Research Article

Effects of Sternocleidomastoid Stretching Exercises on Temporomandibular Joint Range of Motion: A Quasi-Experimental Study

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Abstract

Objective: To compare the effect of SCM stretching exercise on TMJ and neck range of motion, and TMJ pain between experimental and control group. **Methodology:** This quasi-experimental study conducted in academic year 2018 to 2019 included 96 participants, selected using non-probability convenience sampling with diagnosed Temporo Mandibular Disorder (TMD) and shortened SCM between the age group of 20 to 40 years and divided into two groups; 48 participants in each control and experimental group which were given the standard treatment for TMD, and SCM stretching intervention along with the standard physical therapy treatment respectively. Post treatment outcomes were measured as Maximal Mouth Opening (MMO) by plastic ruler and pain improvement by numeric pain rating scale. Neck range of motion measured by goniometer. The analysis was done by using Wilcoxon signed rank test and Mann Whitney U test on SPSS version 22. **Results:** The intra group analysis of pre-treatment and post treatment variables showed signi icant improvement in neck ROM, MMO and decreasing the pain values with p-value <0.05. Between group's comparisons showed that there was a signi icant difference in all neck range of motions. While there was no statistical significance in MMO with p value 0.609(>0.05) and in pain values as p value is 0.662 (>0.05). **Conclusion:** This study concluded that SCM stretching technique is found to be effective for increasing neck range of motion but its effect on reducing TMJ pain and TMJ range of motion was non-signi icant.

Keywords: TMJ; Temporomandibular disorder; Temporomandibular joint; Sternocleidomastoid stretching; TMJ range of motion

Introduction

Temporomandibular disorder is considered a collection of pathologies involving temporomandibular joint, masticatory muscles and surrounding structures [1]. According to the latest studies, population suffering from temporomandibular disorder is assumed to be 75-90% [2]. Usually the population affected by TMD lies between the age group of 13-35 years [3]. Women are more affected from TMD, more than 70% as compared to men [4].

The relative association between cervical and craniofacial area has been studied in many different perspectives. As head postures are maintained by Sterno Cleido Mastoid (SCM) along with other muscles for head balance so it is considered that SCM is involved in functional disorders of stomatognathic system and adjusting the mandibular movement.

Altered position of the mandible and masticatory muscle tone may lead to impaired head balance resulting in restriction of TMJ range of motion [5].

In literature the existence of connection between jaw symptoms and cervical muscle dysfunction is reported. According to evidence, the pain from cervical muscle origin may be referred to cranial structures including jaw muscles there is a marked link of jaw muscle's pain and increased in neck Electro My Ography (EMG) activity with the head and jaw at rest [6]. Sternocleidomastoid is the most

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co-contraction inducing muscle among other cervical muscles during maximal clenching activity of TMJ, which acts in close coordination with the cervical muscles. Due to prolonged, repetitive and habitual postures SCM may get excessive stress for being a posture maintaining muscle. It may get local contractions in skeletal muscle fibers and taut bands in the muscle resulting in cervical spine dysfunction as well as TMJ range of motion restriction. Literature reported that recordings of EMG activities in contralateral SCM found to be high and more asymmetric in diseased group as compared to healthy group depending on head and neck position. The relationship of SCM muscle pain to TMJ muscle pain and movement restriction is also reported [7,8].

For that reason SCM could be assumed as one of the factors effecting TMJ range of motion. This study is conducted to identify if there is significant improvement of TMJ range of motion following SCM stretching in patients with TMD, as TMD is associated with cervical dysfunction as well.

Materials and Methods

The quasi experimental study carried out including 96 participants selected by non-probability convenience sampling. Sample size was 48 per arm according to the following formula:

$$N = \frac{2\left[\left(Z_{\alpha} + Z_{1-\beta}\right)^2 (\sigma)^2\right]}{(\mu_1 - \mu_2)^2}$$

N=required sample size, Z_{α}=alpha error at 5% confidence interval=1.96, $Z_{1-\beta}$=power of study at 20%, σ=standard deviation=4.3 mm, μ_1=40.9, μ_2=41.9 mm.

