

## Evaluation of Scapular Asymmetry in Asymptomatic Young Males

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### ABSTRACT

Even though the scapular asymmetry is common in asymptomatic individuals, it is essential to identify the normal degree of scapular variation. This helps in differentiating normal variation from pathological positional abnormality of scapula and hence useful in detecting clinical abnormality. Kibler WB assumed that a difference of less than or equal to 1.5cm is the normal variation, but the scientific evidence is limited. Therefore, the aim of the present work is to find out the normal scapular asymmetry in asymptomatic young males aged 18 to 25 years using Kibler's Lateral Scapular Slide Test (LSST). Study design is descriptive. 150 asymptomatic males aged 18 to 25 years were the chosen population. Scapular position was evaluated using LSST in three shoulder positions Viz shoulder at neutral, shoulder at 45° and shoulder at 90°. The mean scapular asymmetry was  $.570 \pm .615$ ,  $.563 \pm .562$  and  $.626 \pm .515$  when shoulder at neutral, shoulder at 45° and shoulder at 90° respectively. The difference between two sides was statistically significant in all the three positions. But, between the three positions the difference was statistically insignificant, inferred that scapular asymmetry was more or less same in all the three positions. It is concluded that the scapular distance was significantly higher in dominant side. The asymmetry observed in the present study is comparatively lower than assumed cut off values and hence the present findings anticipate clinical usefulness in early diagnosis of shoulder and scapular problems of young males.

**Key Words:** Scapular asymmetry, Scapular dyskinesis, Lateral Scapular Slide Test (LSST), Position of scapular.

### INTRODUCTION

Adequate scapular movements are essential to maintain proper functions of the Gleno-humeral (GH) Joint. [1,2] The movements of scapula are produced by the combined movements of sternoclavicular (SC) and acromioclavicular (AC) joint. The upward rotation of scapula during arm elevation is vital for achieving full arc (180°) of shoulder movements. The muscles

that are attached to the scapula Viz upper trapezius, middle trapezius and serratus anterior plays an important role in causing essential upward rotation of the scapula during shoulder elevation. [3,4] The other movements of scapula such as internal rotation and external rotation, posterior and anterior tipping is also very much required in varying degrees to complete full arc of shoulder elevation. [5-7]

Sufficient scapular movements can be achieved only if the scapula is positioned rightly on the thorax. More than that, the good position of scapula is crucial for maintaining stability of the shoulder joint especially during functional movement. [8] Therefore, involvement of scapular muscles results in shoulder problem by altering the position of scapula. [1,9,10] Hence evaluation of scapular position is a prerequisite in identifying the causes of shoulder problems. Identification of symmetrical positional abnormality of the scapula is a common clinical measure to identify the problem. Lateral scapular slide test (LSST) is the simple way of measuring scapular symmetry. It is used to determine scapular position with the arm abducted  $0^{\circ}$ ,  $45^{\circ}$  and  $90^{\circ}$  in the coronal plane. Assessment of scapular position is based on the derived difference measurement of bilateral scapular distances. This test has moderate to high reliability. [11-13] Minimal scapular asymmetry is even observed in normal individuals, due to hand dominance. According to Kibler WB a derived difference of scapular position of up to 1.5 cm is normal. [14] But limited scientific evidence is found. Therefore, it is paramount importance to identify the magnitude of normal scapular asymmetry in healthy individual's to better predict the positional abnormality of scapula.

## **MATERIALS AND METHODS**

**Participants:** 150 healthy male students of Annamalai University were the study participants. The study was carried out in Division of Physical Medicine and Rehabilitation (PMR), Rajah Muthiah Medical College and Hospital (RMMCH), Annamalai University (AU) and Malligai Illam – E1 Mens hostel – AU. The selection criteria includes age between 18 to 25 years, no history of shoulder pain and shoulder problems, not involved in regular exercise programs and BMI <25.

