



## Original Article

## Effects of Active Release Technique and Active Isolated Stretching on Muscles of Upper Cross Syndrome

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## ARTICLE INFO

## Key Words:

Active release technique (ART), Active Isolated Stretching (AIS), Muscle-length, Upper-cross syndrome(UCS)

## How to Cite:

Ali Syed, F. ., Ahmed Zahoor, I. ., Shabbir, S. ., Ali Rana, A. ., Ibrahim, M. ., & Ghaffar, E. . (2022). Effects Of Active Release Technique and Active Isolated Stretching on Muscles of Upper Cross Syndrome: ART and AIS on Upper Cross Syndrome . Pakistan BioMedical Journal, 5(7).  
<https://doi.org/10.54393/pbmj.v5i7.621>

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## ABSTRACT

Upper cross syndrome is a condition in which there exist a muscle imbalance in upper quadrant, involving weakness of some muscles and tightness of others. In UCS, levator scapulae muscle, upper fibers of trapezius muscle, and pectoralis minor get stiff and shortened from their original length occasionally involving pectoralis major muscle. **Objectives:** To compare the effect of Active release technique and active isolated stretching on the muscles of upper cross syndrome. **Methods:** This study was a single blinded randomized clinical trial. Muscle length measurement by Vernier calipers and measuring tape between standard bony landmarks, NDI (neck disability index), Cervical rotation ROM, Cranio-vertebral angle & Numeric Pain Rating Scale (NPRS) tools for screening will be used for data collection. Recorded values were analyzed for any change using SPSS 21.0 version. **Results:** In ART the mean value of NPRS was  $2.21 \pm 1.49$  and in AIS was  $2.31 \pm 1.35$ . For ART group the mean NDI score was  $15.12 \pm 8.83$  and for AIS group was  $16.1250 \pm 5.3898$ . The mean of cranio-vertebral angle in AIS group was  $47.2125 \pm 1.9373$  and in ART group was  $48.1819 \pm 1.6483$  which is nearer to normal CV angle. **Conclusions:** The study concluded that both Active release technique (ART) and Active isolated stretching (AIS) are effective methods of treatment. It was indicated that Active release technique (ART) was helpful in pain relief, improving range, cranio-vertebral angle, muscle length and functional status in subjects with Upper-cross syndrome(UCS).

## INTRODUCTION

Upper cross syndrome is a condition in which there exist a muscle imbalance in upper quadrant, involving weakness of some muscles and tightness of others. In upper cross syndrome, elevator scapulae muscle, upper fibers of trapezius muscle, and pectoralis minor muscles get stiff and shortened from their original length occasionally involving pectoralis major muscle. While lower fibers of trapezius muscle and rhomboids with other deep cervical flexor muscles get inhibited [1]. This syndrome can lead to great disorders and joint dysfunctions in human body and

could be a source of headaches. It may cause preliminary decline of the neck and decline in the neck lordosis. This syndrome also involves changes in thoracic spine curvature by increasing the angle of thoracic kyphosis (back-hump). This type of muscle disorder may have a direct impact on kinematics of shoulder joint. This postural imbalance results in such transformation in the biomechanics of cervical vertebrae joints. Such compensation triggers to a decline of cervical spine lordosis(arch). These malalignments in upper cross

syndrome if not treated accurately, may result in degeneration of the cervical spine vertebrae [2]. The functional imbalance of muscles of upper quadrant in a human body is a result of this proximal cross syndrome which frequently is the reason why people with this syndrome develop chronic headache issues. In fact, researchers find evidence that poor posture is linked with rise in death rates in elderly population [3]. Sustained imbalance of muscles of upper quarter may arise through long sitting routines of people e.g., long sitting hours in the classrooms as well as sitting routine for other doings of day-to-day life. There is a high prevalence of upper cross syndrome as kids are not as energetic nowadays. Individuals carry on with such lifestyle till adulthood, where it exclusively gets worse as we grow older [4]. The benefits recommended comprise providing local stimulant by the skin, orientation of fascial tissue, increasing space by uplifting fascia and soft tissues over and above region of swelling, sensory stimulant, elimination of oedema through regulating fluid to lymphatic channels, and assist or limit mobility of joints [5]. Physiotherapy exercises are utilized for elongating muscle fibers, strength training, to gain balance and to relieve pain related to cervical spine. Manual physical therapy involves mobilization of joints and manipulation techniques which are used to rehabilitate normal joint range of motion related with hypo-mobile joints. Soft tissues mobilization techniques include METs, AIS, and massage etc. Several methods are applied by Physical therapists to relieve cervical [6]. Restricted ROM and a subjective sensation of rigidity may go hand in hand with cervical spine pain, which is frequently accelerated by cervical spine motion or continuous cervical spine postures [7]. Janda proposed that prior to any effort is made for strengthening of weak musculature, hypertonus antagonistic musculature should be dealt with suitable therapy which eases (and if applicable expand) them [8]. The aim of this research was to compare the effectiveness of AIS versus ART in the management of upper cross syndrome. Application of ART was found to increase the active cervical lateral flexion, and decreased pain [9]. Following general study, no literature had been placed that uses both the active isolated stretching & ART to take care of this condition [10]. Due to lack of evidence, there is need to find which technique either active release technique or active isolated stretching has more significant effect on the muscles of upper cross syndrome [11]. Past studies indicate to utilize therapy alone can be rather helpful in treating this condition. There are no known studies using ART and active isolated stretching for the rehabilitation of UCS. Most important factors to be addressed, which are not considered in previous research involve reduced in time span passed from work/activities in which the individual

