International Journal of Core Engineering & Management
Volume-6, Issue-11, 2021 ISSN No: 2348-9510

ROLE OF SCAPULAR RETRACTORS AND DEPRESSORS IN SCAPULAR HEALTH

Vidit Atul Phanse
Viditp1992@gmail.com

Madhushree Donde
madhudonde1992@gmail.com

Abstract

The shoulder complex is an intricate system that consists of the scapula, clavicle, and the glenohumeral joint that plays a key role in maintaining shoulder health, it is a link between the upper back and the upper extremity providing stability and range of motion to the shoulder. When there is compromised scapular mobility, we see distinct number of shoulder issues and upper back pain postural problems. In the clinical world where there are more rotator cuff injuries, impingement syndromes, upper cross syndrome, and adhesive capsulitis and we see how important it is to maintain scapular strength and motion. Poor scapular mobility can cause pain and limit range of motion of the shoulder especially with overhead movement that limits the ability to perform activities of daily living (ADL). The scapular retractors and depressors especially assist with shoulder mobility and strength and weakness in these muscles can lead to pain, decreased ROM and strength, injuries such as tears, poor posture, and spinal alignment. This article dives into the deeper understanding of how scapular retractors and depressors can enhance shoulder health, sports performance, and posture.

Keywords: Scapular Retractors, Scapular Depressors, Shoulder Health, Scapular Mobility, Shoulder Complex, Shoulder strength, Scapular strength, Movement

I. INTRODUCTION

The shoulder complex is the connection of the upper extremity to the thoracic wall. It consists of various structures such as ligaments, tendons and muscles of the scapula, humerus, sternum, and clavicle that comprise of four joints, the Glenohumeral (GH) joint, Acromioclavicular (AC) joint, scapulothoracic (ST) joint and sternoclavicular (SC) joint. These joints collectively work to offer the extensive range of mobility of the shoulder complex [1]. The articular spheroid surface of the GH joint especially contributes to allow for the greatest mobility of any joint in the body [2]. This freedom of movement comes at the cost of stability. The tradeoff for stability, known commonly as the mobility-stability trade-off. This intricate design that allows for greater mobility and function also makes the shoulder complex susceptible to a wide range of injuries and instabilities [3]. The ST joint functions to allow for the scapula to move on the thoracic wall offering stability to the shoulder complex. This unique balance for function comes through dynamic forces that are active stabilization forces from the muscles instead of the passive forces from the capsule and ligaments. Thus, it is the muscles that secure the shoulder girdle to the thoracic wall and provide the stability required for the shoulder to move freely and perform its dynamic movement [4]. The shoulder complex has two groups of stabilizers the static stabilizers and the dynamic stabilizers. The static stabilizers are the ligamentous structures, capsule and fascia structures around the shoulder

International Journal of Core Engineering & Management
Volume-6, Issue-11, 2021 ISSN No: 2348-9510

complex. The dynamic stabilizers are further divided into the glenohumeral and scapulothoracic stabilizers [5].

1. **Glenohumeral Stabilizers**

The rotator cuff muscles (RTC), namely subscapularis, supraspinatus, teres major, infraspinatus, and the deltoid, all stabilize the position of the humeral head in the glenoid fossa. These fine-tune static postures and dynamic movements [6].

2. **Scapulothoracic Stabilizers**

Scapulothoracic stabilizers are vital for shoulder health and are often overlooked when strengthening the shoulder complex. More emphasis is placed on strengthening the RTC muscles, but overlooking the periscapular muscles will affect the scapulothoracic rhythm and will delay or cause incomplete healing of the injury [7].

II. ANATOMY OF SCAPULAR MOVEMENT

The scapular motion is paired with motion in the shoulder. This biomechanical movement serves to provide increased mobility to the shoulder girdle and stabilize the humeral head in the glenoid fossa. Codman (1993) first published about the scapulothoracic rhythm [4]. The scapulothoracic rhythm is the kinematic motion between the scapula and the humerus, this interaction is the link between the GH joint and ST joint during shoulder elevation [9]. The GH and ST joint moves simultaneously after the first 30 degrees of elevation motion at a 2:1 ratio. This rhythm serves two main purposes:

1. It preserves the length-tension relation between the muscles and aids the muscles in sustaining force through most of the shoulder range of motion [11].

2. The other function is prevention of shoulder impingement at the humeral and acromial head. The difference in sizes of the glenoid fossa and the humeral head can cause impingement of the shoulder if there is increased relative movement between the humerus and scapula. The simultaneous movement between humerus and scapula during shoulder elevation can restrain the relative movement [12].

The scapulothoracic joint is a floating joint and relies heavily on feedback from the stabilizing muscles and a sense of muscular timing. The scapular elevators, depressors, protractors, and retractors all work to minimize the dysfunction. Study by Struyf, et al. (2011) shows that during shoulder elevation and reaching activities, there are multiple coupling forces on the floating joint, and it is essential to study those to maintain shoulder health.

III. ROLE OF SCAPULAR DEPRESSORS AND RETRACTORS

Scapular retraction is the movement of pulling the scapula in towards the spine. Scapular depression is the action of pulling the shoulder blades down.