**Ethical and informed consent:** The nature of the study was explained and informed consent was obtained before enrolling the

participants in to the study. The study was approved by the local 3 member team of research scrutinizing committee, of division of PMR, RMMCH, AU, validating experimental research in human subjects.

**Procedure:** Scapular position was evaluated bilaterally using Kibler's LSST. The evaluation was carried out in three positions Viz shoulder in neutral, shoulder in  $45^{\circ}$  abduction and shoulder in  $90^{\circ}$  abduction. The measurements of two sides were compared statistically using paired sample 't' test. The mean difference of LSST between sides in all the three positions were compared altogether using Analysis of Variance (ANOVA).

**Evaluation of LSST:** [14] The subjects were told to remove their shirts. The evaluation was carried out by a physiotherapist who has sufficient experience in measuring LSST.

### **Position – 1: Evaluation of scapular position at shoulder in neutral:-**

Assessment was performed in standing position. Inferior angle of scapula was palpated and marked by skin marker. The horizontal distance between inferior angle of scapula to the corresponding spinous process of vertebrae was measured by measuring tape in centimeters (cm) – (Figure - 1).

### **Position – 2: Evaluation of scapula position at shoulder in $45^{\circ}$ .**

The participants were told to keep their hands on the both hip in such a way that web space between the thumb and the second finger rests on iliac crest. Measurement was repeated similar to position 1 (Figure -2).

### **Position – 3: Evaluation of scapular position at shoulder in $90^{\circ}$**

Participants were told to raise the arms  $90^{\circ}$  sideward with simultaneous internal rotation of shoulders. Measurements were repeated similar to position 1 and 2 (Figure - 3).

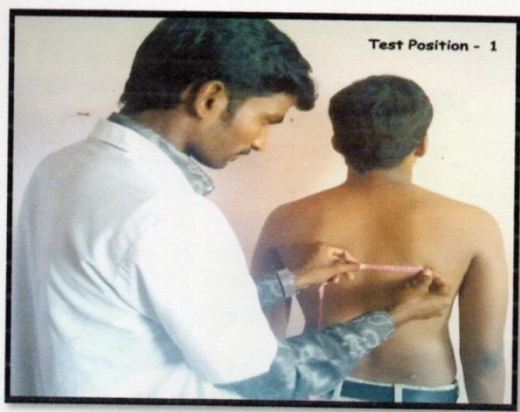


Figure 1: Test Position - 1

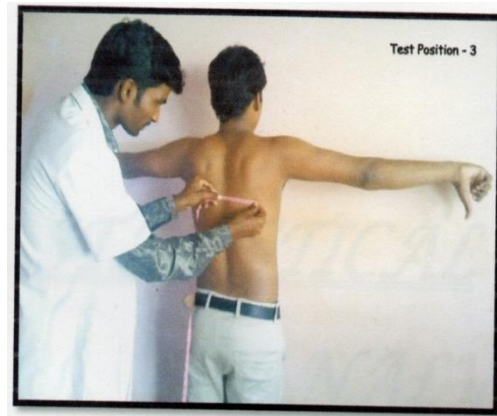


Figure 3: Test Position - 3

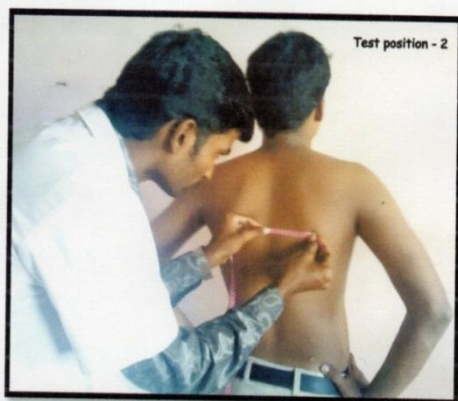


Figure 2: Test Position - 2

## RESULTS

There was significant difference in LSST measurements between right & left scapula in all the three positions as shown in table 1 at 95% confidence interval (significance level 0.05). It is further inferred that, the mean distance was higher in right side.

