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ORIGINAL ARTICLE

A COMPARATIVE STUDY TO FIND OUT THE EFFECTIVENESS OF COMPREHENSIVE CORRECTIVE EXERCISE PROGRAM (CCEP) VERSUS MUSCLE ENERGY TECHNIQUE TO REDUCE PAIN AND TO IMPROVE FUNCTION IN PATIENTS WITH UPPER CROSSED SYNDROME

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ABSTRACT

Background: Upper Crossed Syndrome (UCS), also referred to as Proximal or Shoulder Girdle Crossed Syndrome, is a condition characterized by a pattern of muscular imbalances that affect the upper body. In UCS, certain muscles are becomes tight while others become weak, leading to postural dysfunction and potential joint issues. Upper Crossed Syndrome is a postural dysfunction characterized by an imbalance between certain muscle groups in the upper body. Objective of the study is to compare the effects of comprehensive corrective exercise (CCEP) programs and muscle energy techniques (MET) on pain reduction and functional improvement in patients with upper crossed syndrome patients (UCS). **Methodology:** A quasi-experimental design involving two groups with pre-test and post-test measurements. Both male and female were selected. 20 patients with upper crossed syndrome (UCS) aged between 25 to 40 years were selected for this study. Group A received a comprehensive corrective exercise program (CCEP) and Group B received Muscle Energy Technique (MET) Visual analog scale and Neck Disability Index were used to measure the pre test vs post test values. **Result:** The study reported significant improvement in function in group A compared to group B in response to intervention. **Conclusion:** The study concluded that comprehensive corrective exercise programme effectively reduces pain and disability and improves function in patients with upper crossed syndrome.

Keywords: Upper crossed syndrome, Comprehensive corrective exercise program, Muscle energy techniques, Visual analog scale, Neck Disability Index.

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INTRODUCTION

Upper Crossed Syndrome (UCS), also referred to as Proximal or Shoulder Girdle Crossed Syndrome, is a condition characterized by a pattern of muscular imbalances that affect the upper body. In UCS, has certain muscles become tight while others become weak, leading to postural dysfunction and potential joint issues[1].

Upper Crossed Syndrome (UCS) is a postural dysfunction characterized by an imbalance between certain muscle groups in the upper body. It has typically increases tension in the upper trapezius, sternocleidomastoid, levator scapulae, and pectoral muscles, which is contracted by weakness in muscles such as the deep neck flexors, rhomboids, middle and lower trapezius, and the serratus anterior. These opposing patterns of tightness and weakness form a diagonal or "crossed" configuration when viewed from the side, contributing to forward head posture and rounded shoulders[2].

These muscular imbalances significantly contribute to joint dysfunction, commonly affecting transitional areas such as the cervical spine (C4–C5), thoracic spine (T4–T5), and glenohumeral joint (GHJ). Upper Crossed Syndrome (UCS) is commonly seen in individuals who maintain poor posture for prolonged periods—such as college students, teachers, drivers, and software professionals. This condition is marked by notable postural alterations, including a forward positioning of the head, an exaggerated inward curve in the cervical spine, increased rounding of the upper back, and shoulders that are both elevated and rolled forward[3].These alterations are largely due to muscle imbalances, particularly weakness in the serratus anterior, which causes the glenoid fossa to become more vertically oriented. As a result, glenohumeral stability is compromised. To compensate for this instability, the levator scapulae and upper trapezius increase their activation in an effort to maintain proper glenohumeral centration. Among these groups, software professionals are the most affected, with 55.6% of them showing signs of UCS.

Comprehensive Corrective Exercise Program (CCEP): The CCEP provides a comprehensive approach by simultaneously addressing muscle activation, movement patterns, and posture across the entire body. This is different from traditional methods that typically focus only on correcting posture, particularly in the neck or upper back, and often rely solely on stretching or strengthening exercises. The CCEP recognizes that effectively correcting UCS requires not only biomechanical adjustments but also attention to the neurological factors that influence movement control.

