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Original Research Article

Effect of Scapular Position on Neck Pain in Swimmers

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ABSTRACT

Introduction: Competitive swimming is a rigorous sport being engaged in by an increasing number of young athletes. In swimmers, shoulder pain and neck pain is the most common musculoskeletal complaint and is usually due to Supraspinatus, biceps tendinitis, scapular muscles. Scapular position on the thorax and control during motion is a critical component of normal shoulder function. During elevation of the arm overhead, scapula should upwardly rotate and posterior tilt on the thorax. Upward rotation is the predominant Scapulothoracic motion.
Methodology: A total number of 120 subjects (including male and female) who fulfilled the inclusion criteria were included in the study. 120 Swimming Athletes were taken from a government affiliated swimming pool complex, and from a reputed school of Delhi. Two groups were included in the study; Study group- with neck pain and Control group- without neck pain. Scapular protraction measurements were taken with the participant standing with normal, relaxed posture. The measurements were performed at 3 different positions (at rest, hands on hip, 90 degree glenohumeral abduction).
Statistical test: Independent t test was used to compare the mean in terms of distance of right and left side in study and control group, also test was used to compare the mean difference of scapular position at three different positions between study and control group
Result: The result shows there is significant difference of scapular position among study and control group in all three positions.
Conclusion: In the present study, it was seen that scapular position is altered in swimmers who are suffering from neck pain in all three positions that is at rest, hands on hip, and 90 degree abduction.
Key words – Neck pain, Scapular position, Swimmers disorders

INTRODUCTION

Competitive swimming is a rigorous sport being engaged in by an increasing number of young athletes. In swimmers, shoulder pain is the most common musculoskeletal complaint and is usually due to Supraspinatus or biceps tendinitis. Modern training techniques are producing steady improvements in world record times for competitive swimming but may also be placing the competitive swimmer at greater risk for injury.

Most injuries and complaints encountered in swimming athletes occur because of repetitive micro trauma or overuse, with many injuries originating from faulty technique and poor swimming biomechanics. Swimming is unique in that it provides upper and lower body strength and cardiovascular training, which is performed in a non-weight bearing environment. However the highly repetitive motion of swimming may predispose overuse injury. [2]

Swimmers perform highly repetitive motions that can lead to overuse injuries, specifically to the shoulder and back. Back injuries in swimmers include disc

degeneration, hyperextension, or myofascial involvement. Swimmers who frequently participate in the breast stroke and butterfly continually hyperextend their backs in order to perform the movement, and studies have shown that this element is related to spondylolysis (Nyska et al, 2000). [3] Swimming is one of the safest sports. Still there are few injuries. One of the biggest injury types is shoulder injuries and other upper part chronic overuse injuries. [4] Swimming ranks above both hiking and jogging in the number of participants in the United States. Competitive swimming is a demanding and time consuming sport. During 1 year of practice, the average top-level swimmer may perform over 500,000 strokes per arm. [5]

The position of scapula is the key contributor to normal and abnormal scapular motion and control. Normally scapula rests at a position on the posterior thorax approximately two inches from the midline, between the second and seventh ribs. The scapula also is internally rotated from vertical, and is upwardly rotated 10 to 20 degrees from vertical. [1] Scapular position on the thorax and control during motion is a critical component of normal shoulder function. During elevation of the arm overhead, scapula should upwardly rotate and posteriorly tilt on the thorax. Upward rotation is the predominant scapulothoracic motion. [6]

Abnormal or altered scapular position is defined as an observable alteration in the position and motion of the scapula relative to the thoracic cage .alterations that have been identified in swimmers include increased protraction. [7,12,13] Scapular protraction is an abnormal position which has been defined as an increased distance between the inferior angle of scapula and the spinous process of corresponding vertebra. [8] Some authors reported that imbalanced force produce superior translation of the scapula with less efficient downward rotation and increased posterior tipping. [9-11] which further leads to various serious pathologies

METHODOLOGY

Present research is a case control research. A total number of 120 subjects (including male and female) who fulfilled the inclusion criteria were included in the study. 120 Swimming Athletes were taken from a government affiliated swimming pool complex, and from a reputed school of Delhi. Randomized selection of the subjects was done performing at state level. Subject who fulfilled the inclusion criteria and gave their informed consent were included in the

