

Effectiveness of Active Release Technique Along with Scapular Stabilization Exercises on Pectoralis Minor Tightness and Shoulder Range of Motion Among College Students: A Randomized Controlled Trail

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DOI: <https://doi.org/10.52403/ijhsr.20240557>

ABSTRACT

Background: Pectoralis minor is one of the most common muscles which gets tightened and leads to abnormal shoulder posture. So, the purpose of this study is to find the effects of active release technique along with scapular stabilisation technique in improving the muscle length and shoulder range of motion.

Material and methods: Total 60 college students were randomly divided into two groups: Treatment group in which students were treated with active release technique and scapular stabilisation exercises along with conventional exercises, however, only conventional exercises were provided to the control group. Outcome measures included were pectoralis length through table top test and shoulder abduction and external rotation range of motion.

Results: A statistically significant difference was seen in outcome measure when compared within the group, however between group difference was non-significant.

Conclusion: Active release technique along with scapular stabilisation technique is found equally effective to the conventional exercises in this study.

Keywords: Pectoralis Minor tightness, Active Release Technique, scapular stabilisation, Table top test, Stretching

INTRODUCTION

The pectoralis minor is the most common muscle which gets tightened and its prevalence is 67.92% among college students.¹ The pectoralis minor muscle has been considered as a muscle that affects the positioning of the scapula thus effective measurement of the muscle length is important for the rehabilitation purposes such as to prevent and manage any of the

upper limb dysfunction that may further causes pectoralis minor shortening. Shortening of the muscle is generally associated with sustained posture which involves anterior tilting and protraction of the scapula.² The pectoralis minor muscle helps in stabilizing the shoulder joint, depresses, rotates downward and tilts the scapula anteriorly.³ It is commonly regarded as a contributor to abnormal scapula

positioning and thus leading to faulty biomechanical posture.⁴ Tightening of the muscle can occur for a variety of reasons ranging from repeated overhead motions like any kind of sports or due to chronically sustained aberrant postural positions such as slouched position which can further associated to shoulder pain and various other specific pathologies.¹ Due to this adaptive shortening of the pectoralis minor muscle, there may be increase in passive tension thus reducing the subacromial space by normal scapular motion like upward rotation while elevating arm.⁵ A commonly used method of stretching is static stretching in which the soft tissues are elongated just past the point of the tissue resistance and then are held in lengthened position over a period of time with a sustained stretch force.⁶

Recently, another soft tissue technique gaining importance is Active Release Technique-(ART). Active Release Technique is a manual procedure for soft tissue rehabilitation which requires removal of stiffness, muscle fatigue along with irregular symptoms such as mechanical muscle dysfunction, myofascia and soft tissue tightness. The main principle of this technique is to break the adhesions produced by cross tissues situated at oblique angles to one another.⁷ Deep digital pressure is applied over the tender point when the muscle is in shortened position and after that the participants is asked to actively move the muscle in an opposite lengthened position thus breaking adhesions.⁸

The positions of the scapula and the motions on the thorax are the critical components for the normal glenohumeral functions and play great roles in facilitating optimal shoulder movements. Normally, the scapula provides a stable base for the glenohumeral mobility to take place. The surrounding musculature is also responsible for the stability of the scapula. These muscles dynamically position the glenoid so that the glenohumeral movement can occur efficiently. During the most of the movements of the glenohumeral joint

especially overhead elevation of the arm, it is important that the muscles stabilizing the scapula should be strong enough to properly position the scapula. The main muscles stabilizing the scapula are the levator scapulae, rhomboids and serratus anterior. The muscle group functions through synergistic co-contraction with rotator cuff thus controlling the scapular movements. The purpose of this technique is to restore the position, direction, muscle movement control and movement pattern to stabilize the scapula and improve the functioning of the joint.⁹ Thus the purpose of this study is to find the effects of Active Release Technique along with Scapular Stabilization exercises on pectoralis minor tightness, and shoulder range of motion among college students.

