



Review article

**A structured exercise program for upper cross syndrome**

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**ABSTRACT**

Musculoskeletal injuries have been regarded as the major problem in young population. As stated by Karel Lewitt, muscle imbalances occur prior the functional dysfunction. In 1988 Dr. Janda put forth an interesting concept by dividing muscles in to two groups: Postural and Phasic. He attributes a predicted pattern that encompasses neck, upper part of thoracic spine and shoulder joint, Upper Cross Syndrome. Abnormal posture and its direction affect the physical activity and its direction lead to over stress on supportive structure as well as repetitive bending. Therefore the optimum mechanical condition of body and the energy consumption in daily life activities and exercise has particular importance. He noticed that imbalance in children begins in upper limb as compared to the lower limb, as seen in adults. Different factors like hereditary, stress, bad posture while working and lack of regular exercises can influence the frequency of such disorders. Musculoskeletal disorder (MSD) is one of the important problems encountered by ergonomist in various workplaces around the world. Cervical spine and soft tissue disorder example ligament, facet joint, muscles and disc are important reasons for neck pain due to abnormal posture. A multidisciplinary physiotherapy is advised to approach the impairments including exercises, manual therapy and modalities. Assessment methods for upper cross syndrome include postural examination, measurement range of motion for cervical spine, muscle length testing and evaluation of muscle strength. Various interventions include use of modalities, manual therapy techniques, Therapeutic exercises, Muscle Stretching, Instrument-Assisted soft tissue mobilization etc.

**Keywords:** Upper Cross Syndrome, Bad Posture, Soft Tissue Disorder, Postural Abnormality Physiotherapy Interventions.

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**INTRODUCTION**

Musculoskeletal damage has been represented as the main problem among younger population. Mental, visual and postural problem can bring musculoskeletal issues, specifically affecting the thoracic and cervical region. Masculinity and physical activity are also associated with musculoskeletal distress<sup>[1]</sup>.

In 1988 Dr. Janda put forth an interesting concept by dividing muscles in to two groups: Postural and Phasic. Postural or tonic muscles are responsible for maintaining upright posture, have tendency to become tight and hyper tonic. Phasic muscles, which include almost all other muscles, tend to become weak and hypotonic. Upper cross syndrome is explained as pattern of muscle imbalance which is situated over head and shoulder region which is mainly due to bad posture. It is due to over activity and tightness of upper trapezius, levator scapulae, Sternocleidomastoid, pectoral muscles and reciprocal weakness with extensibility of deep lower trapezius, serratus anterior deep cervical flexors. Dr. Janda called this process Upper Cross Syndrome<sup>[2]</sup>. Today we might refer to it as ‘Text Neck’. Similar kind

of pattern can continue or isolated in lower body called Lower Cross Syndrome. When found in upper body and lower body it is called Stratification or Layer Syndrome.

The series of imbalance produce joint abnormality specifically at Atlanta-occipital joint, C4-C5 segments, glenohumeral joint, cervico-thoracic joint and T4-T5 segment<sup>[2]</sup>. It is commonly seen in the people with forward head posture, desk job workers, dentist, beauticians etc. Clinical features include increase in cervical lordosis, thoracic kyphosis, hunching of thoracic spine (Rounded upper back), forward head posture and shoulder protraction, abduction or Rotation, winging of scapula and reduced motion of thoracic spine. Common Symptoms include Chest pain, Migraine and tension headache, neck, shoulder or upper back pain, Sore shoulder blades, Pain in jaw Tiredness, Strain over back of neck which is accompanied with weakness in front, Neck stiffness, Mid back pain, pain, numbness and tingling in upper arm.

According to Karel Lewitt (1994), usually muscle imbalance

occurs prior to functional imbalance. Janda also described the muscle dysfunction as a condition in which some muscles become weak and inhibited and others become shortened and stiff. Janda predicted that this pattern that encompasses the neck, upper part of the thoracic spine and shoulder joint, Upper Cross Syndrome [3]. He noticed that the most movements which were repetitive reinforce the postural system and neglect the phasic system which may lead to imbalance. He further noticed that imbalance in children begins in upper extremity as compared to the lower extremity, as seen in adults.

Poor posture and its directions affect the physical activity and its direction leads to increased stress on supportive structures as well as repetitive bending. Therefore the optimum mechanical condition of body, the energy consumption in activities of daily living and exercise has particular importance [4]. Musculoskeletal disorder (MSD) is one of the major problems seen by ergonomist in various workplaces around the world. MSD is defined as injuries and disorders of soft tissue and nervous system. Some physical factors at workplace that were associated with the occurrence of MSD were awkward posture, repetitive movements, force of movement, vibration and temperature [5]. Different factors like hereditary, unsuitable posture and stress during work and lack of regular exercises can affect the occurrence of such disorder [6]. Cervical spine and soft tissue disorder e.g. Facet joint, muscles, ligaments and disc are important causes for neck pain caused by postural dysfunction.