desired to contribute & modification of posture all the way through with alteration in structure is much more significant. The addition of active release technique (ART) and active isolated stretching to make this latest rehabilitation program which theorizes to enhance the usefulness of the outcomes in addition to reduce the time span to attain better outcomes.

## METHODS

This study was a single blinded Randomized Clinical Trial. The assessor was blinded from the allocation in the group. The study conducted in Max rehab Lahore institute which was completed in duration of six months. The sample size of 34 subjects 17 each group was calculated from epitool. Both male and female with age ranging from 20 to 40 years scored 4 or more on numerical pain rating scale (NPRS) and cranio-vertebral angle measured less than or equal to 50 degrees were included in this study. Patients with any inflammatory arthritis including Rheumatoid arthritis, ankylosing spondylitis, cervical spine surgery, cervical spine trauma, cervical spine instability were excluded from this study. Convenient sampling technique was used to collect the data. Based on inclusion and exclusion criteria, potential subjects were recruited for the study. They were requested to take part in the research. Written informed consent was taken. Every subject was asked to draw either No.1 or No.2 from a container. No.1 was assigned to Group A and No.2 was assigned to group B. Group A treated with active release technique while Group B treated with active isolated stretching. Muscle length measurement by Vernier calipers and measuring tape between standard bony landmarks, APECS (AI Posture Evaluation and Correction System) app, NDI (neck disability index), Cervical ROM by Universal Goniometer, Numeric Pain Rating Scale (NPRS) for pain were used as assessment tools. The data was analyzed using SPSS for Windows software, version 21. Statistical significance was set at  $P = 0.05$ . Descriptive statistics, frequency tables, pie charts, bar charts were used to describe summary of group measurements measured over time. For difference between groups independent sample t test was used. This test is used to compare two population at different various intervals.

## RESULTS

At the base line data was normally distributed. To assess normal distribution of data Shapiro-Wilk test was used. 36 individuals were chosen to assess on the base of inclusion and exclusion criteria. Out of 36 subjects who met inclusion criteria 34 were selected. 34 subjects then randomly scattered into 2 treatment groups, Group A: ART (Active Release Technique); Group B: AIS (Active Isolated Stretching). Two subjects from Group A dropped out owing to private problems and two subjects from Group B were

unable to continue all therapy sessions. Therefore, in evaluation their information was not included. Both groups socio-demographic information was similar at baseline. Parametric test was introduced for evaluation to verify between group comparisons at many intervals. Group A showed a higher decrease in NPRS with a mean value of  $2.21 \pm 1.49$  compared to pre-screening value  $5.688 \pm 1.8154$  while the post treatment mean value of NPRS of group B was  $2.313 \pm 1.3525$  as compared to its pre-screening value  $5.125 \pm 1.9958$ . This shows that both groups are statistically significant ( $p$  value  $< 0.05$ ) in reducing pain. This table showed the similarity in both groups at baseline treatment values with  $p$  value  $> 0.05$  in Age, NPRS, NDI, craniovertebral angle, cervical right-side rotation, cervical left side rotation, pect minor length & trapezius length on independent sample t test. In ART the mean value of NPRS was  $2.21 \pm 1.49$  and in AIS was  $2.31 \pm 1.35$ . For ART group the mean NDI score was  $15.12 \pm 8.83$  and for AIS group was  $16.1250 \pm 5.3898$ . The mean of cranio-vertebral angle in AIS group was  $47.2125 \pm 1.9373$  and in ART group was  $48.1819 \pm 1.6483$  which is nearer to normal CV angle. The mean of cervical spine right rotation was  $69.75 \pm 10.63$  and  $68.37 \pm 10.48$  in ART group and AIS group respectively. The mean of cervical spine left rotation was  $65.68 \pm 9.830$  and  $60.87 \pm 11.27$  in ART group and AIS group respectively. The mean of pec minor length was  $12.919 \pm 1.59$  and  $12.26 \pm 1.709$  in ART group and AIS group respectively. The mean of trapezius length was  $140.85 \pm 3.68$  and  $140.68 \pm 5.38$  in ART group and AIS group respectively (Table 1).

