SHORT COMMUNICATION

©2023 The Academy of Environmental Biology, India

Journal of Ecophysiology and Occupational Health, *Vol 25(1), DOI: 10.18311/jeoh/2025/44249, 1-5, March 2025*

ISSN (Online) : 0972-4397
ISSN (Online) : 0974-0805

Prevalence of Supraspinatus Weakness in Patients with Scapular Dyskinesis

Nikita Gurudas Malani and Smita Chandrakant Patil*

Krishna College of Physiotherapy, Krishna Institute of Medical Sciences, Karad - 415110, Maharashtra, India; smitakanase@gmail.com

Abstract

Background: This study aimed to evaluate supraspinatus weakness in patients with scapular dyskinesis. **Aims:** To find the number of patients having supraspinatus weakness (scapular *dyskinesis* patients). **Methods:** For this study, the source of the population was scapular *dyskinesia* volunteered to participate after signing an informed consent form, to be eligible for this study. Ages between 20-50 were included. Subjects who had any previous history of injury to the shoulder joint were excluded. **Results:** The empty can test is a reliable method for assessing patients diagnosed with supraspinatus. **Discussion**: Type I or inferior dysfunction: The main external visual characteristic is the prominence of the inferior angle, caused by the anterior tilting of the scapula in the sagittal plane. Type 2 or medial dysfunction: The main external visual feature is the prominence of the entire medial scapular border, resulting from the internal rotation of the scapula in the transverse plane. **Conclusions**: We found that 36% of individuals, both male and female, have supraspinatus weakness. The strength of the muscle was also impacted.

Major Findings: The findings of study conclude that 36% of individuals are having Supraspinatus weakness in both genders, and we can rely on the empty can test for assessment of the same.

Keywords: Empty Can Test, Pain, Scapular Dyskinesis, Shoulder, Supraspinatus

1. Introduction

Any change in the position or motion of the scapula, known as Scapular Dyskinesis (SD), can cause instability and dysfunction in the shoulder[1,2]. The glenohumeral joint is the joint in the human body with greatest range of motion[3]. The frequency of Scapular Dyskinesis is higher in older people with degerative pathology of the shoulder and over use traumas. The deltoid's upper oriented force is of set by the compressive forces of the rotator cuff. By keeping the humeral head in its central position, impingement beneath the coracoacromial arch is prevented. An increased scapular upward movement during the throwing motion is observed in overhead athletes. This avoids Rotator cuff compression by preserving the subacromial space[4]. For the glenohumeral joint to properly rotate, the scapula stabilizing muscles must contract in a balanced manner to permit the scapula to move on the posterolateral surface of the thoracic cage[5,6].

Kibler *et al.* investigated the deficit of the supraspinatus strength and scapular dyskinesis[7], were as other writers documented the impact of the scapula's repositioning on isometric shoulder elevation strength[8,9]. The supraspinatus, a component of the rotator cuff, aids in defying the forces of gravity that draw the upper limbs weight downward at the shoulder joint. Additionally, it aids in stabilizing the shoulder joint by maintaining the humerus head firmly pressed medially on the scapula's glenoid fossa.

2. Materials and Methodology

For this study, the source of the population was recreational and professional athletes, 100 sports players, both male and female, playing various sports like

*Author for correspondence

Article Received on: 28.05.2024 Revised on: 25.07.2024 Accepted on: 26.07.2024

baseball, tennis, track, and field throwing events, football, basketball, and soccer goalkeepers who were diagnosed with scapular dyskinesia volunteered to participate after signing an informed consent form. To be eligible for this study, age between 20-50 were included. Subjects who had any previous history of injury to the shoulder joint were excluded. All 100 players met the pre-requisites, and inclusion criteria and completed the study. No dropouts were observed during the study. The outcome measure followed a standard format, so this study did not require institutional review board approval. Visual analogue scale was used to measure the pain score. Supraspinatus weakness was assessed using the empty can test (Figure 1).

3. Procedure

Empty can test was used to assess supraspinatus weakness[10] (Figure 1). For this exam, the patient stood up straight. The patient's arm was fully internally rotated, pronated in the forearm, and elevated to a 90-degree angle in the scapular plane. The patient then assumed a thumbs-down posture, as though they were emptying liquid out of a can. While the patient attempted to resist the downward

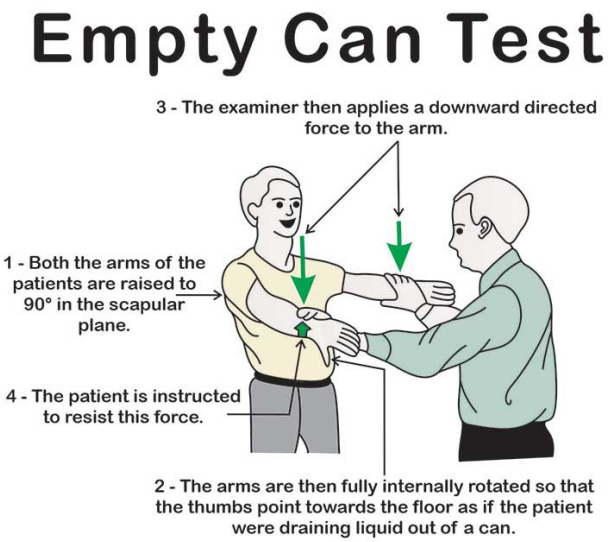


Figure 1. Empty can test.