Patient population was taken from the physical therapy and dentistry department of Fatima Memorial Hospital after taking permission from the respective departments. The inclusion criteria was patients with diagnosed temporomandibular disorder, the age group of 20-40 years, shortened sternocleidomastoid, full permanent dentition and the exclusion criteria included patients with post-traumatic temporomandibular disorder, rheumatoid arthritis, any other autoimmune disease or any type of dental prosthesis. Among 96 participants, 48 allocated in control group which were given the standard treatment for TMD and 48 participants in experimental group which were given SCM stretching intervention along with the standard physical therapy treatment. Standard physical therapy treatment included techniques of active and passive exercises for improvement in range of motion along with ultrasound treatment [9]. Stretching exercise included static stretching of SCM muscle by adopting the supine lying position by the patient for 3 times, 1 minute for each. Treatment to both groups was given under supervision of experienced physiotherapist of more than 3 years of experience. Frequency of treatment was thrice weekly for 6 weeks for both groups. The base line measurements were similar in both groups. Study was single blinded as the patients were unaware of their respected groups. Post treatment follow up of patients was taken on third week basis. The TMJ range of motion as primary outcome was measured in millimeters as a distance between median cleft of the upper and lower teeth referred as Maximal Mouth Opening (MMO) using disposable plastic ruler [10]. Referred to a previous study 43 ± 4 millimeters is considered the normal range of jaw opening using the standardized measurement protocol. Limitation in this range is considered the sign of restricted joint ROM. TMJ pain intensity was assessed by numeric pain rating scale 1-10 integers (1=lowest value, 10=highest value). Secondary outcomes were neck range of motions measured by goniometer. The consent forms were given to all patients and the confidentiality of patients was highly maintained. Any participant, if refused to participate in the study at any time, his/her decision was respected. Study was commended to institutional review board after the approval from respected committee of Fatima Memorial Hospital. The data was entered in SPSS (version 22). As the data showed non parametric distribution, Wilcoxon signed rank test used for intra group comparison of pretreatment and post treatment variables of each of control and experimental group and Mann Whitney U test used between group comparison of post treatment variables of control and experimental groups.

Results

By age participants showed mean value of 30.64 with STD ± 5.2. Among the total number of 96 cases 62 (64.6%) were females and 34 (35.4%) were males (Table 1).

Table 1: Baseline characteristics for gender and age.

Age (mean ± SD)		Control group	Experimental group	Total
		30.21 ± 5.3	29.72 ± 6.1	
Gender *f* (%)	Male	16 (16.6)	18 (18.7)	34 (35.4)
	Female	32 (33.3)	30 (31.2)	62 (64.6)

The analysis through Wilcoxon signed rank test within the control group of pre-treatment and post treatment observations showed significant difference with the p-value of 0.000 (<0.05) in all neck range of motion, maximal mouth opening, as well as in pain numeric scale values (Table 2).

Table 2: Wilcoxon sugned rank test within the control group.

Movement	Pre treatment		Post treatment		P value
	Mean	Std	Mean	Std	
Maximal Mouth opening (mm)	32.3	1.2	39	1.6	0
Neck forward flexion (degrees)	37.8	3.5	41.3	3.8	0
Neck backward extension (degrees)	24.7	2.3	29.8	1.9	0
Neck side flexion (R) (degrees)	23.3	1.1	26.3	1.1	0
Neck side flexion (L) (degrees)	26.3	1.1	31	1.7	0
Neck rotation (R) (degrees)	49	2.8	54	3.3	0
Neck rotation (L) (degrees)	49.4	2.9	55.1	3.1	0
Numeric pain rating scale value	7.5	0.8	3.4	0.6	0

Wilcoxon signed rank analysis within the experimental group of pre and post treatment values showed significant difference in all neck ranges and MMO with significant reduction in pain level having p value 0.000(<0.05) (Table 3).