1. **Trapezius**

The trapezius is a triangular muscle that has upper, middle and lower fibers extending from base of skull to the lower thoracic vertebrae. The upper fibers help in scapular elevation, while the

International Journal of Core Engineering & Management
Volume-6, Issue-11, 2021 ISSN No: 2348-9510

lower fibers help pull the scapula downwards and backwards. The middle trapezius muscle acts as an antagonist to the force of serratus anterior and retracts the scapula [10].

2. Rhomboids

Located between the spine and medial border of scapula, the rhomboid major and minor are deep muscles between the shoulder blades [14]. They primarily retract the shoulder but also assist in depression of the shoulder blade through its anchor to the thoracic wall. Rhomboids along with teres major muscle (proximally attached to scapula and distally to humerus act as scapular retractors [13].

3. Levator Scapulae

The primary function of this muscle is scapular elevation, but it also acts as a force to stabilize the scapula during depression movements. This muscle helps maintain the proper positioning of the scapula during GH movements.

Understanding the interplay between these muscles is crucial for shoulder health. These muscles not only stabilize the scapula on the thoracic wall but also assist the GH joint motion of adduction and extension allowing neutral spine positioning. Adequate forces of the agonist, antagonist and synergist muscles are required for smooth synchronous movement of the shoulder complex [14]. Deficits in these forces can lead to narrowing of the sub-acromial space leading to compression of the soft tissue and tendons in this space and can lead to inflammation and pain [9].

IV. COMMON INJURIES AND CONDITIONS RELATED TO SCAPULOTHORACIC DYSFUNCTION

Several known conditions arise due to dysfunction of the scapulothoracic rhythm and muscle imbalance.

1. Shoulder Impingement Syndrome

This condition occurs when there are altered biomechanics of the shoulder complex. Abnormal scapular position has been known to cause scapular dyskinesis, which can predispose an individual to impingement syndrome [8].

2. Rotator Cuff Injuries

The RTC muscles are primary GH joint stabilizers. RTC injuries include tears, tendinitis, and impingement. Inadequate or abnormal scapular movement can place a strain on the RTC muscles, increasing their risk of tears [6].

3. Scapular Winging

This is a condition where the medial border of the scapula protrudes out posteriorly. Weakness or dysfunction of the periscapular musculature can lead to winging. This can additionally affect shoulder health by causing instability and pain in the GH joint [13]

4. Upper Cross Syndrome

Poor scapular control can lead to postural issues, namely upper cross syndrome. This condition is characterized by forward neck posture, thoracic kyphosis (rounded shoulders), and muscle

International Journal of Core Engineering & Management
Volume-6, Issue-11, 2021 ISSN No: 2348-9510

imbalances that can further lead to shoulder injuries, neck pain, and headaches. Good posture is essential for maintaining optimal scapular function and health [7]

V. EXERCISES AND DOSAGE TO STRENGTHEN SCAPULAR MUSCLES

There are several exercises that can help strengthen the scapular muscles. These include seated rows and shoulder extensions and their variations. There are several exercises that incorporate scapular strengthening with scapulothoracic mobility "black burn exercises" (BME) used in rehabilitation programs are aimed at improving muscle strength and muscle performance. These exercises are divided into 3 positions: BME position I, II, III. Research by De Mey et al. (2013) in their randomized controlled trial (RCT) concluded that the most effective exercise to activate and strengthen the lower trapezius muscle and maximize its muscle activity was BME position II exercises [5]. In a clinical setting, these exercises can help alleviate pain, improve function and overall shoulder health. Following exercises will be divided into groups for the muscles used to help strengthen shoulder muscles.

1. Shoulder extension

This can be performed using a resistance band or weights. Attach the resistance band to a stable surface and hold the ends in both hands, pull the hands back towards the hips while keeping the arms straight. This engages the trapezius and latissimus dorsi.

2. Seated rows

Use a resistance band or cable machine. Sit on a stable surface and secure the band or cable at feet level. Pull the band or cable towards the chest, engaging the rhomboids, middle and lower trapezius.

3. Prone Y and T

Lie face down on a bench or floor with arms extended overhead (Y position) or out to the sides (T position). Lift the arms off the surface, squeezing the shoulder blades together, targeting the trapezius and rhomboids.

4. Face pulls

Attach a resistance band to a stable surface at head level. Hold the ends in both hands and pull towards the face while keeping the elbows high. This engages the rhomboids and trapezius.

5. Scapular wall slides

Stand with the back against a wall, arms at 90-degree angle. Slide the arms up the wall while squeezing the shoulder blades together. This targets the trapezius and rhomboids.

6. Push-ups with scapular protraction and retraction

Perform a push-up and at the top of the movement, push the shoulder blades away (protraction) and then squeeze them together (retraction). This engages the serratus anterior and rhomboids.

VI. CONCLUSION

1. Scapular health is fundamental to maintaining shoulder health. It is also essential for improving athletic performance, preventing injuries, and enhancing postural alignment.

2. Incorporating exercises that strengthen the scapular retractors and depressors into routine shoulder strengthening programs can help address biomechanical inefficiencies and imbalances in the shoulder complex.

