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Current concepts of scapular dyskinesia: Clinical implications and rehabilitation

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Abstract
Scapula dyskinesia is broad term describing the alteration/ abnormal positioning of scapula due to alteration in dynamic movements. Several factors are responsible for such changes which includes anatomical malalignment of supporting structure such as malunion of clavicle fracture, thoracic kyphosis, instability of surrounding joints especially acromioclavicular joint instability, acromioclavicular joint arthrosis, derangement in glenohumeral joint etc. Various authors have suggested that abnormal muscle activity among scapular muscles further contributes to development of shoulder impingement. Altered muscles activity includes overactivity of trapezius muscle upper fibers, reduced or diminished activity of serratus anterior, reduced activity of lower trapezius muscles fibers hence such activities are responsible for alterations in position of scapula which further leads to development of scapula dyskinesia.

Keywords: scapular dyskinesia, dyskinesia, neck pain, scapula disorder, musculoskeletal disorder

Introduction
Health status of general population affected significantly from past few years where more than 60% of population affected with shoulder pain and neck pain during some point of time in their life time, which if not managed properly may lead to development of severe health hazards [1, 2] Several researches have been performed where significantly positive relationship was observed between neck pain and shoulder pain, and scapula dysfunction. Since scapula plays an important link with cervical spine as well as shoulder joint complex, hence any pathology to scapula it may have significant effect over cervical spine and shoulder joint pathologies or may contribute to gradually development musculoskeletal disorders [3].

Literature for causes and development of scapula pathologies has been extensively being performed from past few years especially how it affects shoulder and cervical spine functions and lead to pathologies of its supporting structures. Although it becomes little tricky and troublesome to evaluate the dynamic movement of scapula since it lies deep down covered by bulk of musculature and supporting structures also since scapula movements occurs in different varying planes hence it becomes little tricky to analyze the position of scapula with its motions and functional tasks. Though scapulohumeral rhythm provides some knowledge about pathologies but not able to provide enough information as in how and extent of dysfunction hence extensive research work is going on which puts pressure on the smooth functioning of shoulder joint [4, 5]. Dyskinesia occurs and related predominantly due to alterations in glenohumeral angulation, any sprain and strain of acromioclavicular joint, reduced subacromial space, reduced muscle activation of shoulder joint alteration in humeral anatomical position and movements. Scapula dyskinesia is a broad term which relates to alterations in the scapula movement, and scapula position which may occur due to several other co morbidities which affects its positioning. Dyskinesia is described as abnormal/ altered scapula position (static and dynamic) where prominence of medial border of scapula is observed, prominence of inferior border of scapula, overactivity during scapula elevation/ upward rotation/ scapula protraction [5].

Static and dynamic motions of scapula are two different movements and requires muscle activation firing at specific time frame, hence overactivity and diminished activity may lead to develop of scapula movement dysfunction. Majority of cases scapula position alteration occurs due to poor work ergonomics such working in static position of cervical spine mainly on forward head position which simultaneously lead to development of forward head posture. Since forward head posture having positive relationship in development of shoulder joint pathologies and scapula position dysfunction hence it is very important to find out causative factor to avoid any development of musculoskeletal disorder [5].

Causes of scapula Dyskinesia
Various factors are responsible for development of scapular pathologies, primarily malalignment of bones, weakness of muscles, overactivity of specific group of muscles, diminished activity of certain specific group of muscles, mal union of fractures, instability of associate joints, development of any neurological disorder, fracture nonunion, malunion, muscular tightness, capsular tightness are major factors for development of scapula pathologies [6].

Certain specific muscles may lead to development of malalignment of scapula, majority of muscles which are responsible consist weakness of serratus anterior muscle, weakness of lower trapezius muscles and overactivity of upper trapezius muscle fibers. Patho mechanics of scapula pathology includes disrupted glenohumeral rhythm, alteration in force couple during upward and downward rotation of scapula [7, 8].

Further alterations in force couple between upper trapezius and lower trapezius muscle also lead to development of scapular disorders since such alterations may contribute towards reduced spacing between subacromial space putting excessive strain the supporting strictures such as ligaments, muscles [9, 10].