Table 1. Outcome results of subjects (age 20 to 30

Age	No. of Subjects According to Age	No. of Subjects having 'EC' Test Positive	Average Pain Score
20	5	2	3.2
21	4	1	3.5
22	6	2	4
23	4	1	2.5
24	5	1	4.5
25	7	2	4.3
26	5	1	4.6
28	4	1	2.6
30	5	1	2.8
Grand Total	45	12	32

Table 2. Outcome results of subjects (age 30 to 40)

Age	No. of Subjects According to Age	No. of Subjects having 'EC' Test Positive	Average Pain Score
31	5	2	5.9
32	4	1	5.8
34	3	3	4.9
35	3	2	5.6
36	4	2	6.3
38	3	1	6.5
39	5	3	5.8
40	3	2	5.2
Grand Total	30	16	46

Table 3. Outcome results of subjects (age 40 to 50)

Age	No. of Subjects According to Age	No. of Subjects having 'EC' Test Positive	Average Pain Score
41	3	1	3.1
43	5	2	3.2
45	3	1	3
46	2	1	2.8
47	3	1	3
48	4	1	4.1
50	5	1	2.8
Grant Total	25	8	22



Figure 2. Different types of scapular dyskinesis.

force being applied to the arm to stabilize the shoulder, it was done. If the patient feels weak or in discomfort when facing resistance, the test was deemed successful. The supraspinatus muscle and tendon injury can be diagnosed with an empty can test with 88.6% sensitivity and 58.8% specificity[11]. Using normalized EMG, Boettcher CE, *et al.*[12] showed that the empty can test stimulates supraspinatus to a level of about 90% maximum voluntary contractions. Visual analogue scale was used to calculate the pain score.

Total 45 subjects including both males and females were in between age 20 to 30, out of which 12 subjects were positive for empty can test and pain score was 32.

A total of 30 subjects including both males and females were between the ages of 30 to 40, out of which 16 subjects were positive for the empty can test and the pain score was 46.

Total 25 subjects including both males and females were between ages 40 to 50, out of which 8 subjects were positive for the empty can test and the pain score was 22.

4. Results

The empty can test is a reliable method for assessing supraspinatus weakness in patients with scapular dyskinesia. Scapular Dyskinesis is the initial factor in the sequence of events that leads to supraspinatus weakness.

5. Discussion

Precise scapular placement and ideal bone constraint function are critical for achieving the best possible position for the rotator cuff muscles to generate maximal force[13]. Pain (an intrinsic factor) creates absolute muscle weakness[14]. The two primary causes of the detrimental effects of rotator cuff and Scapular Dyskinesis on shoulder function are pain avoidance and structural damage[15]. Because they can be treated, rotator cuff diseases are a key factor in clinical practice because they cause function loss and shoulder pain[16]. Upward rotation, posterior tilting, and external rotation are the typical three-dimensional (3D) kinematic patterns of the scapula in relation to the thorax during arm raising[17]. Scapular dysfunction classified by Kibler[18].

Type 1, or inferior dysfunction: The prominence of the inferior angle due to the anterior tilting of the scapula in the sagittal plane is the main outward visual characteristic. When eccentrically dropping from overhead elevation or in the hands-on-hips position,

inferior pattern presentation is easier to see. The Type 1 pattern is more frequently observed in patients who have rotator cuff dysfunction, according to Kibler.

Type 2 or Medial dysfunction: Because of the scapula's internal rotation in the transverse plane, the prominence of the entire medial scapular border is the main outward visual feature. Similar to Type 1, Type 2 is more noticeable when hands are on hips and when lowering from overhead is done actively. The majority of patients with glenohumeral joint instability experience medial pattern dysfunction.

Type 3 or Superior dysfunction: Marked by an early and excessive scapular elevation during UE elevation. This behavior, also known as compensatory shoulder hiking or shrug, is most commonly observed in individuals who have imbalances in the deltoid-rotator cuff force pair and rotator cuff dysfunction[19]. The clinical manifestation of Scapular Dyskinesis, which is frequently observed in competitive overhead athletes, should be understood as rotator cuff weakness (Figure 2).

6. Conclusion

We found that 36% of individuals are having Supraspinatus weakness in both genders. Strength of the muscle was also affected. According to various age groups, cumulative scores of pain in the age group 20-30 years had a score of 32, the age group 30-40 years had a score of 46, and the age group 40-50 years had a score of 22.

7. Acknowledgement

I would like to thank Dr. Smita Patil, Head, Department of Sports Physiotherapy, Krishna College of physiotherapy, KIMSDU, Karad, for her support during the project.

