity of 1 to 1.2 bar according to patient tolerance, and 10 Hz frequency **[12,19]** The ESWT was applied for 3 minutes on trigger points of trapezius muscles if there was one trigger point, it was received all 2000 shocks and if more than one trigger point so 2000 shocks were detributed equally (1000 pulses for each) over them. all patients in this study had no more than two trigger points. Participants were instructed to place their arms adjacent to their bodies while lying prone. ESWT applied (for 4 sessions) at the second session of each week **[19]**.

Statistical analysis:

Statistical analysis was conducted using SPSS for Windows, version 26 (SPSS, Inc., Chicago, IL). Before final analysis, data were screened for normality assumption, homogeneity of variance, and presence of extreme scores and the *p*-value was set at < 0.05. This analysis was done as a pre-requisite for parametric testing of the analysis of differences.

Comparison between mean values of the different parameters in the two groups was performed using repeated measure MANOVA test to determine the significant differences between both groups at the two times testing interval (pre and post)

Results:

Fifty-two patients with chronic mechanical neck pain participated in the current study. Patients were subdivided into two groups, n=26 in Group A (Control) received the standradized physiotherapy and n=26 in Group B (Experimental) received ESWT added to standradized physiotherapy. The variables were measured before starting the rehabilitation program (pre) for both groups and at the end of rehabilitation (post).

The distribution of males and females in the control and experimental groups was 61.54 % (16) and 38.46 % (10); 88.46 % (23) and 11.54 % (3) respectively. Comparing the gender distribution for all patients in both groups using the Chi-square test revealed that there was a significant difference between groups ($p < 0.001$).

Comparing the mean values of age, weight, height, and BMI for all patients in both groups using the one-way ANOVA test revealed that there were no significant differences between them in Age ($p = 0.320$), weight ($p = 0.255$), height ($p = 0.133$), and BMI ($p = 0.775$), as shown in Table 1.

Table 1: Descriptive statistics and one-way ANOVA for the mean values of age, weight, height, and BMI of all patients in both groups.

Variable	Mean ± SD		F-value	*P*-value	Sig.
	Control Group N = 26	Experimental Group N = 26			
Age (years)	22.65 ± 3.019	21.92 ± 2.153	1.010	.320	NS
Weight (kg)	79.538 ± 18.21	74. 356 ± 11.81	1.327	.255	NS
Height (cm)	170.85 ± 8.66	174.40 ± 8.11	2.327	.133	NS
m^2)/BMI (kg	27.058 ± 4.597	26.411 ± 10.513	.083	.775	NS

*SD= Standard deviation, *t-value=t-statistic, *P-value=probability, *Sig. =Significance, *NS=non-significant.

Repeated measure MANOVA:

Repeated measure MANOVA was conducted to study the effect of rehabilitation timing on Cervical ROM, in both groups. There was a significant interaction effect of Experimental and time for Cervical flexion ROM ($p = 0.003$), Cervical SBRt ROM ($p = 0.026$), Cervical SBLt ROM ($p = 0.001$), Cervical Rot Rt ROM ($p = 0.045$). On the other hand, no significant interaction of Experimental and time for the other dependent variables including Cervical extension ROM ($p = 0.202$), Cervical RotLt ROM ($p = 0.099$). There was a significant main effect of time for all dependent variables ($p < 0.001$)

1. **The effect of the shockwave therapy on the cervical flexion ROM:**

   a. **Control Group**

The mean ± SD of the cervical flexion ROM pre of group A was 35.31±12.039°, and the cervical flexion ROM post was 36.62 ±8.96° (Table 2, Table (2):. Figure 1).

   b. **Experimental group**

The mean ± SD of the cervical flexion ROM pre of group B was 36.21±10.79°, and the cervical flexion ROM post was 43.35±11.51° (Table , Table (2):. Figure).

   c. **Within and between group comparisons**

There were significant within-group comparisons (p<0.001*) while no significant between-group comparisons were observed (p=0.191) (Table).

Table 2: Mean, within and between group comparisons for cervical flexion ROM.

