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Research Paper Review

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Rehabilitation of Scapular Dyskinesis: From the Office Worker to the Elite Overhead Athlete

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ABSTRACT

The scapula functions as a bridge between the shoulder complex and the cervical spine and plays a very important role in providing both mobility and stability of the neck/shoulder region. The association between abnormal scapular positions and motions and glenohumeral joint pathology has been well established in the literature, whereas studies investigating the relationship between neck pain and scapular dysfunction have only recently begun to emerge. Although several authors have emphasised the relevance of restoring normal scapular kinematics through exercise and manual therapy techniques, overall scapular rehabilitation guidelines decent for both patients with shoulder pain as well as patients with neck problems are lacking. The purpose of this paper is to provide a science-based clinical reasoning algorithm with practical guidelines for the rehabilitation of scapular dyskinesis in patients with chronic complaints in the upper quadrant

ANALYSIS

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Background Information

Chronic neck and shoulder pain are two of the most prevalent musculoskeletal disorders, representing extremely large socioeconomic challenges in the western world.

A large amount of time and resources have been utilized to investigate the relationship between the scapula and shoulder pain. This has led to a countless number of studies elucidating evidence-based methods of evaluating and treating scapulothoracic dysfunction. It has also been clinically recognized that some patients with mechanical neck pain may also exhibit similar scapulothoracic dysfunctions to

those suffering from shoulder pain.

The goal of this paper was to provide an evidence-based clinical reasoning algorithm with guidelines for the rehabilitation of scapular dyskinesis in patients suffering from pain in the upper quadrant, particularly shoulder and cervical spinal disorders.

SUMMARY

Patients with glenohumeral instability and/or impingement consistently show altered scapular kinematics and static posture. It has also been shown that individuals suffering from neck pain feature altered scapular resting position, which becomes particularly apparent with prolonged sitting postures (i.e. computer use).

Slouched spinal postures, such as forward head carriage or hyperkyphosis, are known to affect scapular orientation, shoulder muscle strength and shoulder ROM. Additionally, maladaptive shoulder girdle changes such as reduced clavicular retraction, scapular upward rotation and posterior tilt have all been reported in individuals with neck pain. These changes can be attributed to altered scapular muscle recruitment patterns and flexibility deficits of the soft tissues surrounding the scapula.

Pectoralis minor and posterior glenohumeral capsular stiffness have been implicated in creating abnormal scapular position. These changes can lead to increased scapular internal rotation and anterior tilt. These findings are significantly associated with scapular dyskinesis and chronic neck/shoulder complaints. However, while other muscles surrounding the scapula such as the levator scapulae, latissimus dorsi, the GH external rotators and rhomboids might also be implicated, their exact roles have not been quantified.

On the other hand, altered muscular activity or lack of strength of the serratus anterior (SA), upper (UT), middle (MT) and lower traps (LT) might also be implicated in creating scapular dyskinesis, and shoulder and neck pain. Researchers have found decreased strength of SA and hyperactivity of the UT resulting in excessive elevation of the shoulder girdle during arm abduction (also called the 'Shrug Sign') in those with shoulder pain. With regards to neck pain specifically, researchers have found an association between the maladaptive behaviour of UT and SA during office tasks, and traumatic or insidious neck pain. Additionally, relative weakness of the stabilizing muscles of the scapula (particularly MT and LT), compared to UT has also been found.

Cause-Consequence Relationship Between Scapular Dyskinesis and Neck/Shoulder Pain

In spite of all this evidence, there is no consensus regarding the cause-consequence relationship between scapular dyskinesis and shoulder/neck pain. The proposed mechanisms include:

- Pain-induced muscular imbalance
- Soft tissue stiffness, causing a decrease in the width of the subacromial space
- Poor thoracic posture, causing impingement due a decrease in the width of the subacromial space
- Any of the first three causing a change the fulcrum of the humeral head into the glenoid
- Any of the first three causing abnormal compressive and shear forces into the cervical spine, compromising cervical motion and stability.

It was recently proposed that scapular dyskinesis might progressively cause the onset of neck/shoulder

pain, but once the painful symptoms present, the dyskinesis may be exacerbated by pain inhibition. This inhibition acts to protect the shoulder from pain or injury in the short term. However, this adaptation might predispose the patient to poor long-term mechanical consequences (1).

Rehabilitation of Scapular Dyskinesia

The authors propose a clinical reasoning algorithm which the clinician may use in the treatment of scapular dyskinesis. A brief synopsis is outlined below:

- If the problem is due to lack of soft tissue flexibility of the scapular or glenohumeral muscles (e.g. pec minor, lev scap, rhomboids, infraspinatus, latissimus dorsi etc.) or posterior capsule, these structures require some form of stretching and/or mobilization. The potential therapies include, but are not limited to, manual stretching, home stretching, soft tissue techniques, manual mobilizations and mobilization with movement.
- If the problem is due to a lack of muscle performance, the practitioner could focus on two aspects: muscle control or muscle strength.
- If muscle control with regards to co-contraction or force couples is the issue, neuromuscular coordination needs to be retrained. First, conscious muscle control needs to be established, progressing to advanced control during basic activities, then advanced control during sport movements.
- If the problem is due to a lack of sufficient muscular strength, particularly of the lower/middle traps and/or serratus anterior, targeted strength training needs to be performed. The rehabilitative process begins with conscious muscle control/activation, progressing to balance-ratio, then to actual improvement of endurance/strength. Once this is established, athletes can progress to advanced control during sports movements.

