Original Article

Physiotherapy and Occupational Therapy Journal
Volume 12 Number 4, October – December 2019
DOI: http://dx.doi.org/10.21088/potj.0974.5777.12419.4

Effect of Unilateral Mechanical Neck Pain on Cervical Flexion Strength and ROM Among University Students

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How to cite this article:
Meenakshi Singh, Nimra Nasir. Effect of Unilateral Mechanical Neck Pain on Cervical Flexion Strength and ROM Among University Students. Physiotherapy and Occupational Therapy Journal. 2019;12(4):195–201.

Abstract

Background: Mechanical neck pain is defined as pain experienced anywhere in the base of skull at ear level to the upper part of back or shoulder. It affects 2/3 of population, usually those employed in desk jobs with a sustained neck posture. The prevalence of neck pain has found to be increasing and is mainly found in female population. The contributing factors for neck pain are poor posture, strenuous activities related to sports or occupation. Mechanical neck pain has an impact on our daily living and cause limitations in activities and work capacity, and induces economic and medical burden on individuals and is a major health issue. There is need to identify the effect of mechanical neck pain on muscular strength and ROM.

Methods: Total 50 subjects (male and female) with unilateral mechanical neck pain (duration 3 or more months) with NDI Score ≥10 from age group 18–28 years were recruited in this study. A written consent was taken from all the subjects. General Assessment of the subjects was performed to meet the inclusion criteria. Prior to test subjects were informed about the procedure. To assess the cervical flexor strength, a modified sphygmomanometer was used. The ROM of cervical flexion, extension, lateral flexion and rotation was measured by using a universal goniometer.

Result: The result of this study was analyzed using the Pearson correlation coefficient. The study concludes that there is no significant effect of mechanical neck pain on cervical flexor strength but there is significant effect of mechanical neck pain on cervical flexion and lateral flexion range of motion.

Conclusion: Proper biomechanics help the students to work effectively and for longer duration without any neck pain. Any alteration in the biomechanics affecting ROM and strength will lead to pain and affect ADLs. So regular stretching of muscles and neck ROM exercises must be continued especially by students and working people in order to avoid any neck pain and to improve quality of life.

Keywords: Mechanical neck pain; Range of motion; Strength.

Introduction

Neck pain is defined as the pain experienced anywhere, in the base of skull, at ear level to the upper part of back or shoulder. The various symptoms associated with mechanical neck pain include general pain or aches that can be because of postural fatigue in the neck, shoulders or pain and discomfort in the soft tissues surrounding neck and shoulders.[1] It is the non specific or simple pain that is of mechanical or postural basis. It affects 2/3 of population at some or the other point in life especially in the middle age.[2] It usually affects people who are employed in desk jobs and people who develop a sustained neck posture.

The main contributing factors responsible for neck pain are poor posture, anxiety, depression, strenuous activities related to occupation or sports.[3] Mechanical neck pain has soft tissue origin

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such as cervical strain/sprain or myofascial pain. The causes of neck pain are mainly soft tissue injuries such as ligament sprain, muscle strain, degenerative disk diseases. Weakness of anterior cervical flexor muscles also contributes to persistent pain in patients complaining of chronic neck pain. Lack of inhibition of cervical extensors keep these muscles in spasm.[4] This predispose the patient to developing a forward head posture along with tightness of sternocleidomastoid muscles.[5]

In 1966, Krout and Anderson used manual muscle testing techniques to determine that patients who have chronic neck pain are weaker than healthy individuals; and patients responded to strengthening program.[6] Patients with neck pain complaints of muscle stiffness, increase tension which often leads to postural adaptations and pain.[2] The prevalence of mechanical neck pain is higher in Scandinavian countries than in European and Asian countries.[7] Prevalence of neck pain was 99.2% among 500 subjects in Uttar Pradesh, India.[8] In USA the prevalence of neck pain is 4.4% with 3.9% in men and 4.8% in women.[9]

The prevalence of neck pain has found to be increasing since 50 years and it is found to be more prevalent in females.[10] Limitation of mobility in neck has found to be very common in people with neck pain. Many manual therapy techniques are also being used for treatment of mechanical neck pain such as muscle energy technique, releasing the trigger points, spinal mobilization includes NAGS & SNAGS, cyriax.[11]