Cervical Flexion ROM (degrees) $\bar{X}$ ± SD		
	Pre-intervention	**Post-intervention**
Group A (Control)	35.31±12.039	36.62 ±8.96
Group B (Experimental)	36.21±10.79	43.35±11.51

Within group comparison				
	MS	**F**	***p*-value**	**Sig**
Time	464.973	21.277	<0.001*	**Sig**
Time*Group	221.152	10.120	0.003*	**Sig**
Between-group comparison				
	MS	**F**	***p*-value**	**Sig**
Group A vs Group B	378.726	1.760	0.191	NS

: Mean $\bar{X}$ MS: Mean square *p*-value: Probability value
SD: Standard Deviation S: Significant NS: Non-significant

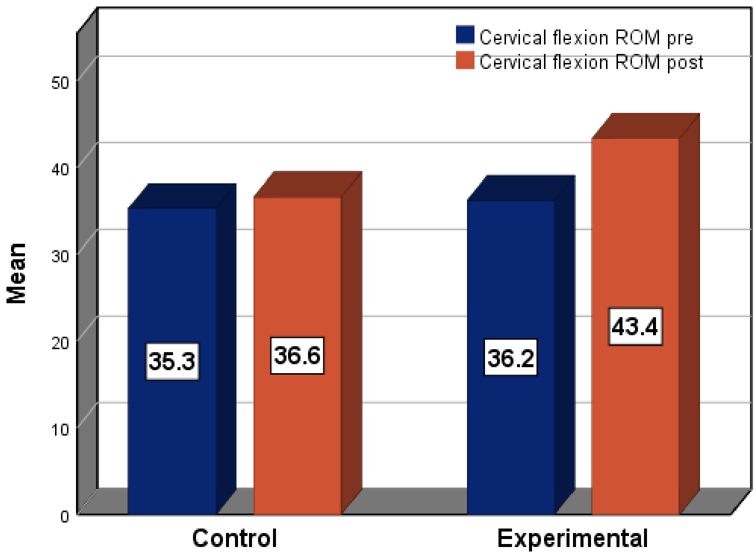


Table (2):. Figure 1: Mean Cervical flexion ROM of control and Experimental groups.

2. The effect of the shockwave therapy on the cervical extension ROM:

a. Control Group

The mean ± SD of the cervical extension ROM pre of group A was 44.36±15.37°, and the cervical extension ROM post was 46.01 ±12.53° (Table , Table (3):. Figure).

b. Experimental group

The mean ± SD of the cervical extension ROM pre of group B was 49.74±14.61°, and the cervical extension ROM post was 54.79±12.93° (Table , Table (3):. Figure).

c. Within and between group comparisons

There were significant within-group comparisons (*p*=0.014*) while no significant between-group comparisons were observed (*p*=0.057) (Table).

Table 3: Mean, within and between group comparisons for Cervical Extension ROM.

	Cervical Extension ROM (degrees) $\bar{X}$ ± SD	
	Pre-intervention	**Post-intervention**
Group A (Control)	44.36±15.37	46.01 ±12.53
Group B (Experimental)	49.74±14.61	54.79±12.93

				Within group comparison
	MS	**F**	***p*-value**	**Sig**
Time	291.253	6.479	0.014*	Sig
Time*Group	75.265	1.674	0.202	NS
				Between-group comparison
	MS	**F**	***p*-value**	**Sig**
Group A vs Group B	1302.251	3.809	0.057	NS

: Mean $\bar{X}$ MS: Mean square *p*-value: Probability value
SD: Standard Deviation S: Significant NS: Non-significant

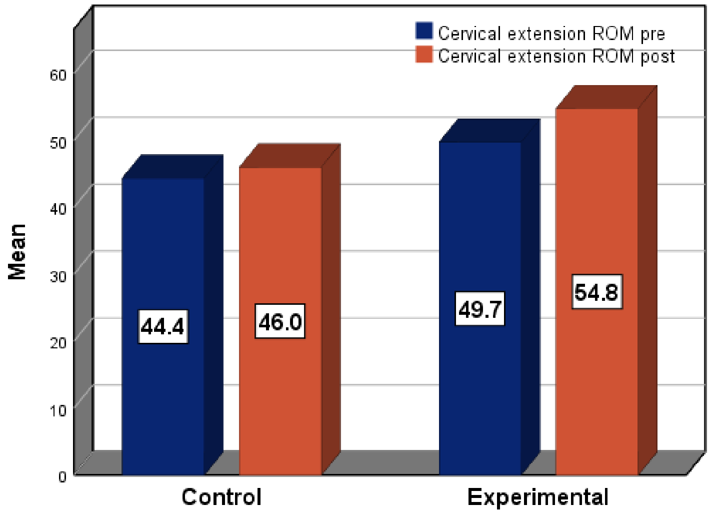


Table (3):. Figure 2: Mean Cervical Extension ROM of control and Experimental groups.