Flexibility of soft tissues

Diminished soft tissue activity may lead to develop of alterations in anatomic positioning hence may contribute to development of malalignment of scapula. Primarily tightness of pectoralis muscle (pectoralis major and pectoralis minor) significantly affect the movement and positioning of scapula as such tightness may further lead to development of anterior tilting of scapula further putting scapula far away from its anatomic position [11, 12]. further patients who were diagnosed with shoulder stiffness were further identified as having tremendous anterior tilting of scapula.[13] Such alterations in the static position of scapula further lead to development of impingement syndrome since subacromial space is also reduced among such patients. Alterations in static position of scapula is significantly lead to development of subacromial impingement syndromes. Glenohumeral capsule stiffness also contributes to one of the key factors for alterations in the scapular pathologies hence it is concluded that soft tissue flexibility plays key role in maintaining position of scapula in its anatomical orientation [14-18].

As mentioned earlier Tyler *et al* also observed tightness of posterior shoulder structures are capable of development of scapular pathologies hence rehabilitation of scapular pathologies must constitute stretching program of tight structures as well along with strengthening program[19]. Further stiffness if pectoralis muscle contributes as major risk factor for development of shoulder pain syndrome among sports athletes who predominantly involves in overhead activities. Hence a positive relationship exists between stiff posterior structures and chronic shoulder and cervical spine pain which together affects scapular kinematics altogether. Scapular muscles play important role in maintaining the positioning of scapula to its ideal position [19]

Reduced muscle strength

Muscles strength plays key role in maintaining the musculoskeletal orientation and hence if there is any weakness of specific group of muscles it is capable to develop pathologies and dysfunctions [20].

If we talk about specifically scapula muscle and its associated pathologies then we first need to identify primary muscles which supports scapula bone to its position which includes primarily serratus anterior, trapezius muscle upper fiber, lower fiber, middle fiber. However continuous researches performed have suggested that serratus anterior is major muscle and any weakness may lead to alteration in static positioning of scapula [21, 22].

It is continuously reported that overactivity or hyperactivity of upper trapezius muscle fiber results on to shrugging of shoulder and over elevation of shoulder during overhead activity, further diminished or reduced muscle strength of middle trapezius and lower trapezius fiber leads muscle imbalance and finally results into altered positioning of scapula [23-26]. Several professionals where head bending position is Maintained for long hours neck pain and shoulder pain is most common musculoskeletal disorder which primarily occurs due to poor ergonomics of muscular system. Professions such as computer worker, type writers, researchers, academicians and other office workers who spent long hours in front of computer used to develop work related musculoskeletal disorders which further results into development of scapular pathologies if not corrected on time [27-31]. Zakharova-Luneva *et al* and Wegner *et al* studied muscle activity of all fibers of trapezius muscle among patients who are having mechanical neck pain, they observed while working in front of computer cervical pain puts greater load on middle trapezius fibers as compared to lower trapezius fibers.

Lately several studies have been conducted where serratus anterior muscle activity was studied it was reported that severe alterations were observed in firing of serratus anterior muscle via surface EMG and MRI studies. Helgadottir *et al* reported delayed activation / firing of serratus anterior muscle during elevation of arm suggesting muscle imbalance is primary factor in development of scapular alterations/ scapula pathologies.

Further O'Leary *et al* demonstrated reported varying muscle activation patterns between serratus anterior muscle and upper and lower fibers of trapezius during arm elevation movements among patients who are suffering from mechanical neck pain [32-35].

Several studies have reported sports specific adaptations are also responsible for development of altered positioning of scapula due to adaptation of wrong technique of playing hence it is very important to identify the pathology and accordingly they must get trained. EMG results are very helpful as in they help us to identify the exact muscle group to be focused for strengthening.

Conclusion

Since scapula plays a key role in smooth function of cervical spine, and shoulder joint complex hence focus must be given while working on such patients. It is an important aspect in rehabilitation of patients who are suffering from pathologies cervical spine and shoulder joint complex. In today's era where lot of time spent in front of screen, focus must be given on the structures which are responsible for maintaining the musculoskeletal system intact and if focus shifts it will lead to development of musculoskeletal disorders primarily neck/ cervical and shoulder area. Hence scapula orientation plays significant role in maintaining the optimal functioning.

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