The CCEP is divided into three phases; Initial Phase: It establishes a foundation for correction by first identifying dysfunctional movement patterns. Improvement Phase: Focuses on enhancing movement efficiency, strengthening muscles, and improving posture through targeted exercises. Maintenance Phase: Ensures that progress is maintained over time, helping individuals develop sustainable movement patterns and muscle strength. The program lasts for 8 weeks, during which participants perform a combination of Postural correction exercises[4]:

Muscle Energy Techniques (MET): Muscle Energy Techniques (METs) are an osteopathic manipulative treatment method where the

patient actively participates by contracting their muscles in a controlled direction and against a counterforce applied by the practitioner. The main principle behind METs is that the patient's muscle contractions help musculoskeletal dysfunctions. Muscle Energy Techniques (METs) involve two key physiological processes: Post-Isometric Relaxation (PIR):

This occurs when a muscle, after being held in an isometric contraction for a brief period (typically around 5–10 seconds), experiences a temporary reduction in tone, allowing it to be more easily stretched.During this time, the muscle tone decreases due to neurological feedback through the spinal cord[5]. The relaxation phase will allow increased range of motion (ROM) because the muscle becomes more pliable, making it easier to stretch and lengthen. Reciprocal Inhibition (RI): When the agonist muscle contracts, it causes the antagonist muscle to relax simultaneously.

METHODOLOGY

The study was conducted at JKKMMRF College of physiotherapy, outpatient department and in Maaruthi Medical Center Hospital, Erode under the supervision of concerned authority. The patients received a comprehensive explanation of the procedure and treatment approach, and voluntarily provided written consent to take part in the study. There were 20 patients with upper crossed syndrome who were selected based on the inclusion and exclusion criteria and they were divided into two groups. Participants in Group A underwent a structured corrective exercise regimen, whereas those in Group B received treatment through the Muscle Energy Technique. A pre test and post test was conducted for the group A and B on Visual analog scale and Neck Disability Index scale. The study was conducted for 8 weeks.

Inclusion criteria: Both genders, Age between 25 to 40 years, Patients have symptoms like shoulder and neck pain with postural deformities, Postural deformities like rounded shoulders, forward head posture, kyphosis, winging of scapula.

Exclusion criteria: Osteoporosis, Congestive heart disease, Cancer, Severe skin infection, Acute rheumatoid arthritis, History of recent surgery, Fracture and joint disease in the spine, Unconscious patient, Open wounds, Acute sprain and strain, Deep vein thrombosis.

Procedure and protocols:

GROUP A:

A total number of 10 patients were included in Group A. These patients received the Comprehensive Corrective Exercise Program (CCEP).

Procedure: An exercise program that spans 8 weeks and is divided into three phases: Initial phase, Improvement phase, and Maintenance phase. Weak muscle group power was assessed using manual muscle testing.

Phase 1: Initial Phase (2 weeks).Goal: Prioritize basic stabilization, flexibility, and mobility.
Stretching is for the Individual Muscles, Wall Lean Exercise, Chin Tuck Exercise, Thoracic Mobility Exercise, Shoulder Wall Slides Exercise, Prone Lying Lateral Shoulder Raise Exercise.

Phase 2: Improvement Phase (4 weeks).Goal: Focus on strengthening key muscles with resistance to improve overall strength and

stability. Deep Neck Muscle Strengthening Exercise with Theraband, Shoulder Elevation and Depression with Dumbbells (Shrug Exercise),Rhomboid Strengthening Exercise with Theraband, Serratus Anterior Strengthening Exercise with Theraband, Pectoralis Muscle Strengthening Exercise (Band Chest Fly), Lower Trapezius Strengthening Exercise (Seated Cable 'Y' Raise),Middle trapezius strengthening exercise.

Phase 3: Maintenance Phase (2 weeks).
Goal: To maintain the improvements made during the first two phases with ongoing strength and mobility work.This phase might include a combination of the exercises from the previous two phases, focusing on maintaining flexibility, mobility, and strength. You could also introduce more dynamic or functional movements, but the focus should remain on maintaining the progress achieved.