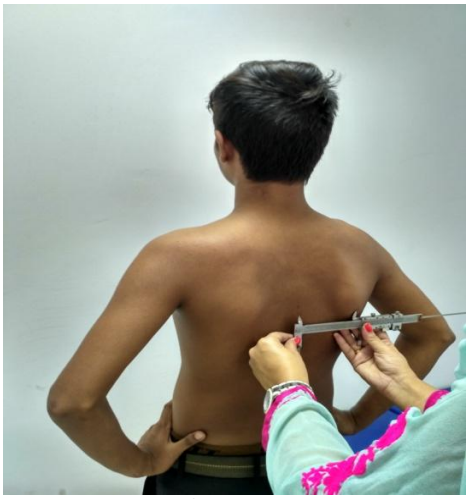
Inclusion criteria:-Under 19 not less than 17 (senior group).

Exclusion criteria:-Any diagnosed case of vascular/ cardiopulmonary or vestibular, visual or neurological deficits. And psychological/psychiatric disorders, any diagnosed case of malignancy. Any history of surgery of any limb, .Any swimmer who is physically challenged and who is not eligible for any physical activity

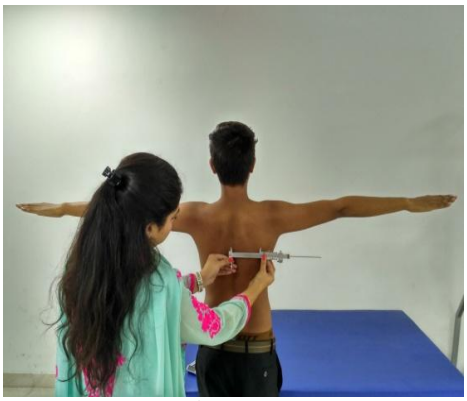
Material required: Vernier caliper, Marker, Goniometer

Procedure: Initially before measuring the scapular position, a brief physical assessment was taken which included demographic data and assessment of neck pain by using VAS. The numbers of hours each individual play in a day will also be taken in to consideration. Two groups were included in the Study group- with neck pain. Control group- without neck pain.

Picture 1 Measurement of scapula at rest



Picture 2 –Measurement of scapula at hands on hip position



Picture 3 – Measurement of scapula at 90 degree glenohumeral abduction

Measurement of scapular protraction:

Scapular protraction measurements were taken with the participant standing with normal, relaxed posture. The measurements were performed at 3 different positions

1. At rest.
2. Hands on hip.
3. 90^0 glenohumeral abduction with internal rotation.

First the inferior angle of scapula was palpated and marked. the subject was asked to stand relaxed with arms by the side of the body. This was considered as position of rest. The distance from the inferior angle of corresponding spinous process was taken. Right and left side measurement was recorded. The measurement was done three times. Average of the three readings was considered as final reading. The same procedure was repeated for second position hands on hip, and for third position 90^0 abduction

DATA ANALYSIS

Statistical methods:

Descriptive statistical analysis has been carried out in the present study. After using descriptive statistics mean value, standard deviation, confidence interval, t value and p value was obtained.

Statistical test:

Independent t test was used to compare the mean in terms of distance of right and left side in study and control group, also test was used to compare the mean difference of scapular position at three different positions between study and control group.

Table 1: gives details of scapular position in individuals without neck pain, At rest mean values of distance between inferior angle of scapula and corresponding spinous process shows 11.68(1.65) for right side and 11.68(1.49) for left side, similarly for second position hands on hip mean value shows 13.32(1.61) for right side and 13.35(1.47) for left side and finally for 90^0 abduction the mean shows 13.32(1.61) for right side and 13.35(1.47) for left side. Results show there is no significant difference between right and left side in all three positions.

Table-1 Scapular position in swimmers without Neck pain

Position	Right	Left	t- value	p-value
	Mean (SD)	Mean(SD)		
At rest(cm)	11.68(1.65)	11.68(1.49)	1.98	0.884
Mean difference	0.49			
Hands on hip(cm)	13.32(1.61)	13.35(1.47)	1.98	0.995
Mean difference	0.43			
90^0abduction(cm)	13.32(1.61)	13.35(1.47)	1.98	0.93
Mean difference	0.43			

The result shows there is no significant difference between right and left side in all three positions

Table 2: gives details of scapular position in individuals with neck pain, At rest mean values of distance between inferior angle of scapula and corresponding spinous process shows 12.04(1.57) for right side and 11.02(1.22) for left side, similarly for second position hands on hip mean value shows 12.67(1.56) for right side and 11.74(1.24) for left side and finally for 90^0 abduction the mean shows 13.51(1.63) for right side and 12.52(1.24) for left side. Results show there is significant difference between right and left side in all three positions.

