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EFFECT OF SCAPULAR STABILIZATION EXERCISES AND THORACIC MOBILIZATION ON CRANIOVERTEBRAL ANGLE, NECK RANGE OF MOTION AND NECK DISABILITY AMONG SUBJECTS WITH UPPER CROSSED SYNDROME.

Physiotherapy

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ABSTRACT

Introduction: Upper Crossed Syndrome (UCS) is a postural disorder caused by muscle imbalance in the neck and upper back. It is commonly linked to prolonged forward head posture, resulting in cervical lordosis and thoracic kyphosis. **Background:** Upper Crossed Syndrome (UCS) is a postural disorder marked by forward head posture, cervical lordosis, and thoracic kyphosis, often causing pain and functional disability. **Aim:** To assess the effectiveness of scapular stabilization exercises with thoracic mobilization in UCS. **Methodology:** Thirty participants (20–35 years) with UCS were randomized into control (scapular stabilization + moist heat) and experimental (scapular stabilization + thoracic mobilization + moist heat) groups for six weeks. Outcomes included cervical ROM, craniovertebral angle, and Neck Disability Index. **Results & Conclusion:** Both groups improved significantly, with greater gains in the experimental group, supporting combined interventions for better outcomes.

KEYWORDS

Upper Crossed Syndrome, Craniovereteb ral Angle, Neck Disability Index, Cervical Range Of Motion.

INTRODUCTION

Upper Crossed Syndrome (UCS) is a postural dysfunction arising from muscular imbalance in the cervical and shoulder regions.[1] It is marked by tightness of the upper trapezius, levator scapulae, pectoralis muscles, and suboccipitals, together with weakness of the deep neck flexors, rhomboids, serratus anterior, and lower trapezius. [2]These changes result in forward head posture, rounded shoulders, increased cervical lordosis, and thoracic kyphosis, leading to pain, stiffness, and restricted range of motion. [3,4]First described by Dr. Vladimir Janda, UCS is recognized as a crossed pattern of overactive anterior and upper trunk muscles combined with inhibited posterior stabilizers.[6]

Poor ergonomics, sedentary lifestyle, and prolonged static postures are major contributing factors, particularly among students, healthcare professionals, and office workers.[7,8,9,10,]Symptoms often include neck pain, headaches, interscapular discomfort, fatigue, and in chronic cases, degenerative joint changes or disc herniation. Functional limitations are commonly measured using the Neck Disability Index (NDI), cervical range of motion assessments, and the craniovertebral angle, which quantifies forward head posture.[5]

The craniovertebral angle (CVA), also called the cervical or forward head angle, is measured between a horizontal line through the C7 spinous process and a line from the tragus of the ear to C7. A smaller CVA indicates forward head posture (FHP) and is commonly seen in individuals with neck pain. Head posture is considered forward when CVA is less than 48°–50°. In this study, Kinovea software was used to calculate CVA from standardized lateral photographs taken at shoulder height.[13,14,15]

Physical therapy management for neck and postural disorders includes electrotherapy modalities (laser, TENS, ultrasound) and exercise-based interventions to reduce pain and improve muscle strength. Scapular stabilization, PNF techniques, and ergonomic training help restore posture and correct muscular imbalances. Additional methods like Kinesio taping, stretching, and thoracic mobilization improve spinal mobility and neuromuscular control.Evidence suggests that a combined physiotherapy approach is more effective than exercise alone in enhancing posture, cervical motion, and reducing disability.[16,17]

METHODOLOGY

Materials

- Couch, Chair, Inch tape, NDI questionnaire, Resisted devices [Theraband] [yellow, Red]

Methods

This randomized controlled study was conducted at SVIMS college of physiotherapy,Tirupati, over six months period.Thirty participants were selected through simple random sampling and divided in to two groups:control (Group A) and experimental (Group B).The study duration was six weeks.