Group B:
A total number of 10 patients were included in Group B. These patients received the Muscle Energy Technique (MET). The Muscle Energy Technique was applied to the sternocleid omastoid, upper trapezius, levator scapulae, pectoralis major, and pectoralis minor muscles.

RESULTS:

VAS	MEAN	Mean Difference	Standard Deviation	Unpaired 't' Value
GROUP A	3.10	1.9000	1.1005	4.4371
GROUP B	1.20		0.788	

Table 1: Visual Analog Scale (Post Test Analysis)

The pre versus post test mean of group A was 3.10 and the pre versus post mean of group B was 1.20 and the mean difference of group A and group was 1.90.The unpaired't' value of 4.4371 was greater than the tabulated't' value of 2.05, which showed that there was a statistically significant difference at 0.05 level, between the mean difference of group A and group B. Which showed that there was significant reduction of pain in group A compared to group B in response to intervention.

NDI	Mean	Mean difference	Standard Deviation	Unpaired 't' Value
GROUP A	5.80	2.90	2.6162	2.9581
GROUP B	2.90		1.6633	

Table 2: Neck Disability Index Scale (Post Test Analysis)

The pre versus post test mean of group A was 5.80 and the pre versus post mean of group B was 2.90 and the mean difference of group A and group B was 2.90. The unpaired 't' value of 2.9581 was greater than the tabulated 't' value of 2.05, which showed that there was a statistically significant difference at 0.05 level, between the mean difference of group A and group B. Which showed that there was significant improvement in function in group A compared to group B in response to intervention.

DISCUSSION

The purpose of this study was to evaluate and compare the impact of a Comprehensive Corrective Exercise Program (CCEP) and Muscle Energy Technique (MET) on pain reduction and functional improvement in individuals with Upper Crossed Syndrome (UCS).

The main outcomes evaluated in this study were pain levels and functional disability. Pain intensity was measured through the Visual Analog Scale (VAS), and functional disability was assessed using the Neck Disability Index (NDI). Initial data for both groups were gathered before the intervention commenced. Group A received the Comprehensive Corrective Exercise Program (CCEP), and Group B received the Muscle Energy Technique (MET) to address upper crossed syndrome.

The paired t-test was used to compare the pre-test and post-test results within each group separately. To compare the mean differences between Group A and Group B, an unpaired t-test was used.

The research investigated how an eight-week corrective exercise program, following NASM guidelines, influenced individuals with Upper Crossed Syndrome. Thirty Female participants were selected randomly. The study results were scored by using forward head angle, kyphosis angle. Rounded shoulder angle. The results of the study showed that corrective exercise programs can lead to improvements in Flexibility and strengthen the correction of postural abnormalities[6].

This study aimed to assess how strengthening the middle and lower trapezius muscles, combined with stretching the levator scapulae and upper trapezius muscles, influences individuals with Upper Crossed Syndrome. The study involved 30 participants, who were randomly divided into two groups,15 in the experimental group and 15 in the control group.The results showed that enhancing the strength of the middle and lower trapezius muscles, along with stretching the levator scapulae and upper trapezius, was more beneficial in addressing symptoms of Upper Crossed Syndrome[7]

Physiological effects of Comprehensive Corrective Exercise Program (CCEP): Strength and Endurance-CCEPs aim to build strength in underactive or weakened muscles while lengthening those that are overly tight or dominant. This rebalancing promotes better muscle coordination and overall physical performance. Posture and Alignment-By correcting muscle imbalances and dysfunctional movement patterns, these programs can help realign the spine and body[8]. This is especially useful for addressing issues like rounded shoulders, forward head posture, or excessive spinal curvature.

Flexibility and Range of Motion-Corrective exercises help relieve muscle tightness and

joint restrictions, leading to smoother, more efficient movement and improved flexibility throughout the body. Neuromuscular Control-Through targeted movement retraining; CCEPs enhance the connection between the nervous system and muscles. This results in better coordination, muscle activation, and a heightened sense of body awareness (proprioception)[9]. Injury Prevention- By correcting faulty movement patterns and restoring muscular balance, CCEPs reduce unnecessary strain on joints and tissues, helping to prevent injuries before they occur.