MATERIALS & METHODS

This randomized controlled trail was conducted at Prem Institute of Medical Sciences, Panipat. The Ethical clearance was taken from institutional ethical committee of college, Panipat. The whole procedure was explained to the participants and the informed consent for participation in the study was obtained. Total 60 college students including males and females who fulfilled the inclusion criteria such as age between 18-22 years and positive Table Top Test were included in the study. Participants with any neurological symptoms, osteoarthritis or rheumatoid arthritis, cardiovascular risks, rotator cuff tear and history of shoulder or neck surgery were excluded from the study. Then, participants were divided into two groups: Group A in which Active Release Technique along with Scapular Stabilization Technique were provided and Group B was control group. Conventional physiotherapy treatment including range of motion exercises, stretching exercises and pendulum exercises were provided to all the participants in both groups.

Outcome measures: Shoulder abduction and external rotation active range of motion

were measured through universal goniometer. Shoulder abduction and external rotation was measured in sitting and supine position respectively. Pectoralis minor tightness was measured with table top test. The individual was in supine position with his/her hands resting on abdomen and elbow in slight flexion. Then, therapist measured the linear distance from the plinth to the posterior aspect of the acromion process using a protractor. If the measured distance was greater than 2.5 cm (1 inch), it was considered significant and positive for tightness of pectoralis minor muscle.

Intervention: For active release technique the participants were positioned in supine lying with therapist on the same side to be treated. After that, the muscle was palpated by the therapist. Then, a firm pressure was applied to the muscle belly using his/her thumb or fist as shown in figure 1. Participants were asked to perform the function of the muscle for 10 times, while keeping thumb or fist placement perpendicular to the fibers and across the orientation of the muscle fibers. The procedure was repeated thrice. Mild pain was felt by the participants during the treatment. After this procedure, stretching was followed.

A brief explanation about the three types of Scapular Stabilization exercises were provided to the participants. These were performed 3 times a week for 6 week period. The participants were asked to avoid any other exercise and severe daily activities during their treatment. Firstly, strength training for rotator cuffs, scapular retractors and shoulder external rotators was done with therabands as shown in figure 2. The level of difficulty of exercises or resistance of therabands was increased based on quality of shoulder motion throughout the treatment process. The participants performed three sets of 10 repetitions with the 60 second rest period between each set. Secondly, Stabilization exercises such as T to Y exercise, T to Y to W exercise and Scapular Protraction were performed on a medium sized Swiss ball in prone position to target the periscapular muscles and to improve the stabilization of the scapula as shown in figure 3. Lastly, scapular clock exercises were performed to facilitate the scapular motions of elevation, depression, protraction and retraction as well. The subject stood beside a wall and then with each hand moved a ball on that wall to show 3, 6, 9 and 12 o'clock based on an imaginary clock he had in his mind.¹⁰ (figure 4)



Figure 1: Active release technique: A) Starting position B) End Position

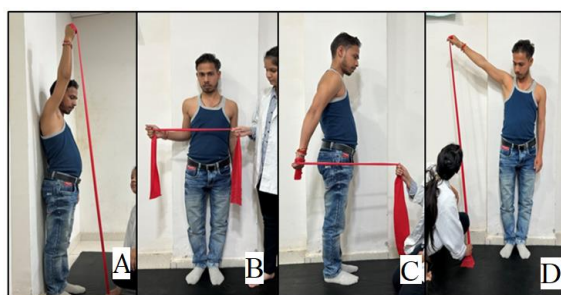


Figure 2: Theraband exercises

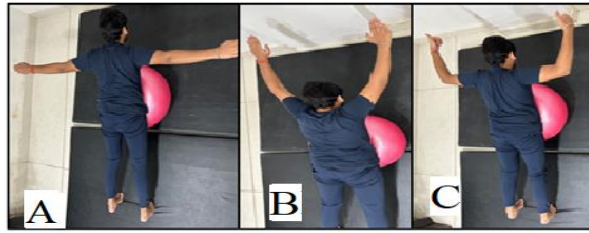


Figure 3: scapular stabilisation A) T- Position B) Y- Position C) W - Position



Figure 4: Imaginary clock exercises A) 12 o'clock B) 3 o'clock C) 6 o'clock D) 9 o'clock