Inclusion Criteria: Subjects who are included in this study are
Age : 20 to 35years,Both males and females,Subjects with forward head posture, CV angle : less than 50 degrees.

Exclusion Criteria:
Age <20 >35 ,Cv angle >50 degrees, Degenerative conditions of spine, Cervical rib,Thoracic outlet syndrome, Tumors around the neck, Subjects with mental disorders, History of spinal surgery, Cardiac Pacemakers, Any fracture of cervical spine, Disc bulge, Torticollis, Scoliosis, Inflammatory disorders, Migraine, pregnant women, Radiating neck pain and were excluded.

Study Procedure: Thirty participants meeting inclusion criteria were enrolled with informed consent and ethical approval (Ref. 1780) and randomly assigned to two groups (15 each). During the study, three participants dropped out (Group A–2, Group B–1). Pre-test measurements in both groups included Cervical ROM was measured by inch tape in sitting position, Craniovertebral angle was measured by Electronic photography, Neck disability was measured by neck disability index score[NDI]

Intervention

All participants received 10 minutes of moist heat therapy prior to exercise, along with warm-up and cool-down routines. Warm-up included pectoralis stretches, shoulder shrugs, and neck movements, while cool-down involved shoulder shrugs and neck exercises.

Group A (Control) performed scapular stabilization exercises combined with moist heat therapy. These exercises included scapular retraction, eccentric scapular retraction, combined scapular retraction with shoulder external rotation, forward punches, and dynamic hugs. Scapular retraction involved standing upright and pulling the arms backward with a resistance band to engage the shoulder blades for 6–10 seconds. Eccentric retraction required controlled backward

pulling with elbows aligned to the trunk. Combined retraction with external rotation emphasized squeezing the shoulder blades while externally rotating the shoulders. Forward punches extended the elbows against band resistance, and dynamic hugs involved shoulder abduction and forward arm movement to activate scapular stabilizers.[11]

Group B (Experimental) performed the same exercises as Group A, followed by thoracic mobilization. Using Maitland's technique, patients were positioned prone, and postero-anterior oscillatory forces were applied to targeted thoracic vertebrae for approximately three minutes. These movements stimulate mechanoreceptors, inhibit nociceptive signals, improve thoracic mobility, restore spinal biomechanics, and enhance cervical function, thereby complementing scapular stabilization and correcting postural deviations associated with Upper Crossed Syndrome.[11,12]

Figure 1 : Thoracic Mobilization

Outcome Measures

ROM of neck : inch tape, Neck Disability: neck disability index score, CV angle : electronic photography. After completing 6 weeks of treatment post-test values measurements were taken in all the subjects and the data was sent for statistical analysis.

RESULTS

Data were tabulated in Microsoft Excel and analyzed using SPSS version 20. Paired t-tests assessed pre- to post-test improvements within groups, while independent t-tests compared post-test scores between groups. A p-value < 0.05 was considered statistically significant.

Demographic Distribution

Age: In the control group mean value is 26.23. In the experimental group the mean value is 23.64

Gender: In the control group (N = 13), there were 5 males (38%) and 8 females (62%). In the experimental group (N = 14), the gender distribution was fairly similar, with 6 males (43%) and 8 females (57%). This indicates a relatively balanced gender composition across both groups, with a slightly higher representation of females in each.

Table1 and graph 1 shows pre and post test mean and standard deviation values for CV angle,neck ROM(neck flexion,RT AND LT side flexion and rotation)NDI for both groups.

