Review Article

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Scapular Dyskinesis

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Abstract

Scapular dyskinesia is the alteration in the static and dynamic positioning of the scapula on the thorax. It is not an independent entity and is associated with other shoulder problems. Statistics has shown that its incidence to be 67% in cases of shoulder instability and 100% in cases of shoulder impingement. There are various means of scapular dyskinesis measurement. 3D measure analysis is considered to be the gold standard. Number of clinical tests have been developed but the problem is that dyskinesis may also be associated in asymptomatic patients also. So it is important to distinguish whether it is a factor which is perpetuating symptoms or not. Tests like SRT (Scapular retraction test) and its refined version SRT (Scapular repositioning test) has been found to have acceptable reliability. The main purpose of these tests is to identify scapular dyskinesia in patients with shoulder pathology who can be helped by improving scapular muscle balance.

Keywords: Scapular Dyskinesis; SRT; Shoulder Impingement.

Introduction

The normal movement of the scapula during arm elevation is a synchronized sequence of superior rotation and posterior tilt [2,15,21] with a variable amount of mediolateral rotation[21]. Alteration in both static position and movement pattern of the scapula on the thorax has been called 'scapular dyskinesis' [8]. This abnormality has been seen along with different shoulder conditions like rotator cuff injuries, shoulder instability and shoulder impingment [6,31,32]. Etiological factors for this problem are loss of muscular control that may due to reduced serratus anterior muscular activity and increased upper trapezius muscular activity [14]: nerve damage like injury to dorsal scapular nerve, long thoracic nerve or spinal accessory nerve [5] alteration in muscular length like decreased pectoralis minor muscle length [1] and a direct trauma to these muscles can result in impairment of normal function. Non muscular causes of scapular movement include AC joint separations clavicular fractures and muscle detachments [9].

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Scapular dyskinesia as a nondependent entity

Scapular dyskinesis is not a independent entity and may occur adjunctly with other shoulder pathologies [11,15,23]. Scapular dyskinesia has also been observed in asymptomatic individuals and there is little difference in magnitude of scapular dyskinesia when compared between symptomatic and symptomatic individuals [14,16,31].

This dyskinesia is reflected by the tilts described in the three types of dyskinesis that predispose the individual to further injury. Type I has prominence of inferomedial border of the scapula that occurs due to abnormal posterior tilt of scapula. Type II has prominence of whole medial border that occurs due to excessive external rotation of scapula. Type III has a pathological upward migration of the superomedial border of scapula. Lukasiewicz et al [16]described the scapular dyskinesia in individuals with impingement syndrome. This relationship was further studied by Schmitt and Snyder-Mackler [24] who observed concomitant serratus anterior weakness, middle and lower trapezius weakness in a case of primary subacromial impingement. Such patients have type I inferior medial border winging. Kibler [5] has explained a spectrum of pathologies that can lead to scapular dyskinesia as:

1. Lack of protraction increases the decelerating force during throwing which can lead to both micro- and macrotrauma to the external rotators.
2. Lack of protraction results in anterior opening of the glenohumeral joint during arm deceleration thus increasing stress to anterior static stabilizers of glenohumeral joint leading to laxicity or glenohumeral instability [5].
3. Excessive protraction reduces the scapular elevation and upward rotation thereby decreasing the subacromial space thus leading to shoulder impingement syndrome. This impingement can further lead to rotator cuff tendinitis, glenohumeral instability, and inefficient supraspinatus function [5].
4. Scapular dyskinesis leads to a breakdown of the kinetic chain because of that force that is generated in the lower extremity and / or torso cannot be appropriately transmitted for involved upper extremity movements. This loss of controlled motion leads to greater muscle activation and force generation being by the intrinsic and extrinsic shoulder muscles as well as the muscles of the arm and hand in order to compensate for the lost kinetic force. The end result is overuse and injury of these musculatures [5].

Modes of scapular dyskinesia evaluation/measurement

There are various methods to assess scapular motion and position like clinical examinations, video analysis and X ray imaging. The goal of scapular assessment is to identify abnormal scapular motion or positioning, identify the causative factors of scapular dyskinesia, determine any relationship between the symptoms and altered motion [7,9]. Clinical assessment of scapular dyskinesis is very challenging because of 3-dimensional nature of scapular movement and presence of soft tissue over and around the scapula obscuring direct measurement of bony positioning. Various methods / tests have been described to identify scapular dyskinesia, however many of those tests have adequate level of reliability but validity of those tests is questionable because of lack of correlation of scapular dyskinesia and symptoms [9]. Clinical evaluation of scapular dysfunction should include 3 basic elements: (1) visual observation to determine the presence or absence of scapular dyskinesis in the symptomatic patient; (2) the effect of manual correction of dysfunction on symptoms; and (3) evaluation of surrounding anatomic structures that may be responsible for dyskinesis [9].