Many studies have been conducted that shows that there may be involvement of different muscles in mechanical neck pain such as upper, middle and lower trapezius, levator scapulae, serratus anterior. Studies have shown that people with neck pain have impaired strength, endurance of different muscles. Few researches say that trigger points in muscles like upper traps, SCM, levator scapulae lead to symptoms in patients of mechanical neck pain with upper traps mostly affected.[12,13] So neck strengthening exercises have found to be beneficial in decreasing pain, increasing the strength of cervical muscles, cervical range of motion and also decreasing the risk of any disability.[14]

To improve patients, quality of life as well as his functional status it is necessary to find out what all structures are responsible for producing disability and pain. Over the past few years, many studies have shown association b/w limited strength and endurance of cervical musculature and non-specific neck pain. There are many studies which say that lower trapezius strength is mainly affected in neck pain patients. Exercises such as stabilization exercises of neck are also being used to relieve pain, improve the functioning in nonspecific neck pain.[15] Many researchers have suggested that posture is related to health status. Poor posture leads to dysfunction and pain. People who have desk jobs or office workers spend a lot of time working on computer. The relationship between sitting posture and neck pain is still controversial even though some studies shows, significant difference in head neck posture in people with and without neck pain.[16]

Poor posture is not only common in middle age but also in young age which mean that neck pain is also common in young individuals especially in college going students. The excess of stress continuously put greater pressure on cervical region leading to neck pain. It has been seen that long duration work has tend to reduce endurance of the muscles and increase in fatigue around the neck or cervical region. With the increasing sedentary lifestyle especially reliance on the, computer tech at the work place, it is predicted that the overall prevalence will, continue to increase in future. Therefore effective management of neck pain is important not just for relieving the symptoms related to it but most importantly, to prevent the recurrent episode of neck pain and to prevent the suffering and loss of work productivity.[17] Shannon M. Peterson et al.[18] 2011, research stated that there is association of weakness of lower trapezius fibers and neck pain.

Mechanical neck pain has an impact on our daily living and cause limitations in activities and work capacity, and induces economic and medical burden on individuals and is a major health issue. Studies have shown that when imbalance between neck musculature occurs, the problem is generally prevalent. Hence there is need to identify the effect of mechanical neck pain on muscular strength and ROM. However the need of this study is to see the effect of unilateral mechanical neck pain on cervical flexion strength and ROM among university students.

Materials and Methods

Total 50 subjects (male and female) with unilateral mechanical neck pain (duration 3 or more months) with NDI Score ≥10 from age group 18–28 years were recruited in this study.[19] A written consent was taken from all the subjects. General Assessment of the subjects was performed to meet the inclusion criteria. Prior to test subjects were informed

about the procedure. To assess the cervical flexor strength, a modified sphygmomanometer was used (Fig. 1). With subject in hook lying position, the cuff of sphygmomanometer was inflated to 20 mm Hg and was placed between the upper cervical spine and surface of table. The patient was asked to flex the neck and hold it for 10 seconds. The normal response is achieving 26–30 mm Hg.

The ROM of cervical flexion, extension, lateral flexion and rotation was measured by using a universal goniometer (Fig. 2). For measuring cervical flexion and extension ROM (Fig. 3). Subject was asked to sit with thoracic and lumbar spine supported by the back of chair. Axis of goniometer was placed over external auditory meatus with the stable arm aligning perpendicular to ground and movable arm aligning along the tip of nose. Normal ROM for cervical flexion is 0–60 degrees and cervical extension is 0–75 degrees. To measure the cervical lateral flexion ROM, subject was asked to sit on a chair with back well supported. Axis of goniometer was placed over the spinous process of C7 vertebra with the stable arm aligning perpendicular to ground and movable arm along the dorsal midline of head taking occipital protuberance as reference. Normal ROM for lateral flexion is 0–45 degrees. For measuring cervical rotation ROM, subject was asked to sit on a chair with back well supported. Axis of goniometer was placed over center of cranial aspect of head with stable arm parallel to imaginary line between two acromion process & movable arm aligning along the tip of nose. Normal ROM for cervical rotation is 0–80 degree.

Correlation between Neck Disability Index (NDI) and cervical flexor strength and ROM was measured to assess their relationship.