STATISTICAL ANALYSIS

Descriptive statistics like frequency (n) & percentage (%) of the categorical data whereas mean & standard deviation of numerical data were depicted. Paired and unpaired t-test were used to see the effect of Active Release Technique along with Scapular Stabilization Technique on pectoralis minor tightness and shoulder range of motion in college students. The level of significance was set at 0.05.

RESULT

This study was conducted on 60 students with pectoralis minor tightness, who were equally divided into 2 groups – 30 students each group. In both the groups, total number of males and females were same i.e. 18 and 12 respectively. The mean age in both the groups was homogenous. Mean age of Group A was 20.60 ± 1.493 and Group B was 20.17 ± 1.599 . There was no statistically significant difference between the groups in mean age (p- value = 0.2765) as shown in table 1.

Table 1: Demographic Data

	Group A	Group B	t-value	p- value
Total participants	30	30	-	-
Mean age	20.60 ± 1.493	20.17 ± 1.599	1.099	0.2765
Male	18	18	-	-
Female	12	12	-	-

When comparing the range of motion of abduction and external rotation within the group statistically significant improvement was seen in both the groups in left and right shoulder as shown in table 2 whereas when

the values were compared between the groups, no statistically significant difference was found between the groups as shown in table 3.

Table 2: Comparison of Range of motion within the group

	Left shoulder				Right shoulder			
	Group- A		Group- B		Group- A		Group- B	
	Abduction	ER	Abduction	ER	Abduction	ER	Abduction	ER
Pre test	128.00 ± 7.935	77.47 ± 2.688	129.03 ± 4.923	77.80 ± 2.747	127.90 ± 6.815	76.90 ± 2.644	129.47 ± 4.869	77.57 ± 2.967
Post test	137.00 ± 6.002	82.83 ± 2.306	137.97 ± 4.255	82.80 ± 2.618	136.93 ± 5.051	83.27 ± 2.164	138.23 ± 4.739	83.20 ± 2.384
MD	9.10	5.37	8.93	5.00	9.03	6.37	8.77	5.63
t- value	12.994	15.164	13.738	15.376	10.675	13.117	14.205	10.057
p- value	0.00*	0.00*	4.25**	0.00*	0.00*	0.00*	0.00*	0.00*

*highly significant **non-significant MD- Mean Deviation ER- External Rotation

Table 3 Comparison of range of motion between the groups

	Left shoulder				Right shoulder			
	Pre test		Post test		Pre Test		Post test	
	Abduction	ER	Abduction	ER	Abduction	ER	Abduction	ER
Group- A	128.00 ± 7.935	77.47 ± 2.688	137.03 ± 4.923	82.83 ± 2.306	127.90 ± 6.815	76.90 ± 2.644	136.93 ± 5.051	83.27 ± 2.164
Group- B	129.03 ± 4.923	77.80 ± 2.747	137.97 ± 4.255	82.80 ± 2.618	129.47 ± 4.869	77.57 ± 2.967	138.23 ± 4.739	83.20 ± 2.384
MD	1.03	0.33	0.87	0.03	1.57	0.67	1.30	0.07
t- value	0.606	0.475	0.645	0.052	1.025	0.919	1.028	0.113
p- value	0.54**	0.63**	0.52**	0.95**	0.30**	0.36**	0.30**	0.91**

**non-significant MD- Mean Deviation ER- External Rotation

Pectoralis Minor muscle tightness was measured in cm with table top test. When comparing the values of pectoralis minor muscle tightness within the group a statistically significant improvement was

seen on both sides (Table 4), however, between group comparison did not show any statistically significant improvement on any side (Table 5).