The occurrence of neck pain in general population was 15 to 44% every year while in office workers its frequency is up to 50-60% [3]. The underlying cause of pain is bad posture, faulty positions, habits which can reduce flexibility and cause tension around muscles and soft tissues. Chronic cervical pain is caused by constantly maintained muscle contraction, fatigue and muscle weakness. Therefore, the muscle strength in the cervical region plays an important role in the cervical stabilization and its control [7]. Besides limitation in activities of daily living, neck pain affects working lives as well, which results in work loss leading the community to bear substantial and economical depletion [3].

Assessment methods for upper cross syndrome include postural examination, measurement range of motion for cervical spine, muscle length testing and evaluation of muscle strength. Various interventions include use of modalities, manual therapy techniques, Therapeutic exercises, Muscle Stretching, Instrument-Assisted soft tissue mobilization etc.

This review is important to undertake as the true burden particularly of upper back pain and forward head posture is in its recurrent and or persistent state. The objective of the study is to systematically review the literature from various studies from Web of Science, Scopus, CINHALL, and Pub Med etc.

### Prevalence of upper cross syndrome

A cross-sectional study was performed to rule out the ubiquity of upper extremity musculoskeletal disorders in dentists. 130 dentist (84 males and 46 females) participated. Subjective Data was taken by demographic questionnaire, Posture was examined using Rapid Upper Limb Assessment Scale (RULA) during normal line of duty and musculoskeletal pain was assessed using Nordic Musculoskeletal Questionnaire (NMQ). After assessment of physical status, it was concluded that 82.8% of subjects were at high risk of musculoskeletal disorders. Out of them majority of population had pain in neck (55.9%) and shoulder (43.8%). The present findings show that improper posture of dentists during work has a considerable effect on musculoskeletal disorders. So, further investigations were required to avoid the ill effects of poor posture [6].

Among laundry workers a prevalence study was conducted. Random sampling method was used to select them. Various special tests were performed to assess the tightness and weakness of the muscles. Population included was asked to fill Oswestry neck disability questionnaire. Data was obtained and analyze from 50 laundry workers out of them 14 patients had symptoms of upper cross syndrome. 4 patients had mild neck disability; 11 patients had moderate and 35 with no disability. The impact and extent of upper cross syndrome provides a better understanding from the findings of this study. Thus, the study concludes that in laundry workers the prevalence of upper cross syndrome is significantly high. The patient with forward head posture complains of neck pain as main symptom [8].

A cross-sectional study was done in 12 -16-year-old students to determine occurrence of Forward head posture, in which three hundred students as participant were included. After obtaining signed consent neck was exposed, on C7 vertebrae and tragus of ear colored marker were placed.

In order to measure forward head posture using adobe acrobat reader DC photo was taken, it was further digitized for calculation of cranio-vertebral angle. 189 out of 300 students were found to have forward head posture in which there was 56% male and 71% female students. Thus the study revealed that the prevalence of 63% forward head posture was seen between twelve- sixteen year old school children [9]. Another cross-sectional overview comprising of 244 physiotherapy undergraduates was done for determining occurrence plus risk factor in the development of upper cross syndrome Information was reported toward upper back, shoulder and neck agony and elements, for example physical activity, visual stress, mechanical presentation and relaxation time was gathered which promotes upper cross syndrome. There were 57 participants who were having pain at neck in passive range of motion during flexion and 187 were not having neck pain. There were 60 participants having thoracic pain during

active range of motion during flexion and 184 had no thoracic pain in active range of motion during flexion. In this study 30-40 participants presented with neck pain, rounded shoulder and flexion posture with consider amount of pain over thoracic area, thus are mainly prone to UCS. However, some literature doesn't have clear cut criterion for diagnosing upper cross syndrome [9].

### Physical examination

Most of the time evaluation of postural function requires technological materials but simple test can also be used to identify postural dysfunction. A number of methods exist to evaluate posture such as Visual Observation Method, Plumb Line Method, Goniometry, Photographic and Digitization Method, Radiographic Method, Photogrammetric Method and Scales like REEDCO Posture Assessment Scale. Various manual therapy approaches have been studied for reducing muscle tightness. Assessment of muscle tightness can be done using Muscle Length Testing and Weakness can be evaluated using Manual Muscle Testing.