Fig. 1: Modified sphygmomanometer.

Fig. 2: Universal goniometer.

Fig. 3: Measurement of cervical flexor strength.

Fig. 4: Measurement of range of motion.

Results

Table 1 shows Demographic data that contains gender ratio and affected side of patients.

Table 2 shows correlation between mechanical neck pain and cervical flexor strength, where p>0.05 which suggests the relation is non-significant.

Table 3 shows correlation between right side mechanical neck pain and cervical flexion ROM.

Table 4 shows the correlation between right side mechanical neck pain and lateral flexion ROM.

Table 1: Demographic data

Total no. of subjects	**50**
Gender (M:F)	6:44
Affected side (left/right)	21/29

Table 2: Correlation between neck disability index and cervical flexor strength

Affected side	**Neck disability index (Mean ± SD)**	**Cervical flexor strength (Mean ± SD)**	**Correlation (*r*-value)**
Right side	16.068 ± 5.535	54.565 ± 9.426	–0.022 (NS)
Left side	15.523 ± 4.621	51.080 ± 7.298	0.009 (NS)

*NS- Non-significant at p <0.05

Table 3 Correlation between neck disability index and cervical flexion ROM

Affected side	**Neck disability index (Mean ± SD)**	**Cervical flexion ROM (Mean ± SD)**	**Correlation (*r*-value)**
Right side	16.068 ± 5.531	34.379 ± 8.136	0.287 *
Left side	15.523 ± 4.621	51.080 ± 7.298	0.009 (NS)

**S*- Significant

Table 4: Correlation between neck disability index and right lateral flexion ROM

Affected side	**Neck disability index (Mean ± SD)**	**Cervical flexion ROM (Mean ± Sd)**	**Correlation (*r*-value)**
Right side	16.068 ± 5.531	35.355 ± 6.092	–0.275 *
Left side	15.523 ± 4.621	53.933 ± 9.959	–0.158 (NS)

**S*- significant

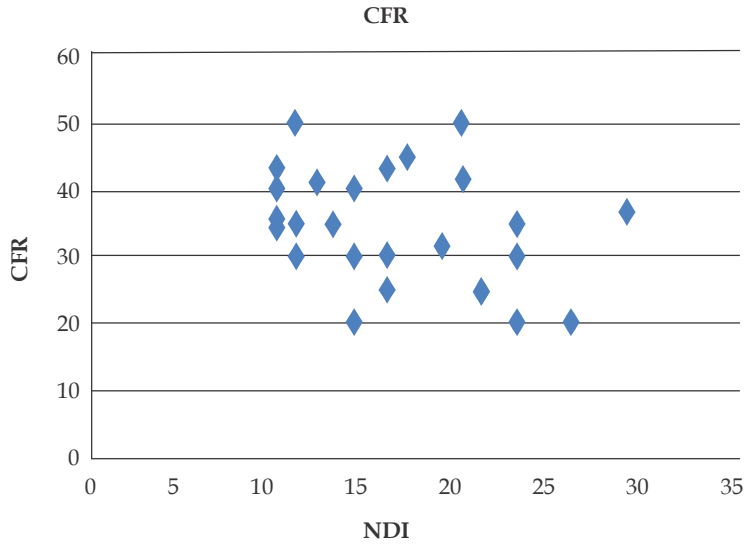

Fig. 5: Correlation between neck disability index and cervical flexion ROM (right side).