Physiological Effects of Muscle energy technique (MET): Post-Isometric Relaxation (PIR)-After an isometric contraction, the muscle experiences a brief period of decreased tone or relaxation. This is thought to be due to autogenic inhibition mediated by the Golgi tendon organs, which sense tension and reduce excitability of the motor neurons. Reciprocal Inhibition-Contracting the agonist muscle can neurologically inhibit the antagonist muscle via spinal reflexes[10].For example, contracting the quadriceps can relax the hamstrings. Improved Range of Motion (ROM)-MET helps lengthen shortened or tight muscles, leading to better joint mobility. This is partly due to reflex relaxation and improved neuromuscular coordination.

Increased Circulation and Lymphatic Flow-The rhythmic contractions and stretching can enhance local blood flow and lymphatic drainage, promoting tissue healing and reducing edema. Reprogramming of Muscle Memory-Repeated, controlled contractions can help “retrain” muscles to hold proper length and alignment, assisting in posture correction and functional movement patterns[11]. Pain Reduction-MET may reduce pain through decreased muscle tension, Stretch reflex inhibition, Enhanced proprioception and neuromodulation, Facilitation of Joint Mobilization by relaxing periarticular muscles, MET can help increase joint play and mobilize restricted joints, especially in the spine and pelvis[12].

In the analysis of interpretation, the visual analog scale scores have shown between groups A and B. The pre versus post test mean of group A was 3.10 and the pre versus post mean of group B was 1.20 and the mean difference of group A and group B was 1.9000. The unpaired ‘t’ value of 4.4371 was greater than the tabulated ‘t’ value of 2.05, which showed that there was a statistically significant difference at 0.05 level, between the mean difference of group A and group B. Which showed that there was significant improvement in function in group A compared to group B in response to intervention.

In The analysis and interpretation of Neck Disability Index score have shown between groups A and B. The pre versus post test mean of group A was 5.80 and the pre versus post mean of group B was 2.90 and the mean difference of group A and group B was 2.90.The unpaired ‘t' value of 2.9581 was greater than the tabulated ‘t’ value of 2.05, which showed that there was a statistically significant difference at 0.05 level, between the mean difference of group A and group B. which showed that there was significant reduction in pain and improvement in function in group A compared to group B in response to intervention .

The findings also suggest that both the Comprehensive Corrective Exercise Program (CCEP) and Muscle Energy Technique (MET)

contributed positively to reducing pain and enhancing functional capacity in individuals diagnosed with Upper Crossed Syndrome (UCS).In particular, CCEP demonstrated long-lasting benefits, with effects maintained even after a 4-week detraining period. This suggests that CCEP may offer sustainable improvements beyond the initial intervention phase.

The study also emphasized the critical role of posture correction and alignment in UCS patients, as improper posture can contribute to musculoskeletal injuries and motor control issues. Researchers have highlighted the importance of addressing these factors to prevent further complications and improve overall functional health. In terms of exercise interventions, the research found that stretching and strengthening exercises were essential for UCS patients. Both CCEP and METs effectively improved posture, alignment, and movement patterns, leading to a significant reduction in pain and disability. These interventions were particularly beneficial for patients aged 25-40 years, offering an effective approach to managing UCS symptoms.

Overall, the study suggests that exercise interventions such as CCEP and METs are highly beneficial in reducing pain, improving functional disability, and correcting posture in UCS patients. These findings support the use of corrective exercises in managing UCS and highlight the importance of postural alignment and movement control in treating musculoskeletal injuries related to the condition.

CONCLUSION

The study concluded that a comprehensive corrective exercise programme effectively reduces pain and disability in patients with upper crossed syndrome. Notably, the improvements were maintained for up to four weeks after treatment, highlighting the convenience and effectiveness of this approach in managing the condition.

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