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Original Article

Effect of Nerve Gliding Exercises and Conventional Treatment in Reducing Wrist Pain among Female Sewing Machine Operators

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Abstract

Background: The wrist is the most used site in operating the sewing machine. Sewing machine operators work continuously for long period of time. The repetitive movement on the wrist joint can cause pain. The acute wrist pain can affect the daily living activities.
Objective: The objective of this study was to determine the effect of nerve gliding exercises and conventional treatment in reducing wrist pain among female sewing machine operators.
Study type, settings & duration: The study was randomized controlled trial that was carried out at Government Polytechnic Institute for Women, Dandy School for Fashion Designing and Government Technical Training Institute for Women, Lahore from February to August 2021.
Methodology: Total of 66 female participants were randomly taken from different settings. Lottery method sampling technique was used to randomly place the 66 participants into two groups: group A (nerve gliding exercises) as treatment group and group B (TENS for conventional treatment) as control group. The treatment was given for 4 weeks. The TENS was applied for 25-30 mins with the frequency of 80-120Hz. Patient Related Wrist Evaluation questionnaire was used. The independent t-test and paired sample t-test was used for statistical analysis.
Results: The group A (nerve gliding exercises) has pain relief score 34.14±7.69 whereas group B (conventional treatment) has pain relief score 38.58±10.14. The *p*-value obtained <0.05 was statistically significant in group A. This *p*-value shows that the treatment of group A was more effective than group B in reducing wrist pain in female sewing machine operators.
Conclusion: This study concluded that nerve gliding exercises was more effective than conventional treatment for the reduction of wrist pain in female sewing machine operators.
Key words: Median nerve, ulnar nerve, exercises, wrist pain, TENS.

Introduction

Sewing machine operator's work is tiresome due to whole day repetitive movement in elbow, wrist and fingers.[1] Sewing machine operator's work may cause pain in the wrist due to continuous movement in the wrist. They sit in front of sewing machine for many hours and use hands for griping objects and holding things which can cause pain in the wrist. The repetitive movements of wrist cause injuries to muscles, tendons, joints and entrapment of nerve.[2]

Wrist pain is the one of the most difficult pain as it hinders the day to day activities particularly for sewing machine operators.[3] The fourth mostly use site is wrist in upper extremity after hand, elbow & shoulder. Walker-Bone et al. had reported that in general population, wrist pain is around 10%.[4] The wrist pain may be due to muscle stiffness. The muscles become fatigued due to continuous working of wrist.[5]

The physiology of pain is that pain occurs due to complicated nature of brain pathway. The painful stimulus is detected by nociceptors in peripheral tissues and transfer information to the spinal cord by the dorsal horn. The dorsal horn neurons of spinal cord gain high level of excitation from the nerves present in peripheries, the

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Authors Contribution

RA conceptualized the project and did the data collection. MA did the literature search and performed the statistical analysis. Drafting, revision & writing of manuscript were done by RN.

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information is transferred to higher centers in the brain, which examine it and make an suitable response. The synapses in the pain pathway from other sensory systems can be modifying by inputs and the response of brain to pain differs on the basis of physiological and environmental conditions. Pain can be divided into two types on the basis of which pathway are affected. Nociceptive pain is more divided into musculoskeletal, somatic and visceral pain. Musculoskeletal pain can be felt on skin, muscles, joints and ligaments. The different sensory modalities are detected by nociceptors, including vibration, temperature, inflammation and stretch; these can be produce very painful sensations when present at highest level. The Central nervous system can be affected by non-nociceptive pain which is pinched nerve.[6]

Transcutaneous electrical nerve stimulation (TENS) is used to reduce pain by activating complex neuronal network. The reduction in pain is due to activation of descending inhibitory system.[7] TENS unit is the battery operated device which is used in pain treatment. It is working by producing small amount of electrical impulses through electrodes pad that attach on a patient's skin. These impulses act on the central nervous system and reduce the ability to transfer the pain signal to the brain and spinal cord.[8] Application of TENS is divided into two frequencies: Low frequency and high frequency. Low frequency TENS is define as 10Hz or less frequency and high frequency TENS define as a 50Hz or 100Hz and above. Low frequency TENS with higher intensity is used to induce motor contraction, on the other hand high frequency TENS with low intensity is used to reduce pain. TENS may effect on endogenous pain. At the segmental level, the descending activity transfer across the rostral ventral medulla (RVM) and the midbrain preaqueductal grey (PAG) in the brainstem may have inhibitory effects. This PAG-RVM transfer segmental inhibition by opioidergic pathway. The effect of low frequency TENS is limit in people using opioids for relieving pain as they first act across μ-opioids receptor pathway.[9]

