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Effect of Altering Sitting Posture on Clinical Shoulder Tests in Individuals with and without Shoulder Impingement Syndrome

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ABSTRACT

Background: Shoulder pain is the third most prevalent musculoskeletal disorder after low back pain and neck pain. Shoulder impingement syndrome is believed to account for 44-65% of all shoulder complaints.It is established that the subacromial space and the acromiohumeral distance (AHD) is increased in the upright position as compared to slouched and neutral positions.The rationale of this study is therefore to find out if these sitting postures modify the clinical output of the three commonly used clinical shoulder tests for shoulder impingement.

Method: This was a cross sectional analytical study with 50 subjects (25 - study subjects, 25 - controls) of age 30 to 50 years with and without shoulder impingement syndrome respectively. 3 clinical shoulder tests (Neer test, Hawkins-Kennedy test and Empty Can test) were performed on all the subjects in 3 different sitting positions (neutral, upright and slouched sitting).

Results: There was a significant difference in the pains levels while performing the clinical shoulder tests in slouched vs upright sitting ($p = <0.05$). However, there was no difference in the pain levels while performing the test in neutral sitting vs slouched sitting or neutral sitting vs upright sitting.

Conclusion: The results of this study suggest that changing the sitting posture may alter the pain levels while performing clinical tests in shoulder impingement syndrome patients.

Keywords: Posture, Shoulder pain, Impingement syndrome

INTRODUCTION

Shoulder pain ranks as the third most prevalent musculoskeletal disorder after low back pain and neck pain.[1]In India, shoulder pain has been reported as one of the major work related musculoskeletal complaints.[2]Shoulder impingement syndrome (SIS) is a clinical syndrome most commonly attributed to patients complaining of shoulder pain with a wide spectrum of subacromial pathologies ranging from rotator cuff tendinosis, bursitis, partial and full rotator cuff tears. SIS is believed to account for 44% to 65% of all shoulder complaints.[4]

Shoulder impingement syndrome is caused by mechanisms that are likely to be multifactorial in origin. It is therefore classified into primary and secondary types.[5]

Primary shoulder impingement

Primary impingement involves mechanical narrowing of the subacromial space and compromise of the rotator cuff due to either intrinsic factors, extrinsic factors or a combination of the two.[3,5]

Secondary shoulder impingement

Secondary impingement is caused due to glenohumeral instability. It involves functional disturbance of centering of the humeral head due to muscular imbalance. This leads to abnormal displacement of the centre of rotation for elevation causing soft tissue entrapment.[3,5]

Clinical special tests play a very vital role in the physical examination for shoulder impingement syndrome along with the range of motion, kinetic deviations and the strength of muscles.[3]It is recommended to use a combination of clinical tests along with patient's history and other factors to distinguish SIS from other pathologies.[8,9] The most commonly used three special tests in subjects with shoulder pain and rotator cuff pathology are,

1) Neer test (NT) – sensitivity: 75%-86%; specificity: 48%-50%
2) Hawkins-Kennedy test (HK) – sensitivity: 75%-92%; specificity: 44%-48%
3) Empty can test (EC) – sensitivity: 62%-88%; specificity: 54%-70%.[20]

The effect of altering the sitting posture while performing these tests, however, has not been adequately studied in the clinical setting.

Postural variations in the upper quadrant have been repeatedly linked to glenohumeral pathologies.[11,12] Sitting in a slouched position has shown a decrease in the glenohumeral abduction strength (possibly due to length-tension improvement), whereas, sitting in an upright posture increases glenohumeral forward flexion in healthy individuals.[13,14] It is anticipated that a slouched posture causes impingement under the acromion, and creates a mechanical block and limitation of movement.[16]Altered scapular kinematics and acromiohumeral distance have been reported in patients with shoulder impingement syndrome.[6,7,10]However, no definite link between posture and shoulder pain has been reported in the literature. Hence, the main purpose of this study is to examine whether altering the posture while sitting brings about any change in the pain provocation and pain intensity while performing 3 clinical shoulder tests on subjects with shoulder pain due to shoulder impingement syndrome.