NPRS	Treatment groups		
	Active Release Stretching (ART) (n=16)	Active Isolated Stretching (AIS) (n=16)	p-value
Pre-treatment (Mean $\pm$ SD)	$5.68 \pm 1.81$	$5.12 \pm 1.99$	0.30
Post-treatment (Mean $\pm$ SD)	$2.21 \pm 1.49$	$2.31 \pm 1.35$	0.004

**Table 1:** Between Group Comparison of Numeric Pain Rating Scale (NPRS)

The comparing of pre-treatment and post-treatment NPRS outcomes between two groups was done using independent sample t test. Analysis revealed that the difference between two groups was statistically significant with  $p$  value  $< 0.05$ . ART group exhibited greater reduction in NPRS with mean value of  $2.21 \pm 1.49$  as compared to AIS group with mean value of  $2.31 \pm 1.35$ . The comparing of pre-treatment and post-treatment NDI statistics between two groups was done using independent sample t test. Analysis revealed that the difference between two groups was statistically significant with  $p$  value  $< 0.05$ . ART group showed greater reduction in NDI score with mean value of  $15.50 \pm 8.83$  as compared to AIS group with mean value of  $16.12 \pm 5.38$  (Table 2).

NDI	Treatment groups		
	Active Release Stretching (ART) (n=16)	Active Isolated Stretching (AIS) (n=16)	p-value
Pre-treatment (Mean $\pm$ SD)	$30.00 \pm 9.20$	$24.12 \pm 6.46$	0.21
Post-treatment (Mean $\pm$ SD)	$15.12 \pm 8.83$	$16.12 \pm 5.38$	0.001

**Table 2:** Between Group Comparison of NDI

The comparison of pre-treatment and post-treatment cranio-vertebral angle between two groups was done using independent sample t test. Analysis revealed that the difference in ART group was statistically significant with  $p$  value  $< 0.05$ . ART group exhibited greater reduction in cranio-vertebral angle with mean value of  $46.18 \pm 1.64$  as compared to AIS group with mean value of  $47.21 \pm 1.93$  (Table 3).

CVA	Treatment groups		
	Active Release Stretching (ART) (n=16)	Active Isolated Stretching (AIS) (n=16)	p-value
Pre-treatment (Mean $\pm$ SD)	$47.41 \pm 2.59$	$46.61 \pm 3.09$	0.40
Post-treatment (Mean $\pm$ SD)	$46.18 \pm 1.64$	$47.21 \pm 1.93$	0.007

**Table 3:** Between Group Comparison of Cranio-vertebral angle

The comparison of pre-treatment and post-treatment cervical spine right rotation between two groups was done using independent sample t test. Analysis revealed that the difference in ART group was statistically significant with  $p$  value  $< 0.05$ . ART group exhibited greater reduction in cervical spine right rotation with mean value of  $67.75 \pm 10.63$  as compared to AIS group with mean value of  $68.37 \pm 10.48$ . The comparison of pre-treatment and post-treatment cervical spine left rotation between two groups was done using independent sample t test. Analysis revealed that the difference in ART group was statistically significant with  $p$  value  $< 0.05$ . ART group exhibited greater range in cervical spine left rotation with mean value of  $65.68 \pm 9.83$  as compared to AIS group with mean value of  $66.87 \pm 11.27$ . The comparison of pre-treatment and post-treatment pec-minor length between two groups was done using independent sample t test. Analysis revealed that the difference in ART group was statistically significant with  $p$  value  $< 0.05$ . ART group exhibited significant increase in pec-minor length with mean value of  $12.91 \pm 1.59$  as compared to AIS group with mean value of  $13.26 \pm 1.70$ . The comparison of pre-treatment and post-treatment trapezius length between two groups was done using independent sample t test. Analysis revealed that the difference in ART group was statistically significant with  $p$  value  $< 0.05$ . ART group exhibited significant increase in trapezius length with mean value of  $140.85 \pm 3.68$  as compared to AIS group with mean value of  $141.68 \pm 5.38$  (Table 4).