### Procedure

Postural Assessment: A number of methods exist to evaluate posture such as Visual Observation Method, Plumb Line Method, Goniometry, Photographic and Digitization Method, Radiographic Method, Photogrammetric Method and Scales like REEDCO Posture Assessment Scale. Assessment of Tight Muscles, Pectoralis major. Ask the subject to lie supine and clasp both the hand behind the head. Then the subject will lower the arm until the elbow touches the couch. Test is positive if elbow does not touch the table.

Pectoralis minor and Levator scapulae, subject is in supine lying. The examiner places the heel of hand over the coracoid process and pushes it toward the couch. Normally posterior movement occurs with no discomfort to subject. Test is positive if there is muscle tissue stretch during the posterior movement. Latissimus dorsi, subject is asked to elevate the arm fully through forward flexion. If the muscle length is normal then arm will be extended to rest against treatment table.

Assessment of Weak Muscles, Deep Neck Flexors (Longus capitis and longus colli), patient position: supine lying with elbow extended. Fixation: anterior abdominals should be stronger to obtain stabilization from thorax to pelvis. Test: subject will depress the chin, approximating towards the sternum. Then they will perform cervical spine flexion simultaneously therapist apply pressure in posterior direction against forehead. Weakness: cervical spine hyperextension that results into forward head posture.

Triceps Brachi, patient position supine lying, fixation shoulder in 90 flexion with arm supported position perpendicular to table. Test: extension of elbow, pressure against the forearm in direction of flexion, weakness: inability to extend the forearm against

gravity. Serratus anterior, subject stood up with arm flexed forward in 90° flexion. The examiner applies force to the arm in backward direction. Test is positive: if winging of scapula is seen.

Rhomboids, patient in prone lying position. Testing arm behind the body and hand kept at opposite side back pocket. Examiner will place index finger along the medial border of scapula while asking the subject to push the shoulder in forward direction against resistance in order to achieve trapezius relaxation. Now the subject is asked to raise hand and forearm away from the body. Thumb is pushed away from the scapula when rhomboids are normal.

Middle trapezius, subject is positioned in prone lying. Arm is then abducted in 90° flexion and laterally rotated. The examiner resists the horizontal extension of arm looking for scapular retraction to occur. If there is protraction of scapula, then test is suggestive of weakened middle fibers of trapezius.

Lower Trapezius, subject lies prone with arm abducting to 120° and shoulder rotated laterally. Therapist apply resistance towards diagonal extension and observe scapular retraction which occurs normally. If scapular protraction occurs, then test is positive revealing weakness of lower trapezius.

### Management of UCS

Postural correction, when sitting in front of laptop, ensure that screen must be at the eye level to avoid poking of chin or facing downward, the keyboard should be leveled such that elbows, making angle of 90 degree, shoulders slightly backwards and wrist placed in neutral position with feet's supported on the ground and back in erect position.

Stretching Exercises for Tight Muscles, Pectoralis major: Stand in open type doorway. Raise each arm to the sideways bent to 90°, palm forward Rest the palm on door frame. By slowly stepping forward using one foot, feel for stretch in chest and shoulder. Holding for 30 seconds, step back and then relax. It should be repeated three times or as prescribed by therapist. Levator Scapulae: It is begun by sitting upright in chair, grasping edge of couch with one hand, while rotating head to opposite side of that of anchored arm, chin tuck is to be performed toward the chest. With free hand grasping the back of head, gently pull downward until stretch is felt and hold. Upper trapezius, begin with sitting upright in chair, grasps the edge with one hand. Now rotate the head up, towards the side of examining arm and then slowly lean towards the shoulder, applying pressure with hand until stretch and hold it.

Sternocleidomastoid: Hold the towel firmly towards chest, while crossing the arm. With other hand towel is pressed against the cheekbone, while towel doing the work and stretch is felt at the neck. Latissimus dorsi: Stand with feet apart, chest up and head back over the shoulder. Raising right arm overhead and grabbing right hand wrist

with the left side. Gently, pull right wrist over the left and bend the trunk to left until comfortable stretch is experienced. Hold for 30-60 seconds. Repeat same on other side also.

**Strengthening Exercises for Weak Muscles, Deep neck Flexors: (Chin Tucks)** Stand with back over the wall and feet's slightly in front. Ask to do small nodding movements, sliding the base of skull to the wall. Hold 5 seconds and repeat ten times. **Middle and lower Trapezius: (Chin Up)** tell the subject to grasp the pull up bar with palms, slightly closer with shoulders width apart. While fully extending arm with feet crossed behind, both knees bent to 90° exhale and pull ourselves up until head lies above the bar. When lifting up keep the elbows closer to body.