METHODOLOGY

The study was performed on 50 subjects between the age group of 30 to 50 yearsat K.J Somaiya college of Physiotherapy, Mumbai. Ethics committee approval was taken and written informed consent was obtained from all the participants in the study.

Selection Criteria

The study group included 25 individuals in the age group 30 to 50 years, males and females, with clinically diagnosed unilateral shoulder impingement syndrome with a duration of symptoms between 6weeks to 12weeks (subacute).

The control group included 25 individuals with no present or past upper limb symptoms

Individuals with any recent trauma/fractures to the upper quadrant, recent surgery in the upper quadrant or a history of shoulder trauma, spondyloarthropathies, rheumatic diseases, oncological diseases and systemic vascular pathology were excluded from the study.

Procedure

Following their signed informed consent, all the subjects were assigned to the two groups by an experienced physiotherapist so that the investigator (second physiotherapist) was unaware of the patient's health status before assessing the patient, to prevent any bias. The same physiotherapist filled out a case record sheet that remained sealed until the end of the procedures. The sheet included which group the patient belonged to, clinical diagnosis, duration of symptoms, age and painful shoulder, body weight and height. Hand dominance of each subject was also recorded. The second physiotherapist (investigator) then performed all the selected tests on all subjects.

The three clinical shoulder tests, Empty can test (EC), Neer test (NT), and Hawkins-Kennedy test (HK) were performed on the left and right shoulder randomly as a block (EC-NT-HK, NT-HK-EC, HK-EC-NT were repeated).[15] The shoulder pain provocation (yes/no) and the level of pain (using the visual analogue scale - VAS) were recorded for all the tests. All these tests were performed on all subjects in the following order of the three sitting postures, neutral-upright-slouched, as described by Kalra et al. (2010).[10]

Postural alterations

1. Neutral sitting – Subjects were instructed to sit comfortably in a chair with their backs supported, feet flat on the ground, hips and knees bent at an angle of 90 degrees. Head and shoulders were placed in a comfortable position while looking straight ahead.
2. Upright sitting – Subjects were asked to sit supported with a pillow between their backs and the chair's back support. They were also asked to retract their shoulders and sit up straight while looking ahead.
3. Slouched sitting – Subjects were instructed to move forward in the chair so that their backs were at a minimum distance of 15cms from the back support. They were then instructed to slouch forwards to achieve a flexed thoracic and lumbar spine with a forward head posture and rounded shoulders. To maintain the forward head, patients were asked to look straight ahead.[15]

Neer test was performed by passively rotating the subject's shoulder into internal rotation and then passively moving the limb through the full range of shoulder flexion while stabilizing the scapula.[17]

The Hawkins-Kennedy test was performed by passively taking the subject's shoulder to 90 degrees of flexion and then internally rotating his shoulder.[18]

Empty Can test was performed by asking the subject to actively abduct his arm to 90 degrees with 30 degrees of horizontal flexion and full internal rotation of the arm. Once in the test position, the examiner resisted active abduction for possible provocation of pain.[19]

DATA ANALYSIS AND RESULTS

Kruskal Wallis test was used on all posture-related dependent variables as the data did not pass the normality test. It was used to establish whether there were any differences between the pain levels of clinical shoulder tests. Dunn's multiple comparison test was used for pairwise comparisons.

Percentage repeatability was calculated for Pain provocation (Yes/No) in both groups.

Due to the considerable differences between the groups and the absence of pain in the entire control group (n = 25) - which felt only slight discomfort during the shoulder tests - calculations related to possible postural effects on pain provocation and pain level during the 3 clinical shoulder tests were only generated for the painful shoulder in the study group.