3. The effect of the shockwave therapy on the Cervical Side bending ROM:

a. Control Group

The mean ± SD of the Cervical Side bending ROM Rt pre for group A was 21.56±10.64°, and the post was 22.18 ±8. 88°. The mean ± SD of the Cervical Side bending ROM Lt pre for group A was 22.22±10.16°, and the post was 23.34 ±8. 70° (Table , Table(4):. Figure &Table(4):. Figure).

b. Experimental group

The mean ± SD of the Cervical Side bending ROM Rt pre for group B was 17.80±9.12°, and the post was 21.52±8.57°. The mean ± SD of the Cervical Side bending ROM Lt pre for group B was 20.60±8.10°, and the post was 25.80±7.04° (Table , Table(4):. Figure &Table(4):. Figure).

c. Within and between group comparisons

There were significant within-group comparisons for the Cervical Side bending ROM on both sides (Rt: p=0.002*; Lt: p<0.001*) while no significant between-group comparisons for both sides (Rt: p=0.381; Lt: p=0.855) (Table).

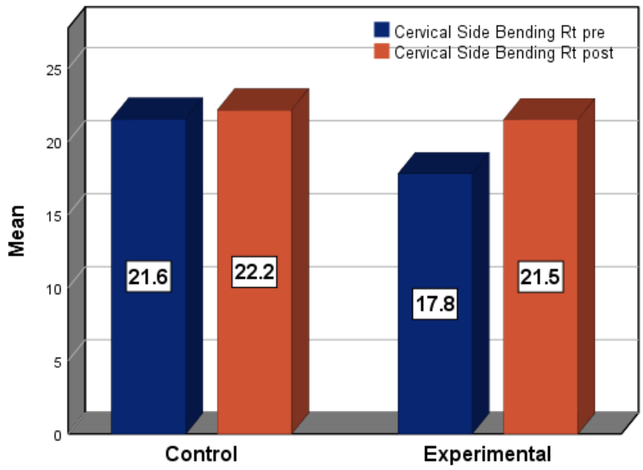
Table 4: Mean, within and between group comparisons for the cervical Side bending ROM.

		Cervical Side bending ROM (degrees) $\overline{X} \pm SD$	
		Pre-intervention	**Post-intervention**
Group A (Control)	**Rt side**	21.56±10.64	22.18 ±8. 88
	Lt side	22.22±10.16	23.34 ±8. 70
Group B (Experimental)	**Rt side**	17.80±9.12	21.52±8.57
	Lt side	20.60±8.10	25.80±7.04

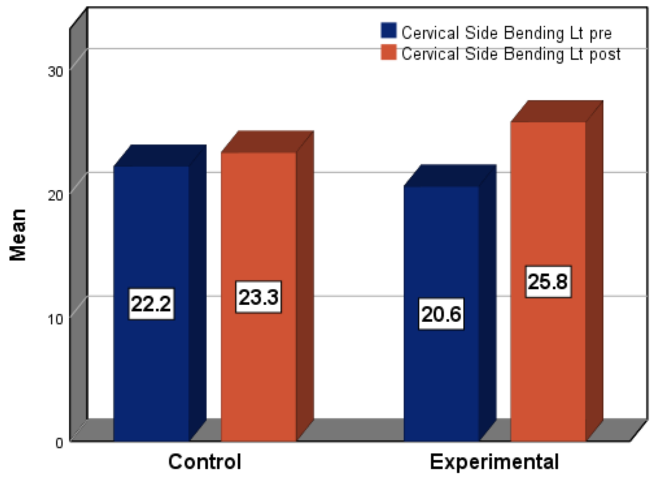
Within group comparison

		MS	F	*p*-value	Sig
Rt	**Time**	121.885	10.250	0.002*	Sig
	Time*Group	62.756	5.277	0.026*	Sig
Lt	**Time**	259.601	29.974	<0.001*	Sig
	Time*Group	108.536	12.532	0.001*	Sig
Between-group comparison					
		MS	**F**	***p*-value**	**Sig**
Group A vs Group B Rt		126.763	.780	0.381	NS
Group A vs Group B Lt		4.648	.034	0.855	NS

: Mean $\overline{X}$ MS: Mean square *p*-value: Probability value
SD: Standard Deviation S: Significant NS: Non-significant



Table(4):. Figure 3: Mean Cervical Side bending ROM Rt of control and Experimental groups.



Table(4):. Figure 4: Mean Cervical Side bending ROM Lt control and Experimental groups.