Table 1 - LSST Comparison

Position	R		L		Paired Sample 't' test	
	Mean (cm)	SD (cm)	Mean (cm)	SD (cm)	't'	'p'
Shoulder in neutral	9.23	1.13	8.64	1.11	4.55	.001*
Shoulder in 45 <sup>0</sup>	9.26	1.08	8.74	1.06	4.18	.001*
Shoulder in 90 <sup>0</sup>	10.88	1.01	10.27	1.09	4.97	.001*

R – Right, L – Left, cm - centimeters

SD – standard deviation

\*- significant

The mean difference in scapular distance between two sides (Scapular asymmetry) is shown in table 2. ANOVA was used to compare the differences in scapular asymmetry between three positions. It was found that, the difference was statistically insignificant at 95% confidence interval (significance level 0.05).

Table 2 Derived difference in LSST between two sides

Position	Mean (cm)	SD (cm)	ANOVA	
			'F'	'p'
Shoulder in neutral	.570	.615	.567	.568
Shoulder in 45 <sup>0</sup>	.563	.567		
Shoulder in 90 <sup>0</sup>	.626	.515		

SD – standard deviation, cm - centimeters

## DISCUSSION

The Scapular position is differed significantly between two sides in all the three positions measured by LSST in the present investigation. In most of the previous work, scapular position was compared between patients with shoulder pathology and normal. Taspinar F et al [15] identified scapular asymmetry and greater protraction in the patient group. Turgut E et al [16] found that scapular was more downwardly rotated and anteriorly tilted in patients with shoulder impingement syndrome compared to controls during arm elevation. Kibler WB assumed that a difference of up to 1.5cm in LSST is normal

for asymptomatic healthy individuals. He further states that as scapular distance increases, positional abnormality is present and vice-versa.

Hand dominant factor is the Contributing factor for scapular asymmetry in normal subjects. Morais NV et al [17] and ShihYF et al [18] found that hand dominance factor is the cause of scapular asymmetry in their studies. It is observed that there is augmented myoelectric activity of the serratus anterior muscle and lower trapezius muscle in the dominant side, causing posterior tilt of scapula on that side. There is greater retraction of scapula on dominant side during arm elevation is reported in previous literatures.

Still the literatures identifying the ideal variation of scapular distance between two sides in normal subjects is lacking. Kibler WB [19] concluded in consensus statement from the scapular summit that scapular positional abnormality is most suitably recognized as a potential impairment to shoulder function. He further states that effective treatment strategies can only be implemented by the assessment of positional abnormality of the scapula. Therefore it is very essential to study the normal variation of scapular asymmetry in healthy subjects to better predict the scapular abnormality as the cause of shoulder problems.

The mean scapular asymmetry in the present study is .570cm, .560cm and .626cm when shoulder at neutral, 45<sup>0</sup> and 90<sup>0</sup> respectively and which is comparatively less than the cut off values of 1.5cm predicted by Kibler WB . This could have been due to ethnicity factors. Hence the variation above the mean values obtained in the present work is a wakeup call that effective scapular training needs to be initiated to prevent shoulder problems due to positional abnormality of the scapula in the current population. In the present work, standard deviation of .50cm to .60cm in the variation of scapular asymmetry is obtained, which is quite high. The present result further shows that there is an equal variation in scapular

asymmetry in three test positions. This is because the present study is done on healthy subjects. It is observed in previous studies that for subjects with shoulder problems, the variations of scapular asymmetry were not similar in three test positions. During shoulder at 45<sup>0</sup> and 90<sup>0</sup>, the muscles of scapula play an important role in stabilizing the shoulder complex.

## CONCLUSION

It is concluded that the scapular distance was significantly higher in dominant side. The asymmetry observed in the present study is comparatively lower than assumed cut off values and hence the present findings anticipate clinical usefulness in early diagnosis of shoulder and scapular problems of young males.

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