Table 4: Comparison of pectoralis minor tightness within the group

	Left Side		Right side	
	Group- A	Group- B	Group- A	Group- B
Pre test	7.33 ± 1.246	7.32 ± 1.003	7.34 ± 1.170	7.30 ± 0.972
Post test	6.07 ± 1.125	6.61 ± 0.964	6.11 ± 1.147	6.58 ± 0.992
MD	1.26	0.71	1.23	0.73
t- value	12.738	11.654	15.165	11.766
p- value	0.00*	0.00*	0.00*	0.00*

*highly significant MD- Mean Deviation

Table 5: Comparison of pectoralis minor tightness between the group

	Left Side		Right side	
	Pre test	Post test	Pre test	Post test
Group- A	7.33 ± 1.246	6.07 ± 1.125	7.34 ± 1.170	6.11 ± 1.147
Group- B	7.32 ± 1.246	6.61 ± 0.964	7.30 ± 0.972	6.58 ± 0.992
MD	0.01	0.54	0.03	0.47
t- Value	0.046	1.996	0.120	1.698
p- value	0.9637**	0.05***	0.9049**	0.0950**

non-significant *significant MD- Mean Deviation

DISCUSSION

The purpose of this study was to see the effects of active release technique along with scapular stabilization exercises on pectoralis minor tightness among college students. The results of this study revealed that shoulder range of motion did not improve by active release technique along with scapular stabilization exercises. Kim et al conducted a study to see the effects of active release technique on pain and range of motion of patients with chronic neck pain. They concluded that active release technique and joint mobilization are both effective for the treatment of patients with chronic neck pain however active release technique was more effective in patients

with chronic neck pain involving soft tissue injury.¹¹ Another study by Naz et al on comparative effects of Active release technique and muscle energy technique on pain, range of motion and functional disability in adhesive capsulitis patients with trigger points had the similar findings. According to them, both the techniques are effective but active release technique is more effective than muscle energy technique in improving pain, range of motion and functional disability.² Similarly, the active release technique was found more effective than the hold relax technique in a study by Paul et al in patients with shoulder impingement syndrome. All the above studies were done in a pathological

condition in which improvement is easy to show, however, the current study was done on college students without any shoulder pathology. Moreover, stretching exercises and range of motion exercises were also given in control group which improved the results in both groups. These might be the possible reasons for not getting desired statistically significant difference between both the groups.

In this present study, findings in between the groups revealed that pectoralis minor tightness was not improved by active release technique along with scapular stabilization exercises. Fizza et al conducted their study on the effects of active release technique and active isolated stretching on muscles of upper cross syndrome. Vernier caliper was used as measuring instrument to measure the muscle length in their study. The findings revealed that both active release technique and active isolated stretching are effective methods but it was indicated that active release technique was more helpful in pain relief, improving range and muscle length and functional status.¹² But in the current study we have used table top test for the measurement of pectoralis minor tightness. This might be the reason of variations in results among the studies.

Limitations of the study: Sample size was small, therefore the result of the study cannot be generalized to the whole population. Samples were collected only from a particular place or from one college. Pure control group was absent.

CONCLUSION

This study found no extra benefits of active release technique and scapular stabilisation exercises in college student with pectoralis tightness. These found equally effective as conventional exercises such as stretching and range of motion exercises. Further studies are recommended with pure control group and larger sample size.

Declaration by Authors

Ethical Approval: Approved

Acknowledgement: None

Source of Funding: None

Conflict of Interest: The authors declare no conflict of interest.

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How to cite this article: Pallavi Jindal, Komal Malik, Gaytri Kankerwal, Sharanjeet Saroa, Ravindra Sharma. Effectiveness of active release technique along with scapular stabilization exercises on pectoralis minor tightness and shoulder range of motion among college students: a randomized controlled trail. *Int J Health Sci Res*. 2024; 14(5):435-441. DOI: <https://doi.org/10.52403/ijhsr.20240557>