4. **The effect of the shockwave therapy on the cervical rotation ROM:**

   a. **Control Group**

The mean ± SD of the Cervical rotation ROM Rt pre for group A was 58.90±10.79°, and the post was 64.95 ±10.61°. The mean ± SD of the Cervical rotation ROM Lt pre for group A was 61.63±9.29°, and the post was 68.03 ±10.03° (Table , Table(5):. Figure &Table 5**:. Figure**).

b. Experimental group

The mean ± SD of the Cervical rotation ROM Rt pre for group B was 59.58±11.37°, and the post was 70.65±10.95°. The mean ± SD of the Cervical rotation ROM Lt pre for group B was 68.91±10.02°, and the post was 79.26±10.15° (Table , Table(5):. Figure &Table **5:. Figure**).

c. Within and between group comparisons

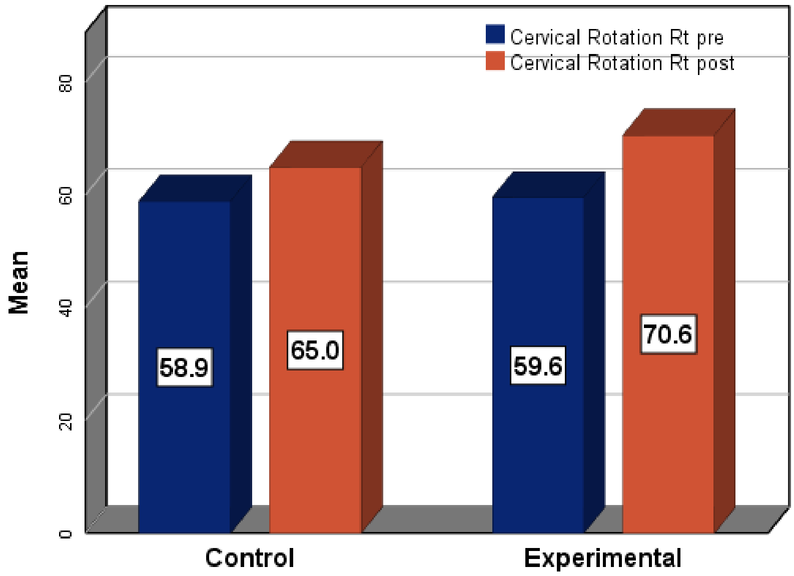
There were significant within-group comparisons for the Cervical rotation ROM on both sides (Rt ≪ *p*<0.001*) while no significant between-group comparisons for the right side (*p*=0.256) and significant between-group comparisons for the left side (*p*<0.001*) (Table).

Table 5: Mean, within and between group comparisons for Cervical Rotation ROM.

		Cervical Rotation ROM (degrees) $\overline{X}$ ± SD	
		Pre-intervention	**Post-intervention**
Group A (Control)	**Rt side**	58.90±10.79	64.95 ±10.61
	Lt side	61.63±9.29	68.03 ±10.03
Group B (Experimental)	**Rt side**	59.58±11.37	70.65±10.95
	Lt side	68.91±10.02	79.26±10.15

		Within group comparison			
		MS	**F**	***p*-value**	**Sig**
Rt	**Time**	1904.715	49.199	<0.001*	Sig
	Time*Group	163.448	4.222	0.045*	Sig
Lt	**Time**	1823.243	51.133	<0.001*	Sig
	Time*Group	100.937	2.831	0.099	NS
	Between-group comparison				
		MS	**F**	***p*-value**	**Sig**
Group A vs Group B Rt		264.128	1.318	0.256	NS
Group A vs Group B Lt		2227.135	13.963	<0.001*	Sig

: Mean $\overline{X}$ **MS: Mean square** ***p*-value: Probability value**
SD: Standard Deviation **S: Significant** **NS: Non-significant**



Table(5):. Figure 5: Mean Cervical Rotation ROM (Rt) of control and Experimental groups.