RRO	Treatment groups		
	Active Release Stretching (ART) (n=16)	Active Isolated Stretching (AIS) (n=16)	p-value
Pre-treatment (Mean ± SD)	62.68 ± 10.53	60.87 ± 11.54	0.41
Post-treatment (Mean ± SD)	67.75 ± 10.63	68.37 ± 10.48	0.006

**Table 4:** Between Group Comparison of cervical spine right rotation

## DISCUSSION

The purpose of this research was to compare two non-invasive therapies, one of which was Active Release Technique (ART) and the other was Active Isolated Stretching (AIS). The focus of this research was on the effectiveness of ART and AIS on muscle length in men and women with UCS (upper-cross syndrome). In terms of pain, activity and cervical spine ranges of flexion and rotation and muscle length of the muscles involved, ART Group exhibited an analytically significant variation relative to AIS Group when doing research for different variables. In both groups, the effects of NPRS, NDI, CV angle and muscle length measurements varied considerably. These studies have thus shown that the Active Release Technique (ART) group is more effective in terms of pain, work and range of motion than Active Isolated Stretching (AIS). The target result measure is the effectiveness of incorporating Active release technique and AIS to the care regimen to right Upper cross syndrome measured by alterations in the forward head carriage angle. A new study reveals that heavy computer users appear to have a protruded head their COG was pushed anteriorly, and their balance capacity was also decreased [12-14]. There are many reasons that may lead to musculoskeletal disorders; defective posture could be a significant factor that triggers symptoms [15, 16]. Chronic pain in the cervical and migraine are among the most prevalent painful disorders in infancy. It is a problem as the incidence of both cervical pain and headache complaints has increased in 10 children and that these painful syndromes become chronic more commonly in puberty and adulthood [17, 18]. A survey found that chronic neck pain was more frequent in women (22%) than in men (16%) [19, 20]. A Global study of Headache Incidence and disability indicated that this would bring headache symptoms into the ten most crippling conditions for the two sexes and into the 5 most disabling conditions for women in the WHO list of sources of disability [21]. UCS management by ART recommended activities by demonstrating change in forward head carriage angle relative to the control group in the results of the interventional group. However, these outcomes were minimal and potentially not clinically relevant in comparison. The research strictly examined the environmental and functional effects of headache in Upper cross syndrome to create a symptom database included,

not as result indicator. The researchers conclude that shoulder pain is also a significant problem faced by individuals with Upper cross syndrome [22]. Results of the trial to analyze improvements in electromyography (EMG) and a reliable self-administered result indicator after administering ART to CTS (carpal tunnel syndrome) patients revealed that the mean symptom intensity and functional condition scores of the BQ after the intervention were substantially increased ( $p < 0.05$ ). No substantial variations were identified in the EMG review [23]. In a randomized clinical trial for the sudden benefit of the technique of Active release against MBLR (Mulligan bent leg raise) in participants with hamstring shortening. In Active release technique group, hamstring muscles flexibility and ROM improved more than Mulligan bent leg raise group [24]. Previous research contrasting the efficacy of ART (active release technique) and Capsular Stretch In combination with traditional Frozen Shoulder Treatment Therapy, this research found that ART and Capsular Stretch with traditional therapy is highly efficient in improving range of motion and decreasing frozen shoulder symptoms than solely with traditional therapy. Such modifications are clinically significant [25]. In terms of NPRS, NDI, CV angle range and muscle length, the findings of the current analysis indicate both statistically and clinically relevant results. Both the technique of active release and the technique of active isolated stretching are widely known and recognized recovery approaches. The Active Release Technique procedure was effective in pain relief, improving range and function in participants with UCS (Upper-cross syndrome) in the current study.

## CONCLUSIONS

Results of this research concluded that ART is more effective treatment to improve pain, ROM, reduce disability improve CV angle and to increase muscle length and improve function in patients suffering from Upper-cross syndrome. Active isolated stretching (AIS) is also effective, but results showed significant effects of Active release technique (ART).

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