3. Strengthening these muscles can also help maintain proper scapulothoracic rhythm, thereby reducing the risk of injuries such as impingement syndromes, rotator cuff tears, scapular winging, and postural deformities like upper cross syndrome.

4. For a better shoulder complex functioning it is not only important to have stronger shoulders itself but a holistic approach of shoulder mobility, shoulder strength, scapular mobility, thoracic mobility and strength is important.

5. It is important to identify the condition and the optimal muscle which might be acting as agonist and the ones that might be acting as antagonist during motion and aggravating pain, causing discomfort or leading to improper mechanics of the shoulder

6. Therefore, scapular muscle strengthening should be a core component of shoulder rehabilitation and conditioning programs.

7. Further scope of study includes role of scapular depressors and retractors with their interaction with thoracic muscles and range of motion in the shoulder joint.

REFERENCES

1. H. E. Veeger and F. C. Van Der Helm, "Shoulder function: The perfect compromise between mobility and stability," Journal of Biomechanics, vol. 40, no. 10, pp. 2119-2129, October 2007.
2. F. Struyf, J. Nijs, S. Mottram, J. Meirte, B. Cagnie, and R. Meeusen, "Clinical assessment of scapular positioning in patients with shoulder pain: state of the art," Journal of Orthopaedic & Sports Physical Therapy, vol. 41, no. 10, pp. 781-791, October 2011.
3. W. B. Kibler, "The role of the scapula in athletic shoulder function," The American Journal of Sports Medicine, vol. 26, no. 2, pp. 325-337, March 1998.
4. W. B. Kibler and J. McMullen, "Scapular dyskinesis and its relation to shoulder pain," Journal of the American Academy of Orthopaedic Surgeons, vol. 11, no. 2, pp. 142-151, March-April 2003.
5. K. De Mey, B. Cagnie, A. Van De Velde, L. Danneels, and A. M. Cools, "Trapezius muscle timing during selected shoulder rehabilitation exercises," Journal of Orthopaedic & Sports Physical Therapy, vol. 43, no. 3, pp. 186-193, March 2013.
6. M. M. Reinold, R. F. Escamilla, and K. E. Wilk, "Current concepts in the scientific and clinical rationale behind exercises for glenohumeral and scapulothoracic musculature," Journal of Orthopaedic & Sports Physical Therapy, vol. 39, no. 2, pp. 105-117, February 2009.
7. Y. S. Lee, S. J. Kim, and S. Kang, "The effect of scapular position on shoulder isokinetic torque in individuals with and without scapular dyskinesis," Journal of the Korean Society of Physical Medicine, vol. 12, no. 2, pp. 13-19, June 2017. Available: https://koreascience.kr/article/JAKO201726868680747.page.

8. A. G. Maenhout, N. N. Mahieu, M. De Muynck, L. F. De Wilde, A. M. Cools, and E. E. Witvrouw, "Scapular muscle rehabilitation exercises in overhead athletes with impingement symptoms: Effect of a 6-week training program on muscle recruitment and core stability," Manual Therapy, vol. 18, no. 6, pp. 519-524, December 2013. Available: https://www.sciencedirect.com/science/article/pii/S0268003309002216.
9. T. Mihata, T. Q. Lee, A. Hasegawa, and M. Neo, "Influence of acromion shape on isometric strength and dynamic performance of the shoulder joint," Arthroscopy: The Journal of Arthroscopic & Related Surgery, vol. 20, no. 4, pp. 342-349, April 2004. Available:https://www.arthroscopyjournal.org/article/S0749-8063(03)00389X/abstract.
10. C. A. Oatis, "The role of scapular stabilizers in overhead function: A review and evaluation of current practices," Physical Therapy Reviews, vol. 14, no. 1, pp. 31-38, February 2009. Available: https://core.ac.uk/download/pdf/5011455.pdf.
11. P. M. Ludewig and J. F. Reynolds, "The association of scapular kinematics and shoulder symptoms," Journal of Orthopaedic & Sports Physical Therapy, vol. 39, no. 2, pp. 90-104, February 2009. Available: https://core.ac.uk/download/pdf/76388922.pdf.
12. N. Poppen and P. S. Walker, "Scapulohumeral rhythm: dependence on the convexity of the humeral head," International Journal of Mechanical Sciences, vol. 18, no. 5, pp. 179-192, May 1976. Available: https://link.springer.com/article/10.2165/00007256-200838050-00002.
13. B. Singh and N. Kaur, "Effectiveness of scapular retraction exercises in management of patients with shoulder impingement syndrome: An evidence-based approach," International Physical Medicine & Rehabilitation Journal, vol. 3, no. 2, pp. 157-160, May 2016. Available: https://www.academia.edu/download/83432258/IPMRJ-03-00157.pdf.
14. N. Wuelker, M. Korell, and T. Thren, "Dynamic three-dimensional analysis of glenohumeral motion after muscular dysfunction and surgery," Clinical Biomechanics, vol. 10, no. 3, pp. 167-172, June 1995. Available: https://www.sciencedirect.com/science/article/pii/S0268003309002216.