While the algorithm stipulates that flexibility deficits must be addressed by stretching and mobilization techniques, identifying whether flexibility deficits are primary or secondary is necessary. This can be established based on the relative weakness of the muscle's agonist. Additionally, muscle recruitment normalization is the main goal for the patient who has muscle performance problems. If both flexibility and muscular recruitment issues are present at the same time, both must be addressed equally and simultaneously.

Primary Flexibility Deficits:

If the clinician finds primary flexibility deficits, it is recommended that solving flexibility issues must precede motor learning. In the case of secondary flexibility issues, gaining stability in the deficient muscle(s) might relax the tight muscle. It is suggested that the pectoralis minor should be stretched while performing a passive retraction and posterior tilting of the scapula with the shoulder in neutral or slightly elevated position and slight external rotation. Additionally, direct pressure on the coracoid might provide an intense stretching effect on the pectoralis minor. The posterior rotator cuff musculature can be stretched via the sleeper stretch or the cross body stretch. These stretches have been shown to be effective in restoring ROM and increasing acromiohumeral distance.

Problematic Muscular Recruitment:

In the case of problematic muscular recruitment, the first stage of the rehabilitative process is to gain conscious muscle control, improve proprioception and normalize scapular resting position. Finding optimal scapular orientation can be performed through scapular positioning with the help of the therapist, progressing to active unassisted positioning. To perform this exercise, the patient palpates

their coracoid with the contralateral finger, and is then asked to pull the coracoid away from their finger by tilting the scapula backwards. This exercise is particularly important prior to performing more dynamic shoulder movements, as it can result in higher surface EMG-activity in the targeted muscles (i.e. MT and LT). Additionally, scapular correction should be incorporated with postural correction exercises – this should serve to get patients out of the kyphotic/forward head posture with protracted shoulder girdles. It is proposed by the authors that postural correction might serve to reduce adverse loads on the cervical joints due to poor cervical and scapular postures, and to train the functional supportive stabilizing muscles of the neck and shoulder girdle.

(Re)-Establishing Muscle Control & Strength:
The next stage should focus on establishing muscle control and strength necessary to perform daily activities. Performance of these exercises must be guided by the clinician's examination, namely manual muscle testing and isokinetic testing. Exercises should be performed in an open and closed-chain, as the shoulder girdle functions in both domains. Open-chain exercises such as the low row, inferior glide, lawnmower and robbery exercises have been described by Kibler et al. to activate key scapular-stabilizing muscles without putting high demand on the shoulder joint (2). On the other hand, closed-chain variations of the push-up, pushing the hands on the thighs, and wall slides have been shown to be beneficial in treating shoulder injuries.

Specifically, for those patients who feature a concomitant strength deficit and muscle imbalance, such as weak SA/LT with a hypertonic UT, choosing exercises that promote balance between these structures is important. Exercises such as the isometric low row, prone extension at zero degrees, side lying external rotation and prone horizontal abduction with external rotation can help with this imbalance.

For the purposes of improving SA activity, the elbow push-up (in favour of the push up-plus), dynamic hug, supine punch and wall slide exercises may be beneficial.

As a progression, performing diagonal patterns such as raising the contralateral or ipsilateral leg while in a push-up position, (or one of its many variations) or standing on one foot while performing a low row can serve to improve UT/LT ratio, while creating more muscle activity. It is especially important that overhead athletes gradually perform functional strength diagonal patterns into internal and external rotation with increasing intensity, in preparation for the next stage.

Advanced Control During Sport Movements:
The next stage involves gaining advanced control during sport movements. The goal in this stage is to exercise advanced scapular muscle control during sport-specific movements, while paying special attention to the kinetic chain. In addition to the performance of sport-specific exercises, overhead athletes should eccentrically load the external rotators using balls or elastic tubing to ensure optimal tensile capacity. Swimmers in particular should perform some exercises in the prone or supine positions, to mimic their sport more closely, while increasing the demand for core stability. Gymnasts and climbers can also perform closed-chain exercises such as side-bridging and prone-bridging.

Return-to-Play:
Return-to-play should be considered when the patient exhibits near normal ROM and strength, and normal functional ability while performing sport specific skills. With regard to scapular dyskinesis, the authors recommend ensuring symmetry in scapular muscle strength in athletes not performing

throwing sports, and a 10% increase in strength on the dominant side in athletes performing unilateral overhead sports. Once the athlete is back to play, they must continue stretching and mobilizing the pectoralis minor and posterior shoulder structures, while at the same time, strengthening the rotator cuff, MT, LT and SA musculature to maintain gains.

STUDY METHODS

This article is a clinical commentary, based on the research and clinical experience of the authors. Neither a literature search, nor statistical analyses were performed.

STUDY STRENGTHS / WEAKNESSES

Study Strengths

- A well rounded guide toward the treatment of flexibility and strength deficits, and motor control issues.
- The authors included an evidence-based clinical reasoning algorithm for our quick reference.
- The authors proposed the pathomechanics of how scapular dyskinesis can cause neck and shoulder pain.

Weaknesses

- Manual therapy and rehabilitation of the cervical spine, thoracic spine and lumbar spine was not included in this narrative. It is pertinent that the readers understand that these areas are just as likely to show dysfunction as the scapula in individuals with neck pain. The authors do acknowledge this fact, but state that their descriptions are beyond the scope of this particular paper.
- No pictures were included in this paper – this would have been helpful, particularly for the exercise prescription aspects.

Additional References

1. Kawasaki T, Yamakawa J, Kaketa T, et al. Does scapular dyskinesis affect top rugby players during a game season? J Shoulder Elbow Surg 2012; 21: 709–14.
2. Kibler WB, Sciascia AD, Uhl TL, et al. Electromyographic analysis of specific exercises for scapular control in early phases of shoulder rehabilitation. Am J Sports Med 2008; 36: 1789–98.

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