**Rhomboids: (Prone lateral raise)** Lie flat on your stomach; hold a tight dumbbell in each hand. Keep your arm extended and palm face in towards your body. Lift your arms up to your sides until arms are in parallel with the floor. Exhale. Keep your arm perpendicular to your torso and fully extended through the movement. Squeezing the shoulder blades together, inhale then slowly lower the dumbbell back down in starting position.

**Serratus Anterior: (Push up)** In prone position, hands are placed under shoulders with elbow in extension, back and legs are kept straight with toes touching the ground. Body is lowered until an arm lies parallel to ground. Then reverse this movement and raise the body until the arms are extended.

### **Interventions used in management of UCS**

#### **Effectiveness of Stretching Exercises versus Muscle Energy Technique**

The patients in this study were divided randomly in 2 groups. Both the groups were then treated using conventional physiotherapy and a home exercise program including specialized care, three sessions held every week for the period of sixteen sessions. Using SPSS version 20, data was analyzed. It was concluded that if muscle energy technique is given then patients with UCS showed reduction of pain, increase in range of motion and improvement in functions as compared to stretching exercises [3].

#### **Effect of Structured Exercise Program in Blind Person**

The patient was a blind male, age 19 years. He was referred for the upper quarter trunk abnormalities. The program for corrective exercise was planned for 12 weeks. The kyphosis improved from 450 to 410, round shoulder from 400 to 480 and forward head from 570 to 400 after training intervention. Thus, a regular long-term corrective exercise program is essential to maintain a correct posture and prevent deformities [4].

#### **Prescription of Exercises and use of active release technique**

The subjects in the study were categories into 2 groups, control and experimental group. All subjects were screened for upper cross syndrome by posture Print Biotonix System. Minimum of 50

anterior head carriage were required. Then muscle tightness was evaluated. The control and experimental group performed stretching and exercises daily. The experimental group received active release technique treatment bilaterally for upper trapezium, pectoralis major, and levator scapulae. The study was concluded after 3 weeks. Experimental group showed an improvement in the anterior carriage as compared with control one. This study warrants a repeat prior to any final decision on whether application of active release technique is having advantages in the treatment of upper cross syndrome. Further studies are needed to carry about the appropriate use of clinical protocols to treat UCS [10].

#### **Cervicogenic Headache: Clinical Management**

In this literature review, it was summarized that Cervicogenic headache was accompanied with musculoskeletal diseases and muscle imbalance having a pattern of tightness and muscle weakness. A thorough clinical examination along with history taking leads to a precise diagnosis. Multi-modal physiotherapy interventions are therefore recommended for individual impairments, including modalities, manual therapy and therapeutic exercises [11].

#### **Pressure Biofeedback with training of deep cervical flexor**

In this study, 20 college going students were chosen and were randomly assigned to the groups who undergone either deep cervical flexors training using pressure biofeedback unit. Both experimental and control group had 10 participants. All of them have performed conventional type deep cervical flexor exercises 3 times/week over a period of six week. The experimental group underwent Biofeedback Pressure Unit training for 5-10 minutes per day, three times a week. The study concluded that training of deep cervical flexor with a biofeedback unit is helpful method to maintain the mobility of the neck and endurance of muscle in people having forward head posture [12].

#### **Effect of Strengthening and Stretching Exercises**

30 students having forward head posture were chosen after measuring the alignment of cervical spine with the help of Global Posture System and classified into two subgroups. Experimental group participated in the exercise program and the control group did not. In this experimental group it was found to have significant difference among pre and post-test. This study had shown that middle and lower trapezius strength exercises with levator scapulae and upper trapezius stretching are quite effective for UCS [13].

#### **Deep Cervical Flexor training in Chronic Neck Pain**

This study includes various reviews from Web of Science, CINHALL, and PubMed were search for inceptions until January 2018 [14]. The quality of method was evaluated using Cochrane risk bias tool. Outcome measures have been broadly analyzed and meta-analysis has been carried out for measures which were evaluated in three or more studies. Study concluded that Deep Cervical Flexor Training can be

successfully addressed as neuromuscular condition which is impaired but not the strength of cervical flexor and endurance at high intensity of contraction. However studies suggested that multimodal training regimen is must if the aim of management of patients with neck pain is to address the impaired physiological function which is associated with the neck pain <sup>[15][16]</sup>.

## CONCLUSION

Multi-modal physiotherapy interventions are recommended to address individual impairment including therapeutic exercises, modalities and manual therapy. Designing and executing a rigorous and targeted program of corrective exercises including stretching, strengthen and integrating of spine and shoulder that can regularly be performed can have beneficial role to prevent and correct Upper Cross Syndrome.

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Authors declare no conflict of interest

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