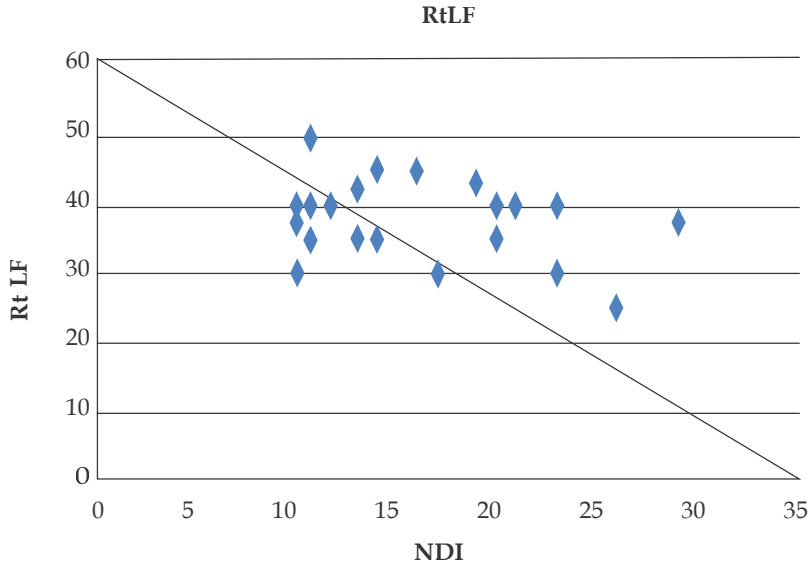

Fig. 6: Correlation between neck disability index and right lateral flexion ROM (right side).

Discussion

In this study, there is no significant correlation present in between cervical flexor strength and mechanical neck pain (Table 2 and Fig. 5). It is indicative of that mechanical neck pain alone cannot affect strength among college going students, some other factors should also be considered in conjunction. In one of the studies of Jin young kim et al. (2016),[20] it is stated that the forward head posture is considered one of the commonest findings in patients with chronic mechanical neck pain and results in serious alterations in joints between neck and the head but in this study. Forward head posture was not measured and if forward head posture was measured, we may get high correlation between cervical flexor muscle strength and mechanical neck pain.

This study shows significant correlation present between cervical flexion ROM and mechanical neck pain in right side affected students (Table 3). This is because college going students are mostly involved in writing and laptop work which require constant neck flexion leading to muscle fatigue and neck pain. But there is no correlation present between cervical flexion ROM and mechanical neck pain in left side affected students. This is because the number of left side affected students was less in number as compared to right side affected students; we may get correlation if the number of left side affected students were more in number or if the sample size was bigger.

In this study, there is significant correlation present between lateral flexion ROM and mechanical neck pain (Table 4 and Fig. 6). In one of the studies of Shannon M. Peterson et al. (2016),[21] they stated weakness of lower fibers of trapezius, middle fibers of trapezius &serratus anterior may be present in people with neck pain. So they recommended strengthening as well as endurance exercises for these muscles in neck pain with movement deficit. The study concluded that strength of lower trapezius on the affected side was lower in subjects with mechanical neck pain and lead to movement deficit. In this study significant correlation is present between lateral flexion ROM & neck pain in both right side and left side affected individuals which is indicative of lower strength of lower trapezius muscle on both sides.

There is no significant correlation between present between extension and rotation ROM with mechanical neck pain because in this study the extension and rotation ROM were not much affected as the other ROM. Moreover the sample size was also small; we may get correlation if the sample size was big.

Clinical implication of the study

This study may help in considerations that need to be taken for proper management of mechanical neck pain. As in this study subjects with neck pain found to have reduced flexion and lateral flexion ROM, hence for the proper management of patients with mechanical neck pain, there is a need to evaluate for the same and treat for restoration of ROM and strength of muscles.

Limitations of the study

1. The sample size was small.
2. The study was limited to 18–28 age group.
3. The study can be done on specific population only.

Scope of further study

1. Further studies must focus on other factors like strength of scapulothoracic muscles and measurement of forward posture in neck pain individuals because may be the findings then vary due to postural abnormalities and strength deficit. These factors may correlate to mechanical neck pain.
2. The study was done on young population. So future study can include the middle-aged individuals.
3. The sample size was also small, the future study should include a large sample size for better results.
4. The study can be correlated with shoulder joint too.

Conclusion

The study was conducted to check if there is association between mechanical neck pain and cervical flexor strength and to check association of mechanical neck pain with cervical ROM that is flexion, extension, lateral flexion and rotation. Proper biomechanics help the students to work effectively and for longer duration without any neck pain. Any alteration in the biomechanics that is ROM and strength will lead to pain and affect ADLs. The study suggested that there is negative correlation between mechanical neck pain and cervical flexor strength but there is significant correlation between mechanical neck pain and cervical flexion ROM. Also there is significant correlation between mechanical neck pain and lateral flexion ROM. So regular stretching of muscles and neck ROM exercises must be continued especially by students and working people in order to avoid any neck pain and to improve quality of life.

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