Table 1: Analysis of variance in the pain levels for 3 clinical shoulder tests in 3 sitting postures (neutral, upright, slouched)

Test	Kruskal Wallis statistic	P value	Significance (P < 0.05)
Neer test	12.81	0.0017	Significant
Hawkins-Kennedy test	13.71	0.0011	Significant
Empty Can test	9.515	0.0086	Significant

Table 2: Dunn's multiple comparison test for pairwise comparisons for the 3 clinical shoulder tests

Test	Postural alterations	p value	Significance (P < 0.05)
Neer test	Upright vs. Slouched	0.0011	Significant
Hawkins-Kennedy test	Upright vs. Slouched	0.0006	Significant
Empty Can test	Upright vs. Slouched	0.0064	Significant

RESULTS

The following major results were identified:

1. There was a significant difference in the pain levels (VAS) while performing the 3 clinical shoulder tests in upright sitting and slouched sitting in subjects with shoulder impingement syndrome.
2. There was no significant difference in the pain levels (VAS) while performing the 3 clinical shoulder tests in neutral sitting vs upright sitting and in neutral sitting vs slouched sitting in subjects with shoulder impingement syndrome.
3. All the study group subjects demonstrated a 100% repeatability of pain provocation (Yes) while performing the 3 clinical shoulder tests in 3 different sitting postures.
4. There was an absence of pain for the entire control group with just a minor discomfort while performing the 3 clinical shoulder tests in 3 different sitting postures.

DISCUSSION

The study showed a significant difference in the pain levels while performing all the 3 clinical shoulder tests (Neer test, Hawkins-Kennedy test and Empty Can test) in upright sitting vs slouched sitting.

This can be explained as follows:

- Upright posture has been found to increase the acromiohumeral distance (AHD) and thereby the subacromial space (SAS).[10] A slouched posture is linked to reduction in the outlet of the SAS, thereby leaving lesser space for the subacromial structures, especially the rotator cuff tendons.[10,11]
- This increase in the AHD may have the effect of relieving the symptoms of compression of the SAS structures and hence, may reduce the pain due to impingement.

The findings of this study however, contradict the findings of Asaf Weisman and Youssef Masharawi, (2019) who examined the effect of altering sitting posture while clinically testing shoulders with rotator cuff degenerative tears (RCDTs). However, their study included patients with RCDT which is degenerative and can be chronic in nature, while, our study included patients with subacute SIS. This can be a probable cause for the contradictory findings as their findings cannot be generalised for acute and subacute cases in which the surrounding soft tissues are more sensitive.[15]

The study also showed no significant difference in the pain levels while performing all the 3 clinical shoulder tests (Neer test, Hawkins-Kennedy test and Empty Can test) in neutral sitting vs slouched sitting and in neutral sitting vs upright sitting.

This can be explained as follows:

- The immediate possible alteration in the subacromial space or the acromiohumeral distance was not clinically relevant in these sitting postures.[15]
- Upper quadrant posture is a combination of thoracic spine and cervical spine posture, and shoulder posture is a combination of the humerus and scapula position.[10] In the 3 postures, the components of upper quadrant posture were not measured.
- The changes in the components of the upper quadrant posture could be inconsistent across subjects, thereby leading to insignificant differences in the pain levels across the postures.

  Similarly, Nitin Kalra, Amee Seitz, et al., found no significant main effect of posture for the arm at rest while examining the effect of altering posture on the subacromial space (SAS) in subjects with rotator cuff disease.[10]

Limitations of this study were that complete blindness of the investigator during the performance of all the clinical shoulder tests was not maintained, however, an effort was made to minimise all the possible initial biases.The sitting postures were induced and not prolonged and hence might not have led to significant biomechanical changes.

CONCLUSION

Changing the sitting posture from slouched to upright sitting (or vice versa) while performing 3 clinical shoulder tests (Neer test, Hawkins-Kennedy test and Empty Can test) significantly alters the pain levels in individuals with shoulder impingement syndrome.

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