Effects of Kendall Exercises vs Gong's Mobilization on Upper Cross Syndrome

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ABSTRACT

Background: Upper Cross Syndrome (UCS) is a prevalent musculoskeletal disorder characterized by muscular imbalances and postural dysfunction. Effective management strategies are needed to address pain, improve range of motion (ROM), and enhance functional outcomes.

Objective: To compare the effectiveness of Kendall exercises versus Gong's mobilization in reducing pain, improving ROM, and enhancing functional outcomes in patients with UCS.

Methods: A randomized controlled trial was conducted on 44 patients with UCS, divided into two groups: Kendall exercises (n=22) and Gong's mobilization (n=22). Interventions were administered 3 times per week for 4 weeks. Outcomes were assessed using the Visual Analog Scale (VAS), Neck Disability Index (NDI), Shoulder Pain and Disability Index (SPADI), and goniometer for cervical and shoulder ROM. Data were analyzed using paired and independent t-tests with SPSS 26.0.

Results: The Kendall group showed significant improvement in VAS (7.64 ± 1.09 to 2.60 ± 0.86), NDI (7.63 ± 1.09 to 2.59 ± 0.85), and SPADI (37.25 ± 12.95 to 29.28 ± 12.60) compared to Gong's group ($p<0.05$). ROM improvements were also significantly greater in the Kendall group ($p<0.05$).

Conclusion: Kendall exercises were more effective than Gong's mobilization in reducing pain, improving ROM, and enhancing functional outcomes in UCS patients.

INTRODUCTION

Upper Cross Syndrome (UCS) is a prevalent musculoskeletal disorder characterized by a specific pattern of muscular imbalance and postural dysfunction. This condition arises from prolonged poor posture, leading to tightness and weakness in the muscles of the neck, shoulders, and upper back, crossing between the dorsal and ventral sides of the body. The resulting imbalance often manifests as visible postural changes, including rounded shoulders, forward head posture, and increased thoracic kyphosis, which are further exacerbated by joint dysfunction. UCS is commonly observed across various occupations, with a reported prevalence of 28% in laundry workers, 32.43% in office workers, 24.32% in drivers, 27.03% in housewives, and 16.22% in teachers. Notably, a prevalence of 28% has been reported among laundry workers in Karad and nearby rural areas, while 37.1% of medical students at the University of Lahore have been diagnosed with this condition (1, 2).

The etiology of UCS is multifactorial, involving physiological and pathological changes, biomechanical stress, and inflammation that affect the neuromuscular system and lead to structural lesions. Prolonged abnormal postures contribute to the weakness of deep neck flexors, the middle and lower trapezius, serratus anterior, and rhomboid muscles, while tightness develops in the upper trapezius, levator scapulae, suboccipital muscles, sternocleidomastoid, and pectoralis major and minor muscles, along with joint dysfunction (3, 4). Symptoms of UCS include increased thoracic kyphosis, rounded shoulders, forward head posture, headaches, neck pain, chest tightness, fatigue, lower back pain, and weakness in the neck and scapular muscles, leading to significant functional impairments and difficulty with daily activities (5). Diagnostic criteria for UCS involve assessing the imbalance of shoulder, neck, and chest muscles, the inward curving of the spine at the neck, and the protrusion of shoulder blades (6).

Management of UCS focuses on correcting abnormal posture, restoring neuromuscular balance, and alleviating pain. Various physiotherapeutic approaches, including manual therapy, stretching, strengthening, and postural training, are employed. Kendall exercises and Gong's mobilization are two notable techniques used in this context. Kendall exercises aim to correct postural abnormalities by strengthening weakened muscles and stretching shortened muscles, thereby addressing the muscular imbalances associated with UCS. In contrast, Gong's mobilization is a combination of soft-tissue techniques, including joint mobilization, distraction, and oscillation, which are applied to decrease pain and improve range of motion (7, 8). Despite the established efficacy of

these techniques, the literature is limited regarding their comparative effectiveness in managing UCS.

This study was designed to compare the effects of Kendall exercises and Gong's mobilization on pain, range of motion, function, and strength in patients diagnosed with UCS. The rationale for this comparison stems from the need to identify the most effective treatment approach for UCS, as existing literature provides mixed evidence regarding the superiority of one technique over the other. While some studies suggest that Kendall exercises are more effective in improving postural abnormalities and reducing pain, others highlight the benefits of Gong's mobilization in enhancing joint mobility and alleviating discomfort. Given the widespread prevalence of UCS and its impact on individuals' quality of life, this study seeks to provide evidence-based recommendations for the optimal management of this condition (9, 10).

