

Effect of rehabilitation on muscle imbalance in upper cross syndrome

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Abstract

Aims and Objective: To assess the effect of exercise, stretching and postural correction on neck Imbalance and To assess the effect of exercise, stretching and postural correction on forward head posture **Design:** Experimental **Study Setting:** Dr.D.Y.Patil I.P.D. and O.P.D. **Participants:** Twenty four patients with the complain of neck pain in the age group of 20-40 years and history of working in same posture for 6 to 8 hours participated in the study. **Intervention:** All the patients were conveniently selected from the OPD of Physiotherapy clinic in our institution and after signing of consent form they were given 2 week rehabilitation protocol of stretching and strengthening (based on Sherrington law) and posture correction exercise. Craniovertebral angle, NDI and VAS were used to assess the pain discomfort and disability caused by neck pain. **Outcome Measures:** VAS (visual analogue scale), Neck Disability Index, CV angle.

Result: 24 participants completed the study. Comparison of pre and post Neck disability index, Neck pain (VAS) and craniovertebral angle were found to be statistically significant ($p<0.05$) at the end of 2 week rehabilitation protocol of stretching, strengthening and posture correction **Conclusion:** This study concludes that the effect of exercise, stretching and postural correction was there on Pain, neck Imbalance and also on the forward head posture. There was significant decrease in pain and neck disability.

Keyword: upper cross syndrome, Sherrington law of reciprocal inhibition, deep neck flexors, forward head posture

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the posture that develops is forward head posture (turtle neck posture). maintaining the head forward for long periods of time cause musculoskeletal disorders such as ‘upper crossed syndrome’, which involves reduced lordosis of the lower cervical spine and along with it kyphosis of the upper thoracic vertebrae.^{2,3} A forward head posture is considered a cervical musculoskeletal variation that has been associated with shortening of the posterior neck extensor muscles and tightening of the anterior neck muscles.⁴ If a muscle becomes tight or over contracted, then whether you are moving it or not it will stay tight leading to poor Range of movement and stiffness at the joint causing further wear and tear of the joint.. If a muscle becomes weak or if it is overstretched it will not be able to support joint properly and sudden quick movements can cause irritation of the joint and also damage to its surrounding ligaments. because of such kind of over contracted or over stretched muscle the body tries to compensate or adapt elsewhere within the system because of the body’s attempt at homeostasis⁵ (Panjabi, 199 Neck pain (NP) is a most common problem in the community now a days because of lot of use of electronic gadgets like mobiles, computers, laptops etc. People

INTRODUCTION

Perfect posture is considered to be a state of musculoskeletal balance that involves correct and balanced use of body musculature with minimal amount of stress or strain exerted by the body (Griegel-Morris *et al.* 1992)¹. Long hours of sitting in front of computer screen in a posture continuous staring at a monitor, located below the height of eyesight, causes the head to move forward, which causing exaggerated anterior curve in the lower cervical vertebrae and exaggerated posterior curve in the upper thoracic vertebrae to maintain balance;

continuously focusing on screen for one or another reasons develops neck pain affecting at some point in their life. One study says that approx 70 % of people are suffering from neck pain and about 5-10 % are getting disabled because of it.⁶. NP is usually sometimes considered as self limiting and benign, but it is common cause for workers disability seeking medical compensations.⁷ Upper crossed syndrome, as described by Janda is also known as “student syndrome” or “corporate syndrome”. it is reciprocal tightness and weakness develops because of bad postural tendencies..This pattern is seen typically in head and shoulder region.^{6,7,8}.A muscle must be short enough to provide stability of a joint and long enough to allow mobility. A muscle does not function in isolation and is dependent on the normality of its antagonist. There is close relationship between antagonist and agonist muscle. Muscle activation is associated with inhibition of its agonist so that over activation of muscle group occurs as in muscle spasm, and will be associated with inhibition of the antagonist group, which may then become weak. this situation produces what is known as imbalance (i.e. a disruption of the coordinated interplay of muscle)⁹ Janda has observed that certain muscle group respond to a dysfunction by tightening and shortening, while other muscle group react by inhibition, atrophy and weakness. This imbalance