Nerve gliding is a stretching technique that improves the mobility and free up injure nerve through specific range of motion by the body. Nerves become injured by trauma or repetitive motions. During movement, they lose their ability to slide within their sheath which cause pain and reduce mobility.[10] Mobilization emphasis on the nervous system itself and structure around nervous system. It is used in the treatment of nerve-related musculoskeletal conditions in the clinical practice.[11] Nerve gliding exercise (median, ulnar & radial nerve) is used to increase the mechano-sensitivity of the nervous system. It is used along the tract of nerve, which improve the pain and disability.[12] Neural mobilization produces mechanical effect in way of nerve strain and excursion. There are three types of nerve gliding techniques (slide, glide and tension) for treatment.[13] Nerve tension and gliding is important for making plan of treatment about neural mobilization. The tension creates stress by pulling both nerve ends, which reduces axoplasmic and vascular flow. Gliding occur within nerve by itself and also between the nerve and its interfacing tissue. Nerve gliding can accumulate the intraneural and extraneural fluid, which manage the increased pressure due to edema or fibroblastic activity. Nerve mobilization is used to reduce pressure, increase blood flow and restoring tissue mobility.[14] Neural mobilization is effected on nerve movement, axoplasmic flow and its connective tissue and the circulation of nerve by changing the nervous system pressure and distribution of intraneural oedema. There are various ways in which neural mobilization can be performed by using manual mobilization of nerve, passive movement and exercise. The purpose of neural mobilization is to rehabilitate the neurophysiological and mechanical function of the nerve.[15] Due to repetitive movement, the nerve becomes tight and entrapped under the sheath. The nerve tension and tightness may cause pain and limit motion; the nerve gliding exercises may improve mobility and reduce pain. The purpose of nerve gliding is to reduce pain, increase range of motion, flexibility and functions.[16]

Methodology

The study design was randomized controlled trial. The duration of this study was 6 months. The simple random sampling technique was used. A sample size was estimated 66.[17] The formula was given by Kelsey et al.

$$N1=\frac{\left(Z_{\frac{\alpha}{2}}+Z_{1-\beta}\right)2\ pq(r+1)}{r(p1-p2)^2}$$

The setting of this study was Government Polytechnic Institute for Women, Dandy School for Fashion Designing and Government Technical Training Institute for Women located in Lahore.

The inclusion criteria was females experiencing wrist pain between the age of 25-35 years(work for at least 3 months duration),[18] Working for 5-6 hours continuously and females diagnosed with wrist pain with specific type of tests such as Scaphoid Shift test for Scapholunate Instability, Finkelstein Test for DeQuervain's syndrome.[19] The single blinding method was used.

The exclusion criteria was pregnant females, females with co morbidities and recent injuries like fractures, infections and inflammations etc. Patient-Related Work Evaluation questionnaire was used for assessing the pain and functional disability

After attaining approval from ethical committee, individuals were randomly allocated according to the inclusion and exclusion criteria. Lottery method was used to randomly place the 66 participants into two groups: group A for nerve gliding exercises and group B for conventional treatment and an informed consent was acquired from them. The Patient-Related Wrist Evaluation questionnaire was used for evaluating the wrist pain and disability among female sewing machine operators. This questionnaire had 15 items divided into two scales: pain scale and function scale. The pain scale contained 5 items which were rated from 0-10 and the function scale contained 10 items divided into specific activities (having 6 items) and usual activities (having 4 items). The minimum score was 0 and maximum score was 100. Zero was the best score and 100 were the worst score. The duration of treatment in this study was 4 weeks for both groups.

First of all, PRWE questionnaire was filled by the participants of both groups. Group A received nerve gliding exercises (median, ulnar and radial nerve) in which the position of patient was either lying, sitting or standing. It was performed in 1 to 3 sets of 10 repetitions for 30 seconds to one minute for 4 weeks.[10]

Group B received TENS as conventional treatment. For acute pain control, the mode of high frequency TENS used was modulated and continuous. The frequency of TENS used was 80-120Hz. The duration of TENS used was 30-60 minutes up to 4 times a day for 4 weeks. The pulse width of TENS used was 60µsec.[20] After 4 weeks, the PRWE questionnaire was again filled by the participants of both groups for checking the difference in reduction of pain.

The ethical approval was obtained from Institutional Review Board of Rashid Latif Medical College, Lahore vide reference IRB/2021/015.

Results

In this study, all participants were female having age 25-35 years. They had acute wrist pain because the pain had duration of at least 3 months. The 66 selected populations were of sewing machine operators in Lahore. The high frequency TENS mode was used in this study.

Table 1: The descriptive analysis of age and group.

Group	
Mean	1.50
Std. Deviation	0.54
Minimum	1.00
Maximum	2.00
Age	
Mean	28.88
Std. Deviation	2.76
Minimum	25.00
Maximum	34.00

The normality of data was check by Kolmogorov Smirnov test. The results of this study showed that the mean and standard deviation of the age was 28.88±2.76 (Table-1). The comparison among both groups (group A for nerve gliding exercises and group B for TENS) by using paired sample t-test and independent sample t-test showed that the pain, specific activity, usual activity and PRWE scoring difference was statically significant (*p*-value <0.001) and (*p*-value <0.05) with greater difference seen in nerve gliding exercise group (group A).