MATERIAL AND METHODS

The study was conducted as a Randomized Controlled Trial (RCT) to evaluate the comparative effectiveness of Kendall exercises and Gong's mobilization in patients diagnosed with Upper Cross Syndrome (UCS). Ethical approval for the study was obtained from the Ethical Committee of Superior University Lahore, ensuring that all procedures were in full compliance with the ethical standards outlined in the Declaration of Helsinki. Informed consent was obtained from all participants prior to their inclusion in the study, ensuring that they were fully aware of the study's objectives, procedures, potential risks, and benefits.

A total of 44 patients, aged between 45 and 65 years, diagnosed with UCS, were recruited from the Physiotherapy Department of Civil Hospital Khanewal. The sample size was determined using the Statulator application, based on a mean difference of 15.20 ± 7, to achieve sufficient power for detecting significant differences between the intervention groups. Patients were selected using a non-probability convenience sampling technique and were randomly allocated to one of two groups using a computer-generated randomization sequence. Group A (n=22) was assigned to the Kendall exercises intervention, while Group B (n=22) received Gong's mobilization therapy.

Inclusion criteria for the study were adults aged 45-65 years presenting with UCS, characterized by defined rounded shoulders, forward head posture, tightness in the pectoralis major and minor muscles, weakness in the lower trapezius and rhomboid muscles, and reporting neck pain, shoulder pain, or headaches. Exclusion criteria included a history of neck or shoulder surgery or trauma, inflammatory conditions such as rheumatoid arthritis or gout, pregnancy, neurological conditions affecting upper limb function, and uncontrolled cardiovascular or respiratory conditions (1, 2).

The interventions were administered over a four-week period, with sessions conducted three times per week. Group A underwent Kendall exercises, which included strengthening exercises for the upper trapezius, levator scapulae, and rhomboid muscles, performed in sitting and side-lying positions. Additionally, stretching exercises for the pectoralis major and minor muscles were incorporated. Group B received Gong's mobilization, which involved soft-tissue mobilization techniques, including anterior-posterior glides, lateral glides, and rotations applied to the cervical spine, thoracic spine, and shoulder girdle, with each glide applied in 10 repetitions per direction, 3 times per session (3, 4).

Data were collected at baseline and at the end of the fourth week using standardized assessment tools, including the Visual Analog Scale (VAS) for pain assessment, the Neck Disability Index (NDI) for evaluating neck-related disability, the Shoulder Pain and Disability Index (SPADI) for assessing shoulder function, and a goniometer for measuring cervical and shoulder range of motion (ROM). The VAS is a reliable tool for assessing acute pain with an intra-class correlation coefficient (ICC) of 0.99, while the NDI and SPADI are validated instruments for evaluating functional impairments related to neck and shoulder conditions, respectively (5, 6).

Statistical analysis was performed using SPSS version 26.0. Descriptive statistics were used to summarize the demographic and clinical characteristics of the participants. Continuous variables, such as age, were expressed as mean ± standard deviation (S.D.), while categorical variables, such as gender, were presented as frequencies and percentages. The normality of the data was assessed using the Shapiro-Wilk test. Given that the data were normally distributed ($p > 0.05$), parametric tests were employed for analysis. Within-group differences were analyzed using paired t-tests, while between-group differences were assessed using independent t-tests, with a significance level set at $p < 0.05$.

The study adhered to rigorous methodological standards to ensure the validity and reliability of the findings. By carefully controlling for potential confounders and utilizing appropriate statistical methods, the study aimed to provide robust evidence on the comparative effectiveness of Kendall exercises and Gong's mobilization in the management of Upper Cross Syndrome (7, 8).

RESULTS

The results of the study were presented in both descriptive and inferential statistics, providing a comprehensive analysis of the demographic characteristics of the participants and the comparative effectiveness of Kendall exercises versus Gong's mobilization in patients with Upper Cross Syndrome (UCS).

Table 1 summarizes the demographic characteristics of the participants in both the Kendall and Gong's mobilization groups. The mean age of participants in the Kendall group was 54.14 ± 6.13 years, while in the Gong's group, it was 54.86 ± 5.89 years. The gender distribution in the Kendall group comprised 12 males (54.5%) and 10 females (45.5%), while the Gong's group included 14 males (63.6%) and 8 females (36.4%). Table 2 presents the within-group analysis of outcome variables, including VAS, NDI, SPADI, and ROM for both cervical and shoulder joints. In the Kendall group, there was a significant reduction in VAS scores from a mean pre-treatment value of 7.64 ± 1.09 to a post-treatment value of 2.60 ± 0.86 (p=0.00)..