8. References

1. Kibler BW, Sciascia A, Wilkes T. Scapular dyskinesis and its relation to a shoulder injury. J Am Acad Orthop Surg. 2012; 20(6):364–372. https://doi.org/10.5435/jaaos-20-06-364
2. Postacchini R, Carbone S. Scapular dyskinesis: Diagnosis and treatment. OA Musculoskeletal Medicine. 2013; 1:20. https://doi.org/10.13172/2052-9287-1-2-869
3. Morrev BF, Ito E, An KN. Biomechanics of the shoulder. Rockwood and Matsen's the Shoulder. 2009; 233-276. https://doi.org/10.1016/b978-1-4160-3427-8.50012-x
4. Duca CJ, Forrest WJ. Force analysis of individual muscles acting simultaneously on the shoulder joint during isometric abduction. J Biomech. 1973; 6(4):385-386. https://doi.org/10.1016/0021-9290(73)90098-5
5. Kibler WB. Role of the scapula in the overhead throwing motion. Contemp Orthod. 1991; 22:525-532.
6. Roche SJ, Funk L, Sciascia A, Kibler WB. Scapular dyskinesis: The surgeon's perspective. Shoulder Elbow. 2015; 7(4):289–297. https://doi.org/10.1177/1758573215595949
7. Smith J, Kotajarvi BR, Padgett DJ, Eischen JJ. Effect of scapular protraction and retraction on isometric shoulder elevation strength. Arch Phys Med Rehabil. 2002; 83(3):367-370. https://doi.org/10.1053/apmr.2002.29666
8. Tate AR, McClure P, Karena S, Irwin D. Effect of the scapula reposition test on shoulder impingement symptoms and elevation strength in overhead athletes. J Orthop Sports Phys Ther. 2008; 38(1):4-11. https://doi.org/10.2519/jospt.2008.2616
9. Ludewing PM, Phadkev V, Braman JP, Hassett DR, Ciemiski CJ, La Prade RE. Motion of the shoulder complex during multiplanar humeral elevation. Bone Joint Surg Am. 2009; 91(2):378-389. https://doi.org/10.2106/jbjs.g.01483
10. Jobe FW, Moynes DR, *et al.* Delineation of diagnostic criteria and a rehabilitation program for rotator cuff injuries. Am J Sports Med. 1982; 10(6):336-339. https://doi.org/10.1177/036354658201000602
11. Ackmann T, Schneider KN, Schorn D, Rickert C, Gosheger G, Liem D. Comparison of efficacy of supraspinatus tendon tears diagnostic tests: A prospective study on the "full-can," the "empty-can," and the "whipple" tests. Musculoskeletal Surg. 2019; 105:149-153. https://doi.org/10.1007/s12306-019-00631-0
12. Boettcher CE, Ginn KA, Cathers I. The 'empty can' and 'full can' tests do not selectively activate supraspinatus. J Sci Med Sport. 2009; 12(4):435-439. https://doi.org/10.1016/j.jsams.2008.09.005
13. Giuseppe LU, Laura RA, Berton A, *et al.* Scapular dyskinesis: From basic science to ultimate treatment. Int J Environ Res Public Health. 2020; 17(8):2974. https://doi.org/10.3390/ijerph17082974
14. Kihler WB, Sciascia A. Current concepts: Scapular dyskinesis. Br J Sports Med. 2010;44(5). https://doi.org/10.1136/bjsm.2009.058834
15. Robert-Lachaine X, Allard P, Godbout V, Tetreault P, Begon M. Scapulohumeral rhythm relative to active range of motion in patients with symptomatic rotator cuff tears. J Shoulder Elbow Surg. 2016; 25(10):1616–1622. https://doi.org/10.1016/j.jse.2016.02.031
16. Doiron-Cadrin P, Lafrance S, Saulnier M, *et al.* Shoulder rotator cuff disorders: A systematic review of clinical practice guidelines and semantic analyses of recommendations.

Arch Phys Med Rehabil. 2020; 101(7):1233–1242. https://doi.org/10.1016/j.apmr.2019.12.017
17. Leong HT, Ng GYF, Chan SC, Fu SN. Rotator cuff tendinopathy alters the muscle activity onset and kinematics of scapula. J Electromyogr Kinesiol. 2017; 35:40–46. https://doi.org/10.1016/j.jelekin.2017.05.009
18. Kibler WB, Uh TL *et al.* Qualitative clinical evaluation of scapular dysfunction: A reliability study. J Shoulder Elbow Surg. 2002; 11(6):550-556. https://doi.org/10.1067/mse.2002.126766
19. Inman VT, Saunders JB, Abbott LC. Observation on the function of the shoulder joint. J Bone Joint Surg. 1996; 330:3-12. https://doi.org/10.1097/00003086-199609000-00002

Access this journal online	
Website: www.informaticsjournals.co.in/index.php/JEOH/index	**Quick Response Code**