METHOD

Participants

A Total of 24 subjects having neck imbalance (upper cross Syndrome) participated in this study. Subjects were recruited from OPD of D.Y Patil Hospital. All subjects met the following inclusion Criteria: 1) Forward head posture 2).Tenderness and trigger point in trapezius, rhomboids 3)Persons working for 6 to 8 hours in same posture.4) Age 20 to 40 (5)Sex both males and females.⁶⁾

Study design

The study was an Experimental study, taking place recruited from August 2013 to December 2013 with two week of follow-up. 41 patient were contacted out of which 32 matched the criteria, but there were 7 drop outs out of which 2 got increased pain and 5 patient can't come daily

Interventions

The Rehabilitation Program consisted of 8 sessions,4 times a week followed by home protocol. Intervention was conducted individually and not in a group format. The Physical therapist was involved in performing the intervention as well as conducting the assessment. The examiner first palpated the spinous process of C7 by asking the subject to flex and extend the neck. The more prominent process that is C7 spinous process was marked by marker to ensure correct location of bony landmark.

leads to: Neck Pain, Thoracic outlet syndrome, Cervicogenic headache, Spondylitis, Poor lung inflation and IBS type symptoms such as constipation, diahorrea, abdominal pain etc. Poor posture can result in pain, muscle aches, tension and headache and can lead to long term complications such as osteoarthritis, spondylosis, early degenerative changes etc. This Paradoxical muscular imbalance is due to Sherrington's law of reciprocal innervations as stated by Janda that which when one muscle is shortened or tightened its opposite muscle is lengthened or is relax. So, while treating patients with this imbalance the shortened muscles must be stretched or restored before strengthening the weak muscles.¹⁰⁻¹⁵ According to Kapandji for every inch your head moves forwards, it gains 10 pounds in weight, and the muscles has work more in order to keep chin balanced and straight. This continuous activation of sub occipital muscle causes compression of sub occipital nerves and sometimes causing headaches. The muscles that are prone to tightness are mainly postural i.e. Sternocleidomastoid, Scalene Levator scapulae, Pectoralis major, Trapazius (Upper part), Flexors of upper limb, Quadratus lumborum, Back extensors. And the muscle that are prone to weakness are mainly phasic muscle i.e. Short cervical flexors, Pectoralis Major, Trapazius, Rhomboids, Seratus Anterior, Subscapularis, Extensors of upper limb.

Person having cervicogenic headache. Subjects were excluded with following exclusion criteria 1) Bilateral headache 2) Persons doing regular exercise and gyming 3) Torticollis 4) Persons having scoliosis and recent fracture in upper limb. 5) Patient having hearing loss. 6) Patient having frozen shoulder. All subjects were required to sign and written informed consent document approved by the ethical committee at Dr. D.Y Patil Vidyapeeth, Padamshree Dr. D.Y Patil college of Physiotherapy, Pimpri, Pune.

During the assessment, the subject was asked to stand in normal relaxed posture without making him conscious about to keep neck straight. conscious people were asked to do neck flexion and extension 3 times and then e neck in comfortable neutral position (Watson, 1994)¹⁶. The photograph was taken in right saggital view. The cranivertebral angle was measured by taking a lateral photograph. Tightness of Pectoralis major, Pectoralis minor and trapezius was assessed and 10 RM and 1 RM was measured for Middle Trapezius, Lower Trapezius, Rhomboidus.¹⁷

- For Rhomboids 1RM and 10 RM testing the test position was used prone lying with shoulder in 90degree of abduction as used for deltoid because Smith and colleague found that the posterior deltoid manual muscle test produce greater rhomboids activity then other test

- position described in Daniels and worthingham's manual muscle testing.^{18,19}
- For Middle and lower Trapezius (1RM and 10 RM) testing the test position was prone lying head stabilized on towel roll with shoulder in 90degree of abduction and 110 degree of abduction respectively and then performing Adduction of the scapula with upward rotation and without elevation of the shoulder girdle, met by 90° abduction of arm with lateral rotation as described by Kendal et.al weight cuff of 250,500,1000,2000 were used to asses 1 RM and 10 RM.