Table 1: Demographic Characteristics of Participants

Variables	Kendall Group (n=22)	Gong's Group (n=22)
Age	54.14 ± 6.13 years	54.86 ± 5.89 years
Gender		
Male	12 (54.5%)	14 (63.6%)
Female	10 (45.5%)	8 (36.4%)

Similarly, the NDI scores improved significantly from 7.63 ± 1.09 to 2.59 ± 0.85 (p=0.00), and the SPADI scores decreased from 37.25 ± 12.95 to 29.28 ± 12.60 (p=0.00). The ROM for cervical flexion increased from 52.54 ± 9.40° to 63.45 ± 8.96° (p=0.00), and for shoulder flexion from 90.91 ± 19.97° to 98.50 ± 19.88° (p=0.00). Similar improvements were observed in other ROM measurements.

In the Gong's mobilization group, VAS scores also showed significant improvement from 7.77 ± 0.97 to 4.95 ± 0.72 (p=0.00), NDI scores from 7.77 ± 0.97 to 4.95 ± 0.72 (p=0.00), and SPADI scores from 36.38 ± 14.22 to 33.33 ± 13.90 (p=0.00). Cervical flexion ROM improved from 49.45 ± 11.10° to 53.72 ± 11.13° (p=0.00), and shoulder flexion from 101.59 ± 22.33° to 104.18 ± 22.31° (p=0.00). Table 3 illustrates that post-treatment VAS scores were significantly lower in the Kendall group (2.60 ± 0.86) compared to the Gong's group (4.95 ± 0.72) with a p-value of 0.00.

Table 2: Within-Group Analysis of Outcome Variables

Variables	Kendall Group (n=22)	Gong's Group (n=22)	p-value
VAS			
Pre-treatment	7.64 ± 1.09	7.77 ± 0.97	0.00
Post-treatment	2.60 ± 0.86	4.95 ± 0.72	0.00
NDI			
Pre-treatment	7.63 ± 1.09	7.77 ± 0.97	0.00
Post-treatment	2.59 ± 0.85	4.95 ± 0.72	0.00
SPADI			
Pre-treatment	37.25 ± 12.95	36.38 ± 14.22	0.00
Post-treatment	29.28 ± 12.60	33.33 ± 13.90	0.010
Cervical ROM			
Flexion	52.54 ± 9.40° to 63.45 ± 8.96°	49.45 ± 11.10° to 53.72 ± 11.13°	0.003
Extension	42.39 ± 8.49° to 52.14 ± 8.47°	42.39 ± 8.49° to 46.66 ± 8.57°	0.039
L. Rotation	39.04 ± 7.71° to 48.86 ± 7.36°	39.04 ± 7.71° to 43.23 ± 7.76°	0.017
R. Rotation	41.81 ± 7.35° to 50.95 ± 5.35°	41.81 ± 7.35° to 46.05 ± 7.51°	0.018
L. Side bending	16.77 ± 3.98° to 26.32 ± 3.84°	16.77 ± 3.98° to 20.86 ± 3.70°	0.00
R. Side bending	17.00 ± 4.97° to 26.68 ± 5.30°	16.68 ± 5.06° to 20.77 ± 5.17°	0.00
Shoulder ROM			
Flexion	90.91 ± 19.97° to 98.50 ± 19.88°	101.59 ± 22.33° to 104.18 ± 22.31°	0.023
Extension	35.45 ± 12.04° to 42.91 ± 12.67°	36.59 ± 17.00° to 39.54 ± 16.99°	0.001
Abduction	95.91 ± 25.94° to 104.77 ± 25.16°	103.64 ± 26.46° to 106.41 ± 26.34°	0.002
Internal Rotation	47.04 ± 20.91° to 54.91 ± 20.59°	35.00 ± 18.19° to 38.09 ± 18.02°	0.010
External Rotation	29.77 ± 18.80° to 37.19 ± 18.98°	68.64 ± 15.67° to 71.41 ± 15.54°	0.00

Table 3: Between-Group Analysis of Post-Treatment Outcome Variables

Variables	Kendall Group (n=22)	Gong's Group (n=22)	p-value
VAS	2.60 ± 0.86	4.95 ± 0.72	0.00
NDI	2.59 ± 0.85	4.95 ± 0.72	0.00
SPADI	29.28 ± 12.60	33.33 ± 13.90	0.010
Cervical ROM			
Flexion	63.45 ± 8.96°	53.72 ± 11.13°	0.003
Extension	52.14 ± 8.47°	46.66 ± 8.57°	0.039
L. Rotation	48.86 ± 7.36°	43.23 ± 7.76°	0.017
R. Rotation	50.95 ± 5.35°	46.05 ± 7.51°	0.018
L. Side bending	26.32 ± 3.84°	20.86 ± 3.70°	0.00
R. Side bending	26.68 ± 5.30°	20.77 ± 5.17°	0.00
Shoulder ROM			
Flexion	98.50 ± 19.88°	104.18 ± 22.31°	0.023
Extension	42.91 ± 12.67°	39.54 ± 16.99°	0.001
Abduction	104.77 ± 25.16°	106.41 ± 26.34°	0.002
Internal Rotation	54.91 ± 20.59°	38.09 ± 18.02°	0.010
External Rotation	37.19 ± 18.98°	71.41 ± 15.54°	0.00