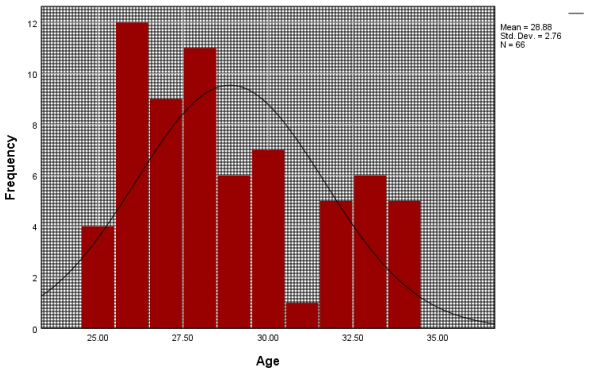

Figure: This table shows that the Mean (28.88), Std. Deviation (2.76) of the age in which the minimum age was 25 and maximum age was 34.

The Table-2 shows that the pain, specific activity, usual activity and PRWE scoring difference in both groups (group A for nerve gliding exercises and group B for TENS) using paired sample t-test, the result was statistically significant (*p*-value <0.001).

The pain, specific activity, usual activity and PRWE scoring difference in both groups using independent t-test is elaborated in table 3, the results are statistically significant (*p*-value <0.05), with greater difference seen in nerve gliding exercise group (group A).

Table 2: Comparison of groups by using Paired Sample T-Test.

Group		*Pre*	*Post*	*p-value*
A	Pain	28.88±6.32	17.15±5.38	<0.001*
	Specific Activity	31.00±7.53	17.76±5.78	<0.001*
	Usual Activity	22.30±4.26	13.36±3.23	<0.001*
	PRWE scoring	55.32±11.75	34.14±7.69	<0.001*
B	Pain	24.24±5.76	19.48±5.91	<0.001*
	Specific Activity	28.42±6.03	22.09±6.54	<0.001*
	Usual Activity	20.21±3.24	15.97±3.41	<0.001*
	PRWE scoring	48.55±9.61	38.58±10.14	<0.001*

Table 3: Comparison within groups by using Independent Sample T-Test.

Time		*Group A*	*Group B*	*p-value*
Pre	Pain	28.88±6.32	24.24±5.76	0.003*
	Specific Activity	31.00±7.53	28.42±6.03	0.130
	Usual Activity	22.30±4.26	20.21±3.24	0.028*
	PRWE scoring	55.32±11.75	48.55±9.61	0.013*
Post	Pain	17.15±5.38	19.48±5.91	0.098
	Specific Activity	17.76±5.78	22.09±6.54	0.006*
	Usual Activity	13.36±3.23	15.97±3.41	0.002*
	PRWE scoring	34.14±7.69	38.58±10.14	0.050*

Discussion

In this study, effect of nerve gliding exercises and conventional treatment in reducing wrist pain among female swing machine operators was assessed. There was limited literature available on wrist pain in female sewing machine operators. This was the new study in which TENS and nerve gliding exercises were compared to reduce the wrist pain. After the result, it was observed that the nerve gliding exercises were more effective as compared to TENS as conventional treatment. The main objectives were to demonstrate the effect of nerve gliding exercises and use of TENS in reducing wrist pain. The result was explained by unique methods. This study was created to find out the most effective treatment for reducing wrist pain in female sewing machine operators. Indeed, a previous study reported that neural pain was common in sewing machine operators and if it persist for longer time period, the pain is increased and the wrist becomes functionally limited. Nerve gliding exercises (median, ulnar and radial nerve) used to improve the pain, function and quality of life in female sewing machine operators.[10] However some studies does not support therapeutic effect of nerve gliding exercise or neural mobilization. Due to lack of quality and quantity of available researches, there was limited evidence of studies to support the use of neural mobilization.[21]

TENS was used as an alone treatment for mild to moderate pain. TENS gave maximum pain relief when the strong non-painful TENS treatment is used. It could be used to relief nociceptive, musculoskeletal and neuropathic pain.[22] TENS was used as a non-opioid modality for effectively treating the acute pain. It was a safe modality for using an acute or chronic pain. It was effectively used in the emergency department for pain relief.[23] In another study, TENS was beneficial in treating actinic keratoses during photodynamic therapy. Patients took the treatment and had greater effect on reducing the neuralgia pain.[24] A study has compared TENS versus no treatment in pain relief and could not define any effect in pain relief. The study has reported that these conflicting results could be due to lack and low quality of evidence and limited data.[25]

A study reported that neural pain was common in sewing machine operators and if it was persisted for longer time period, the pain was increased and the wrist became functionally limited. Nerve gliding exercises used to improve the pain, function and quality of life in female sewing machine operators.[12] But some studies do not support therapeutic effect of nerve gliding exercise or neural mobilization. Due to lack of quality, and quantity of available researches, there were limited evidences of studies which had to support the use of neural mobilization.[21] The result of this study was that the nerve gliding exercises resulted in pain relief better than TENS.

Due to limited resources, sample size of only 66 was taken, sample was confined to Lahore due to COVID-19 and there was a limited period of time. Future researchers are advised to take larger sample size, sample should be taken from other cities as well and male gender should also be included.

The conclusion of this study was that nerve gliding exercises was more effective than conventional treatment for the reduction of wrist pain in female sewing machine operators.

Conflict of interest: None declared.

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