The rehabilitation part was based on Sherrington's law of reciprocal innervations which states that: When treating patients with UCS the shortened muscles must be stretched before giving strength training of the weakened muscles. so stretching was followed by strengthening. Stretching was given 3sets of 20 sec hold for trapezius, Pectoralis major and minor. strengthening was given on individual strength basis with or without weight cuff.(3sets of 10 repetition each for rhomboids, lower and middle trapezius in the same position as used in assessment). Specific postural exercises included: making them aware of their forward head posture, so that they can voluntarily correct at their work place. Bruegger's Position of external arm rotation, shoulder abduction and retraction of the scapulae. This position with simultaneous head and neck retraction is a strengthening exercise for deep neck flexors and lower scapular stabilizers. Core strengthening for neck : patient was asked to Lie supine with a pillow under head and a small rolled towel supporting the normal curve of the neck. and then was asked to nod the chin slowly down towards the throat by keeping head on the pillow and hold it for 10 counts. and then relax. At the end of 2 week session the

home programme was given including self stretching and continuation of protocol almost 3 times a day

Statistical Analysis

Data was analyzed using the WinPepi Professional Statistics, version 11.38 software, and primer of Biostatistics version 7. Initially data was analyzed in WinPepi for normal distribution Paired t -test was used for normally distributed data and for rest Wilcoxon Signed Rank Test was used to compare the improvement after 2 week protocol. A level of significance was taken at p<0.05.

RESULT

Twenty four subjects including 16 females and 8 males participated in the study. The mean age of subjects was 28.9 ± 8 years, ranging from 20-40 years. There mean hours of doing work in same posture was 7.4 hrs. Almost all of the Patient visited OPD with the complain of Neck pain and upper back pain. Forward head posture was measured one day prior to intervention (baseline data) and after 2 weeks. Pre and Post analysis. first test for normal distribution was done and then Paired t test was applied,(t=4.63) which showed significant improvement in patients (p c=.0001).But none of the patient reached to ideal posture. Neck disability index was measured pre and post i.e. after 2 weeks Paired t-test was applied, which showed significant improvement in NDI scores. first test for normal distribution was done Pitman's test for equality of variances was done then Wilcox on Signed Rank Test giving t=9.46, P = 0.000. Pain intensity was measured at rest and at work on VAS scale on day one (baseline data) and at end of study i.e. after 2 weeks. Group analysis, which showed that on comparing the values between the baseline i.e. VAS(R) and VAS(W) after 2 weeks, significant improvements were noted (t = 9.09) (p = 0.0001) and (t = 12.10) (p = 0.0001) respectively at rest and work.

Table 1: Illustrating pre and post mean, SD and P value

	Week=0 N=24 Mean ± SD	Week=2 N=24 Mean ± SD	P value
Age	28.9±8.04	28.9±8.04	
Craniovertebral angle	49.44±4.60	53.05±5.48	P=0.0001
DNF endurance	23.58±1.32	26.33±1.13	P=0.0001
Neck disability index (%)	38.54±11.77	22.29±6.48	P=0.0001
VAS at work	6.38±1.13	3.29± 0.75	P=0.0001
VAS at rest	4.83±1.99	2.13± 1.19	P=0.0001

(Significant at p ≤ 0.05 with 95% confidence interval)