Table 2- Scapular position swimmers with Neck pain

Position	Right	Left	t-value	p-value
	Mean(SD)	Mean(SD)		
At rest(cm)	12.04(1.57)	11.02(1.22)	1.98	0.0004
Mean difference	1.36			
Hands on hip(cm)	12.67(1.56)	11.74(1.24)	1.98	0.0007
Mean difference	1.30			
90^0abduction(cm)	13.51(1.63)	12.52(1.24)	1.98	0.0005
Mean difference	1.37			

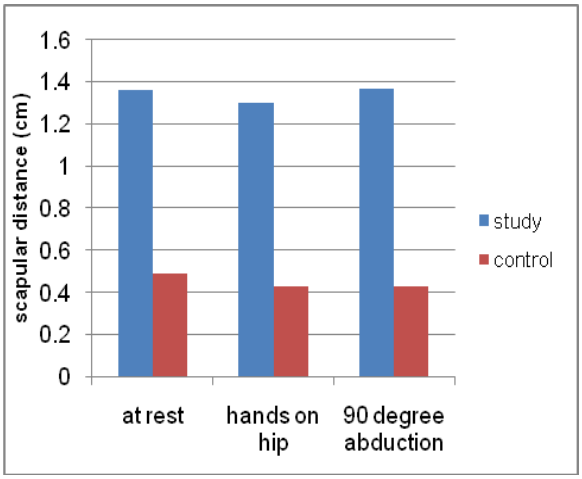
The result shows there is a significant difference between the right and left side in all three positions

Table 3: gives details of scapular position of study and control group the results shows there is significant difference of scapular position among study and control group

Table 3- Comparison between study and control group

Position	Cases	Control	t-value	p-value
	Mean (SD)	Mean (SD)		
At rest(cm)	1.3	0.39	1.9	0.0007
Hands on hip(cm)	1.35	0.42	1.9	0.0009
90^0abduction(cm)	1.36	0.40	1.9	0.0006

The result shows there is significant difference of scapular position among study and control group in all three positions.



Graph 1- Comparison between study and control group

DISCUSSION

The present study assessed the scapular position in swimmers with and without neck pain in three different positions. The vernier caliper was used to assess the scapular position in swimmers.

The result of the study showed that there is significant difference of scapular position in all three positions that is at rest, hands on hip and 90^0 glenohumeral abduction with internal rotation in swimmers with neck pain as seen in Which infers that the scapular kinematics is altered in all three positions in swimmers who plays in abnormal posture for long hours which cause neck pain.

Previous studies have reported altered motor control of the neck-shoulder muscles in patients with chronic neck-shoulder pain. Whether the activation of neck-shoulder muscles is altered among elite swimmers who have shoulder pain is unknown. [14]

There is evidence of muscle dysfunction related to the control of the movement system. There is a clear link between reduced proprioceptive input,

altered slow motor unit recruitment and the development of chronic pain states. Dysfunction in the global and local muscle systems is presented to support the development of a system of classification of muscle function and development of dysfunction related to musculoskeletal pain. The global muscles control range of movement and alignment, and evidence of dysfunction is presented in terms of imbalance in recruitment and length between the global stability muscles and the global mobility muscles. [15]

Female competitive swimmers have shoulder pain and disability throughout their lives. Given that exposure and physical examination findings varied between athletes with and without substantial pain and disability, a program to prevent shoulder injury that might lead to pain and dysfunction appears warranted and might include exposure reduction, cross-training, pectoral and posterior shoulder stretching, strengthening, and core endurance training. [16]

The possible reason for this change can be explained by the fact that Neck pain from poor biomechanics can be explained as in an upright position the head is supported by the spinal vertebrae. Once the head is flexed forward, the vertebrae do not support the weight of the head as much. Muscles, tendons, and ligaments work harder to hold up the head. Overtime the muscles and other soft tissues tighten up due to the excessive workload required to hold the head in position. The anterior neck muscles become weak from being in shortened position and neural structures are kept in less than optimal positions. This chronic overload and tightening of soft tissues may eventually result in decreased blood flow and oxygen to the soft tissues, ultimately causing pain.

CONCLUSION

In the present study, it was seen that scapular position is altered in swimmers who are suffering from neck pain in all three positions that is at rest, hands on hip, and 90 degree abduction.

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