Outcome Measure	Group	Mean ± SD		P - Value	
		Pre	Post	Pre	Post
CVAngle	A	45.77±2.31	47.15±1.68	0.000	0.000
	B	47.50±1.70	51.43±1.16		
NeckFlex	A	7.08±1.71	5.38±1.71	0.000	0.000
	B	7.14±2.32	4.07±1.49		
LatFlex_RT	A	7.69±1.93	9.69±1.65	0.000	0.000
	B	8.21±1.85	11.36±1.39		
LatFlex_LT	A	7.46±1.71	9.31±1.65	0.000	0.000
	B	9.64±1.98	11.64±1.50		
Rotation_RT	A	10.23±2.05	11.23±1.64	0.021	0.023
	B	11.07±2.50	12.57±0.94		
Rotation_LT	A	9.77±1.59	11.08±1.61	0.000	0.024
	B	10.93±2.30	12.29±1.07		
NDI	A	20.08±2.40	18.38±2.33	0.000	0.000
	B	19.50±3.80	15.50±3.80		

Both groups showed significant post-test improvements, but the Experimental group outperformed the Control group. In the Control group, CV Angle improved from 45.77° to 47.15°, Neck Flexion reduced from 7.08° to 5.38°, Right and Left Lateral Flexion increased from 7.69° to 9.69° and 7.46° to 9.31°, Right and Left Rotation from 10.23° to 11.23° and 9.77° to 11.08°, while NDI decreased from 20.08 to 18.38. In contrast, the Experimental group showed greater changes: CV Angle improved from 47.50° to 51.43°, Neck Flexion decreased from 7.14° to 4.07°, Right and Left Lateral Flexion increased from 8.21° to 11.36° and 9.64° to 11.64°, Right and Left Rotation from 11.07° to 12.57° and 10.93° to 12.29°, and NDI dropped more substantially from 19.50 to 15.50. These results confirm that while both groups improved,the experimental group shows highly significant functional improvement.

Table 2 and graph 2 shows comparison of post-test mean values of CV angle, neck ROM, and NDI between the groups.

Group Statistics			
Post-test Score	Group	Mean±SD	P-value
CVAngle_Post	Control	47.15±1.68	0.000
	Experimental	51.43±1.16	
NeckFlex_Post	Control	5.38±1.71	0.043
	Experimental	4.07±1.49	
LatFlex_RT_Post	Control	9.69±1.65	0.009
	Experimental	11.36±1.39	
LatFlex_LT_Post	Control	9.31±1.65	0.001
	Experimental	11.64±1.50	
RotationRT_Post	Control	11.23±1.64	0.014
	Experimental	12.57±0.94	
RotationLT_Post	Control	11.08±1.61	0.029
	Experimental	12.29±1.07	
NDI_Post	Control	18.38±2.33	0.027
	Experimental	15.50±3.80	

The Experimental group showed significantly better outcomes than the Control group: CV Angle (51.43 vs 47.15), Neck Flexion (4.07 vs 5.38), Right Lateral Flexion (11.36 vs 9.69), Left Lateral Flexion (11.64 vs 9.31), Right Rotation (12.57 vs 11.23), Left Rotation (12.29 vs 11.08), and NDI (15.50 vs 18.38). Thus, the Experimental group was more effective in improving cervical posture, mobility, and reducing disability.

DISCUSSION

The study investigated the effects of scapular stabilization exercises and thoracic mobilization on CV angle, neck ROM, and NDI in subjects with upper crossed syndrome. Both treatment groups showed significant improvements over 6 weeks, with Group B demonstrating greater statistical improvements compared to Group A. These findings align with previous research reporting significant enhancements in CV angle, neck ROM, and NDI.

CONCLUSION

The present study concluded that the subjects who received Thoracic mobilization along with Scapular stabilization exercises. Experimental group had shown more improvement in terms of CV angle, Neck ROM, Neck disability than the subjects who received Scapular stabilization exercises alone control group So, our study found that Thoracic mobilization along with Scapular stabilization exercises is recommended for improving CV angle Neck ROM, Neck disability. This study accepts the alternate hypothesis and disproves null hypothesis.

Limitations of the Study

- Small sample size in both groups limits generalizability.
- Lack of long-term follow-up prevents assessment of sustained effects.
- Study included only participants aged 20–35; results may not apply to other age groups.

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