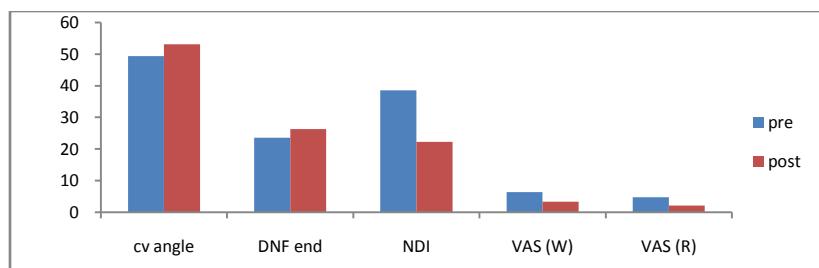


Figure 1: Illustrating pre and post mean, SD and P value

Table 2: 10 RM strength of B/L right and Left of Trapezius, rhomboids

	Pre Mean ±SD	Post Mean ±SD
Rt. Lower trap	572.92±357.22	729.17±360.53
Lt. Lower trap	375±353.55	614.58±303.77
Rt. Middle trap	885.42±466.13	1104.17±504.96
Lt. Middle trap	739.58±463.21	958.33±440.27
Rt. Rhomboids	979.17±510.31	1197.92±483.30
Lt. Rhomboids	822.92±463.21	979.17±396.43

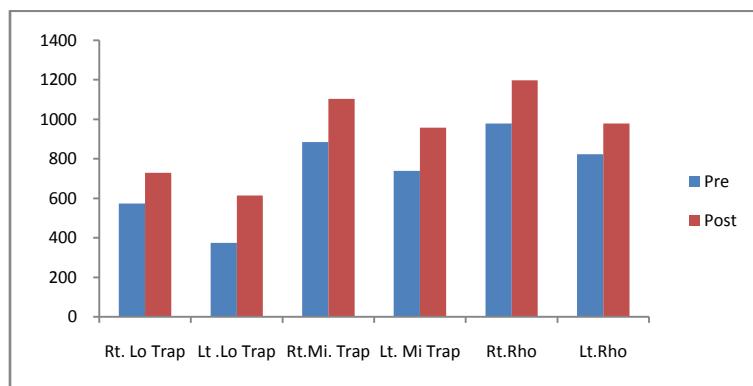


Figure 2: 10 RM strength of B/L right and Left of Trapezius, rhomboids

Table 3: Comparison of Tightness of Trapezius, pectoralis major and minor of right and left side

	pre	post
Rt. Trap	1.92±0.58	0.96±0.96
Lt. Trap	2.13±0.68	0.83±0.48
Rt. PecMaj	1.46±0.59	0.92±0.65
Lt. PecMaj	1.42±0.65	0.96±0.69
Rt. Pec Min	1.42±0.50	1.25±0.74
Lt. Pec Min	1.58±0.58	1.25±0.68

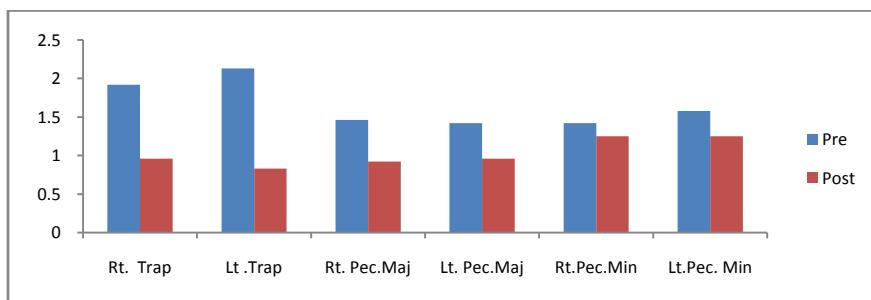
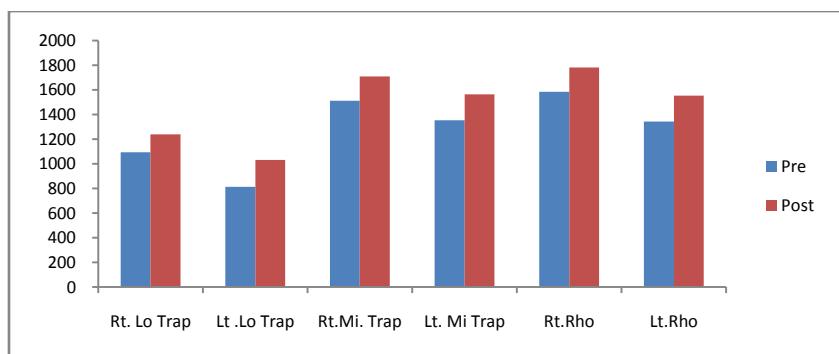


Figure 3: Comparison of Tightness of Trapezius, pectoralis major and minor of right and left side