3 dimensional kinematic analysis of scapular movement have produced reliable measures, with ICC coefficient of values ranging between 0.77 and 0.90 and SEM values ranging from 1° to 2° [19]. However availability of 3D motion analysis in every clinical set up is the limiting factor. Various clinical tests that are used to identify scapular dyskinesia are as under:

The Lateral Scapular Slide Test involves the static measurement of the side-to-side difference of the distance from the inferior angle of the scapula to the adjacent spinous process of vertebra [5]. The measurements are taken with arms in three different positions and if the side to side difference is greater than 1.5cm, it is considered as pathological. This test has shown fair to moderate levels of reliability and is easily applicable in a clinical settings [5,20]. The major advantage of this test is its ease of use in the clinics. However, the validity of this test has been questioned because of the findings that both symptomatic and asymptomatic individuals will show asymmetry while testing by this method [13,19]. Also if both the shoulders have symmetrical scapular dyskinesia then the validity of this test is questionable when comparison is made only to the contralateral side. Furthermore, due to 2 dimensional and static nature of this test, it fails to fully assess the dynamic 3-dimensional motion found to occur with scapular movement [13,18,28]. This inadequacy of measurement along with questionable validity of results requires the use of other methods of scapular assessment during clinical examination.

Visual assessment schemes of classifying scapular dyskinesis have been developed in an attempt to resolve the issues with linear or static measures [12,18,30]. These methods involve classifying scapular movement that occurs during shoulder motion into normal or abnormal categories. These measures are considered more functional and more inclusive with the ability to judge scapular movement in 3-dimensional plane. Kibler et al [12] was the first who gave the observational method for rating scapular dysfunction into three categories. The above mentiones system had too low reliability and it had to be refined later [18,30].

The Scapular Dyskinesis Test is a visually based test for scapular dyskinesis that involves a subject performing weighted shoulder flexion and abduction movements while visual observation of the scapula is performed [18]. This test is basically a classification for presence and absence of dyskinesia. Dyskinesis included a cluster of findings like winging or dysrhythmia [18,28]. Interrater reliability of this test, has been shown to be better than other previously

described visual classification systems. Concurrent validity was assessed in overhead athletic population and it was shown that those judged as demonstrating abnormal motion by this method also demonstrated decreased scapular upward rotation, less clavicular elevation, and less clavicular retraction when measured with 3-dimensional motion tracking [28]. Abnormalities were seen far more prevalent during shoulder flexion compared with shoulder abduction abduction. These results support the assertion that the shoulders which are visually judged as having dyskinesis using this system, demonstrate distinct alterations in 3-dimensional scapular motion during shoulder movements particularly during shoulder flexion. Although visually observed dyskinesis demonstrated altered 3 dimensional scapular motion, subjects shown to be having dyskinesia by this method were no more likely to report any shoulder symptoms during sports [28].

Uhl et al [30] classified dyskinesis into "yes" or "no"(if they showed normal scapular motion.) They studied both patients having shoulder symptoms with various soft-tissue pathologies as well as an asymptomatic group. The "yes / no" test was found to have superior interrater reliability (inter-rater percent agreement (79%, K Š§ 0.40) , and demonstrated better specificity (74%) and sensitivity values (76%) when using asymmetry found with 3-dimensional testing as a gold standard [30]. An important finding in this study was a higher frequency of dyskinesis during shoulder flexion in patients (54%) compared with asymptomatic subjects (14%), whereas no differences between groups were detected during scapular plane elevation. Because scapular dyskinesis is a common finding in asymptomatic individuals also, a basic problem in evaluation is deciding if the presence of scapular dyskinesis is an important abnormality perpetuating symptoms or not. It may be possible that scapular dyskinesia could be a pain reducing phenomenon. Scapular dyskinsis can be considered to be a contributing factor if alteration in scapular position causes decrease in shoulder symptoms.

There are two main symptom alteration tests: the scapular assistance test [5,22] and the scapular reposition (or retraction) test (SRT) [13,27] . The scapular assistance test involves manual assistance of scapular upward rotation during shoulder elevation and determining its effect on pain [3]. Rabin et al, later modified this test by incorporating scapular posterior tilting as well [22]. The test is positive if pain with elevation is either decreased or abolished during the assisted maneuver. This test has shown acceptable levels of reliability and has been shown to be acceptable for clinical use [22].

The scapular retraction test involves manually positioning and stabilizing the entire medial border of the scapula in a retracted position on the thorax while the subject is asked to elevate the arm against manual resistance [3]. This test was developed to help identify whether shoulder elevation strength loss in patients is due to a loss of proximal stability of the scapula or not. The test may be considered positive when either improvement in strength or reduction in pain is seen with isometric contraction in scapular plane [3,7]. Kibler et al [10] studied this test in symptomatic and asymptomatic subjects and they demonstrated that there was no change in pain levels and all subjects demonstrated improved strength output, regardless of symptoms.

The Scapular Reposition Test (SRT) is a refinement of the Scapular Retraction Test and involves components like scapular tilting and external rotation, without full scapular retraction. This modification was based upon previous investigations who demonstrated a decrease in shoulder elevation strength with maximal active scapular retraction [26]. Scapular reposition test has demonstrated acceptable reliability and when performed on a large group of overhead athletes 47% subjects had shown reduction in pain and 26% had a substantial increase in isometric elevation strength [33]. Therefore, this test may be helpful at identifying the patients with shoulder pathology that may benefit from interventions focused towards improving scapular muscle function.

Conclusion

3D motion analysis of scapular motion is appropriate method of studying any alteration in scapular motion and thereby diagnosis of scapular dyskinesia. EMG study of scapular muscles provides the valuable information about variation in muscle activation in dyskinesic scapula. However they cannot be available in every clinical set-up. Various clinical tests have been introduced with good reliability but variable validity with scapular dyskinesia was evaluated between symptomatic and asymptomatic subjects.

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