Table 3: Wilcoxon signed rank test within experimental group.

Movement	Pre treatment		Post treatment		P value
	Mean	Std	Mean	Std	
Maximal mouth opening (mm)	31.1	1.9	39.2	0.8	0
Neck forward flexion (degrees)	41.3	3.8	48.4	2.6	0
Neck backward extension (degrees)	26.9	3	37.2	2.5	0
Neck side flexion (R) (degrees)	26	1.2	32.5	1.4	0
Neck side flexion (L) (degrees)	26.3	1.1	32.5	1.5	0
Neck rotation (R) (degrees)	48.9	2.7	56	2	0
Neck rotation (L) (degrees)	49.4	3.2	58.1	1.6	0
Numeric pain rating scale values	7.5	0.7	3.3	0.5	0

The analysis between group's comparison done with the data of post treatment control group and post treatment experimental group variables and compared *via* Mann Whitney U test, it showed that there was a significant difference with p value of 0.000 (<0.05) in all neck range of motions. While there was no significant difference in MMO as the p value was 0.609 (>0.05) and in pain of participants on numeric pain rating scale values as p value is 0.662 (>0.05) showed in Table 4.

Table 4: Mann-whitney test between control and experimental group.

Movement	Post treatment control group		Post treatment experimental group		P value
	Mean	Std	Mean	Std	
Maximal Mouth Opening (mm)	39	1.6	39.2	0.81	0.609
Neck forward flexion (degrees)	41.3	3.8	48.4	2.6	0
Neck backward extension (degrees)	29.8	1.9	37.2	2.5	0
Neck side flexion (R) (degrees)	26.3	1.1	32.5	1.4	0
Neck side flexion (L) (degrees)	31	1.7	32.5	1.5	0
Neck rotation (R) (degrees)	54	3.3	56	2	0.003
Neck rotation (L) (degrees)	55.1	3.1	58.1	1.6	0
Numeric pain rating scale values	3.46	0.6	3.38	0.5	0.662

Discussion

This study was conducted on patients experiencing TMD showed the mean age of participants as 30.6 ± 5.2 similar as the literature also reported the population affected by TMD lies between the younger age group of 20-40 years. This study showed a greater proportion of participants belongs to female gender as according to a study females are more effected from TMD as compared to male gender [10]. In present study majority of the patients reported sharp joint pain in lower jaw, neck, face, headache and pain during swallowing, yawning, chewing, grating sounds, joint clicking and joint locking on the same side of involved joint. Assumption for this study about the association of SCM tightness and head posture alterations which ultimately leads to increase masticatory muscle tone and TMJ range of motion restriction are made by the many literature reports [11]. Keeping the phenomenon of association of SCM increased tone and TMJ range of motion restriction there is limited literature about this line of treatment for increasing the TMJ range of motion while other physical therapy treatment options as massage therapy, SCM trigger point release therapy and Kinesis tapping on tight SCM in patients with TMD are reported to be effective for increasing ROM of TMJ [12]. So according to present study SCM is reported to be associated with the head postures. Along with the standard physical therapy treatment, head posture correction, SCM lengthening/stretching and other neck muscle lengthening is important for neck ROM as post treatment analysis between control and experimental group showed significant improvement in neck ROM but there was no significant difference in MMO and numeric pain rating scale values explaining that SCM stretching is joint pain. For improving MMO more critical work is required to be done for evaluating the effectiveness of SCM stretching techniques.

Limitation

The present study has some limitations regarding muscle tone measurement, isolation of SCM from other neck muscles causing the limited TMJ range of motion and limited head posture evaluation due to SCM tightness. EMG was not available in the research setting which is more reliable tool for measuring increased muscle tone as compared to muscle length measurement for measuring tight SCM. Randomization was not done among groups.

Conclusion

SCM stretching technique may be effective for increasing neck range of motion but their association with TMJ range of motion still needs further work to be done, as there is limited literature about its effectiveness.

Conflict of Interest

The study has no conflict of interest.

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