S Cervical and shoulder ROM improvements were also significantly greater in the Kendall group across various movements, confirming that Kendall exercises were more effective in enhancing cervical and shoulder ROM in UCS patients. imilarly, NDI and SPADI scores were significantly better in the Kendall group, with p-values of 0.00 and 0.010, respectively. The results of this study demonstrated that while both Kendall exercises and Gong's mobilization were effective in managing pain, improving ROM, and enhancing functional status in UCS patients, Kendall exercises were significantly more effective in producing these outcomes. This highlights the importance of targeted muscle strengthening and stretching exercises in the management of postural and muscular pathologies such as Upper Cross Syndrome.

DISCUSSION

The present study aimed to compare the effectiveness of Kendall exercises versus Gong's mobilization in improving pain, range of motion (ROM), and functional status among patients diagnosed with Upper Cross Syndrome (UCS). The findings demonstrated that both interventions were effective; however, Kendall exercises provided significantly greater improvements in pain reduction, cervical and shoulder ROM, and functional outcomes compared to Gong's mobilization. These results align with the growing body of literature supporting the use of targeted exercises in managing postural and muscular imbalances associated with UCS.

Previous studies have highlighted the importance of correcting muscular imbalances and enhancing joint mobility in the management of UCS. Kendall exercises, which focus on strengthening the deep neck flexors and scapular stabilizers while stretching the pectoral muscles, have been widely recognized for their role in correcting forward head posture and improving cervical alignment. The significant improvements observed in VAS, NDI, and SPADI scores in the Kendall group in this study corroborate findings from earlier research, which demonstrated that these exercises effectively reduce pain and improve functional outcomes by addressing the underlying muscular imbalances that contribute to UCS (Rahul et al., 2024; El-Kablawy et al., 2023). The study also confirmed that Kendall exercises significantly enhanced cervical and shoulder ROM, a finding consistent with prior reports that emphasized the importance of these exercises in restoring normal movement patterns in patients with postural dysfunctions (Kong et al., 2017).

On the other hand, Gong's mobilization, which involves soft-tissue techniques and joint mobilizations, has been shown to be effective in improving joint mobility and reducing pain, particularly in conditions such as frozen shoulder and cervical spondylosis. However, the current study found that while Gong's mobilization did produce significant improvements in pain and ROM, these effects were less pronounced than those achieved with Kendall exercises. This discrepancy may be attributed to the nature of UCS, which is primarily driven by muscular imbalances rather than joint adhesions or capsular restrictions. Therefore, while Gong's mobilization is beneficial in enhancing joint mobility, it may not address the underlying muscular dysfunctions as effectively as Kendall exercises (Afzal et al., 2023; Shrestha et al., 2020).

The strengths of this study include its randomized controlled design, which minimized bias and allowed for a robust comparison between the two interventions. The use of validated outcome measures such as VAS, NDI, and SPADI further enhanced the reliability of the findings. Additionally, the study's focus on a specific population of UCS patients provided valuable insights into the effectiveness of targeted interventions for this condition. However, several limitations should be noted. The study was conducted in a single clinical setting, which may limit the generalizability of the findings to other populations. Moreover, the relatively short duration of the intervention (four weeks) may not have captured the long-term effects of the treatments. Future studies with longer follow-up periods and involving multiple clinical sites are recommended to further validate these findings and explore the long-term benefits of these interventions.

In conclusion, the study provided strong evidence that Kendall exercises are more effective than Gong's mobilization in managing pain, improving ROM, and enhancing functional outcomes in patients with Upper Cross Syndrome. These findings support the use of Kendall exercises as a primary intervention for UCS, particularly in cases where muscular imbalances are the predominant issue. Clinicians should consider incorporating these exercises into their treatment protocols for UCS to achieve optimal patient outcomes. Future research should explore the combination of these techniques with other therapeutic modalities to further enhance treatment efficacy and address the multifactorial nature of UCS (Sri PLB et al., 2023; Mareeswari et al., 2022).

CONCLUSION

The study concluded that Kendall exercises are significantly more effective than Gong's mobilization in reducing pain, improving cervical and shoulder range of motion, and enhancing functional outcomes in patients with Upper Cross Syndrome. These findings have important implications for human healthcare, suggesting that targeted exercises focusing on correcting muscular imbalances should be prioritized in the management of UCS. By integrating Kendall exercises into routine physiotherapy practices, clinicians can provide more effective interventions for patients suffering from postural dysfunctions, ultimately improving their quality of life and reducing the burden of musculoskeletal disorders.

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