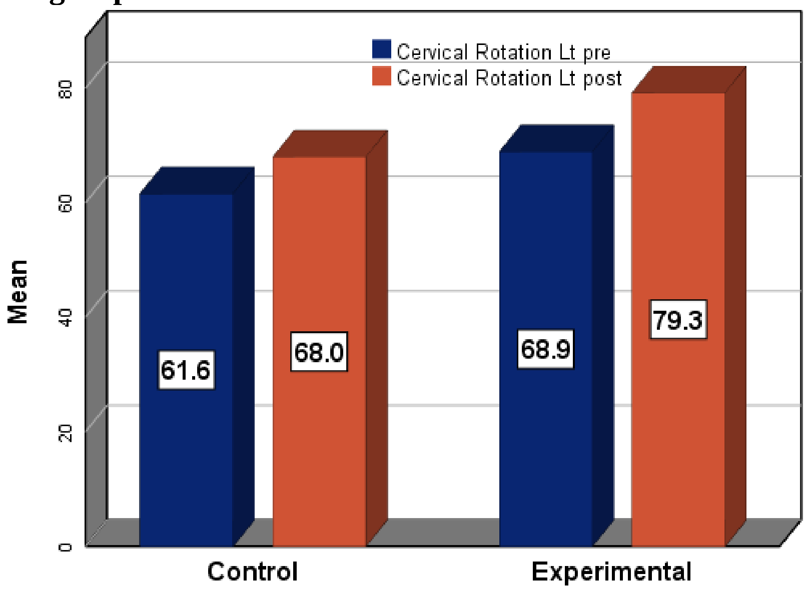


Table 5:. Figure 6: Cervical Rotation ROM (Lt) of control and Experimental groups.

Discussion

The aim of this study has been to explore the effect of adding extracorporeal shockwave therapy to the standradized physiotherapy on active cervical range of motion, in patients with chronic mechanical neck pain.

The results of the study suggested that adding ESWT to standradized physiotherapy is better in effect than standradized physiotherapy alone on active cervical range of motion This effect may be due to releasing taut bands that cause Myofascial syndrome, which is characterized by taut bands that cause pain and limit range of motion in individuals with chronic mechanical neck pain these taut bands is a substantial source of pain, hence breaking the cycle of pain by relaxing tense bands is the primary goal of its treatment **[12]**.

ESWT has been shown to enhance blood circulation in capillary blood vessels, reduce muscle tension, and reduce pain, and interfere with the process of excessive stimulation of nociceptors and stimulation of nerves **[40]**. Furthermore, **Hausdorf et al**. hypothesized that ESWT decreases pain in the muscle tissues by destroying non-myelinated fibers selectively and lowering the amount of substance P in the target tissues and dorsal root ganglia **[41,42]**.

Also, ESWT may promote the development of new blood vessels and improve perfusion in ischemic tissues **[43]**. This was supported by previous literature that comparing traditional ultrasound therapy, and ESWT plus active exercises (animal simulation) exercise can reduce pain, improve cervical joint ROM, and strengthen muscles **[23].** For patients with cervical myofascial pain syndrome, low-level laser therapy (LLLT) and extracorporeal shockwave therapy have similar short-term effects on pain alleviation, reduction of pressure pain threshold, and improvement of cervical flexion and extension range of motion. There is no significant difference between the two treatments **[25]**. These results were supported by **Battecha et al (2024)** who reported that patients with mechanical neck pain who had ESWT and conventional treatment could benefit by having more neck range of motion, less NDI, and less pain. Therefore, both modalities were successful in the improvement of clinical symptoms with no significant difference between them. So, they can be used as alternatives to treat patients with mechanical neck pain **[19]**. This study revealed that improvement in AROM in all directions non-significantly except for cervical rotation to the left significantly improved this improvement may be attributed to ESWT application on the right upper fibers of the trapezius for all patients. We thought ESWT may act as a trigger point releaser, breaking the trigger point formation cycle (metabolic crisis) mechanically and reducing muscle tension. Therefore, upper descending fibers of the trapezius improved structurally and functionally so its unilateral action which is contralateral rotation was improved. Because all patients received ESWT on the right-side upper portion of the trapezius cervical rotation to the left was improved significantly. On the other hand, just a few cases received left-side ESWT so cervical rotation to the right was not improved significantly. These results can be attributed to pain relief arising from trigger point release. ESWT may release trigger points and reduce muscle pain during movement making ROM free of pain and guarding so ROM became greater without pain avoidance limited ROM. Researchers suggested ROM may improve more with ESWT because ROM is not a primary variable that is affected directly by ESWT. ROM is a secondary variable as well it may need more time for ESWT application to reveal its effect.

These results are not liable to bias due to tester bias or statistician that's due to the utilizationt of a double blinded study design. The design included random assignment of subjects into the groups and blinded tester and statistician to the group allocation.

Conclusion

These results suggested that Adding ESWT to the standradized physiotherapy program may be superior in improving active cervical range of motion compared to standradized physiotherapy alone in patients with chronic mechanical neck pain.

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