Table 4: Comparison of 1 RM of trapezius (middle, lower), rhomboids of right and left side

	Pre	Post
Rt. Lo Trap	1093.75±540.80	1239.58±445.26

Lt. Lo Trap	812.5 ± 437.69	1031.25 ± 323.97
Rt.Mi. Trap	1510.42 ± 601.08	1708.33 ± 554.95
Lt. Mi Trap	1354.17 ± 494.08	1562.5 ± 484.82
Rt.Rho	1583.33 ± 535.01	1781.25 ± 528.08
Lt.Rho	1343.75 ± 487.97	1552.08 ± 448.30

**Figure 4:** Comparison of 1 RM of trapezius (middle, lower), rhomboids of right and left side**Figure 5:** Deep neck flexor strengthening.(2)middle trapezius strengthening.(3)craniovertebral angle

DISCUSSION

Pain and disability significantly reduced in the experimental group, Also forward head posture showed significant improvement statistically but none of the individual reached to ideal posture. G Jull et.al also concluded that neck pain and disability has been reduced, but this has not affect over the forward head posture²⁰. The reason for this might be that pain relief had occurred because of systemic pain modulation effect and because of posture correction and feedback that was taught during the session.²¹. It is known that the cause of work related neck disorders is multidimensional which is associated and linked with number of individual physical and psychosocial factors. In comparison with any other professionals the sedentary job workers (i.e. chair desk workers) and people working in same posture for many hours report a higher incidence of work related disorders. The reason for this may be that hours of sitting in a same posture increases stress on the non-contractile structures and on the posterior cervical muscle, which causes neck pain, as was reported by Chris Ho Ting et al.,²². According to Watson and Trott, another reason repetitive minor trauma and sustained forward head posture affects

the length tension relationship of cervical musculature, which leads to increased flexion movement thereby causing pain.²³ the cranial cervical flexion is the principal action of Deep neck flexor muscle²⁴. Deep neck flexor training plays major role in supporting and straightening the cervical lordosis. The high endurance of deep cervical flexor muscle, during the functional task of sitting has shown improvement in maintaining upright posture and strengthening of these muscles reduces neck pain symptoms so its training is recommended.²⁴⁻²⁷ In our study, there was significant reduction in the pain associated with neck movements but there was no change in photographic measure of measuring FHP. This was in contrast with the study of Jull et al.²⁰ Also, some studies have proved the direct relationship of endurance and forward head posture in reducing neck pain²³ In our study as reported by patients, that were getting aware of their wrong posture which they were voluntarily correcting at their work place. In our study the strength (1RM) and endurance (10RM) was assessed for lower trapezius, middle trapezius and rhomboids and it was found that as compare to middle trapezius and Rhomboids the strength and endurance of lower trapezius was less. This may be

due to less of overhead activity in sedentary and chair bound professionals. Further study regarding this may clear this concepts. Also the Range of motion which was the hidden objective in my study showed improvement as compared to pre Range of Motion. In our study, the sample size taken was small, so a further study with a larger sample would provide a better generalization of the results. It was also realized that the postures that patient adopted during photographic analysis are not same as they adopt while working. Also it was observed during study that 2 week protocol alone is not sufficient for posture correction as the VAS scoring was reduce but the Pain was not gone fully, so there should be continuous follow up many times in a day and progression of the exercise for posture correction

CONCLUSION

This study concludes that the effect of exercise, stretching and postural correction was there on Pain, neck Imbalance and also on the forward head posture. There was significant decrease in pain and neck disability. Hence this study rejects the 'null Hypothesis' and accepts the Alternate hypothesis that " The effect of exercise, stretching and posture correction is effective in relieving neck imbalance among the professional and forward head posture". To give our protocol a more grounded base of practice, we suggest that. Further studies are also recommended using protocols of 2 weeks or longer durations, with subsequent follow ups. Electromyography could be used concurrently, to provide additional information on muscle activation associated with any observed postural changes. Moreover, future studies could be designed by using a more dynamic and functional outcome measure, instead of using static photographic measure, for forward head posture.

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