

Role of Rotator Cuff Muscles in Adhesive Capsulitis: A Narrative Review and Critical Appraisal of Available Literature

Dr. Riddhi Ghodasara¹, Dr. Urmi Bhatt²

¹MPT Student, C. U. Shah Physiotherapy College, Surendranagar, Gujarat, India
Email: riddhi.ghodasara[at]gmail.com

²PhD, MPT (Musculoskeletal Conditions), Professor, C.U. Shah Physiotherapy College, Surendranagar, Gujarat, India
Email: urmibhatt.87[at]gmail.com

Abstract: Adhesive capsulitis [AC] is the most common disorder causing painful and stiff shoulder, with prevalence ranging from 3-30%. Etiology of AC is unclear, ranging from inflammation in musculotendinous structure around shoulder to thickening of capsule. Despite of multifactorial etiology, physiotherapeutic interventions used in adhesive capsulitis are predominantly focused on lengthening capsule, by stretching and joint mobilization. The study intends to explore etiology of underlying pathomechanical basis for development of AC. So, that “appropriate biomechanical” intervention can be used as conservative management for the AC. A literature search for current study was performed in electronic databases of PubMed and Google scholar till 2024 with “Frozen Shoulder”, “Adhesive Capsulitis” as key words. The review was carried out in three steps to assess relationship between function of rotator cuff muscles and AC. Many reviews have identified rotator cuff dysfunction as a trigger for development of AC. Apart from these, rotator cuff dysfunction has also been reported in people with adhesive capsulitis. There is sparse literature highlighting use of rotator cuff strengthening in AC. The study highlights that potential pathway for development of AC is through rotator cuff dysfunction, yet there is sparse literature on retraining rotator cuff muscles in people with AC.

Keywords: Adhesive capsulitis, Rotator cuff dysfunction, Shoulder stiffness, Pathomechanics of shoulder joint

1. Introduction

Frozen shoulder [FS], also known as adhesive capsulitis is the commonest cause of shoulder pain associated with restriction of active and passive range of motion. Prevalence of frozen shoulder is estimated to be about 2% to 30% in general population and mainly seen in 40 to 60 years of age and it is seen more commonly in women than men.^[1,2] Clinically patient with frozen shoulder have sign and symptoms of restriction of active and passive range of motion.^[3] Patients complain of generalized shoulder pain specially over deltoid region but usually cannot point a localized area.^[4] Occasionally patient complain of pain which is radiating to the lateral aspect of upper arm and occasionally to the forearm, pain is aggravated by movement and patient finds pain relief on limiting the arm movement.^[5] Patient also complain of pain more at night than day time. Due to pain patient is unable to sleep on the affected side and night pain hampers the patients sleep.^[5] There may be diffused tenderness over the joint line but difficult to locate the maximum tender point.^[6]

Due to pain there is gradual reduction in the range of shoulder, shoulder motion decreases to the point where little or no motion is demonstrated. Patients with frozen shoulder may present various functional impairments such as difficulty in putting on a coat, taking dishes from the cupboard or reaching into a hip pocket for a wallet. Women may complain of inability to comb their hair or fasten garments behind their back.^[7,8,9,10] Frozen shoulder usually starts with one shoulder and may affect the other side. Relationship to occupation as been noted but Wright and Haq found more manual workers among their Frozen shoulder patients^[11] Both shoulders may be affected

simultaneously or successively.^[12,13,14] Involvement of the second shoulder occurs in 6% to 17% of patients in reported series, but usually after the shoulder initially involved has recovered. Codman and Lippmann believed that a relapse does not occur in the same shoulder. Seasonal variations were reported by Lundberg.^[15,14,16] According to Reeves, frozen shoulder is divided into 3 phases and can last upto 2 – 3 years, he also described the frozen shoulder as a self limiting condition, which can settle down with or without any treatment. Reeves carried out the prospective study of 41 patients followed up to 10 years, reported that approximately 40% of patients demonstrated a full recovery, more than 50% had some clinical limitation of movement without restriction in function. Similarly Shafeer et al carried out the study which included 61 patients, with mean follow up time of 7 years, study conclude that 50% of patients complained of pain or stiffness and 60% had a reduction in range of motion, 11% of cases demonstrated a functional deficit. The exact cause of frozen shoulder syndrome is unclear, although certain factors seem to be associated with its development. Typically, frozen shoulder syndrome develops in individuals in the fifth and sixth decades of life. It often follows some episode of trauma to the involved shoulder or chest. Improvement tends to be slow and is characterized by periods of gain and plateau. A variety of intrinsic and extrinsic factors are thought to influence the origin and course of frozen shoulder syndrome. Several treatment approaches have been advanced, each with the goal of restoration of normal, pain-free shoulder function.^[17]

Till date, no intervention has been proven to cure the condition at earliest. It is imperative to know the exact cause and the patho-physiology of the condition to determine the best biomechanical intervention. Therefore, to know the

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etiology and causes of the development of frozen shoulder, current review is conducted. The present study intends to explore etiology and underlying pathomechanical basis for development of adhesive capsulitis. So that appropriate intervention can be selected for conservative management of adhesive capsulitis.

2. Methodology/ Approach

Current review is prepared in accordance with SANRA (Scale for the Assessment of Narrative Review Articles) guidelines for writing narrative reviews. A literature search for this narrative review was performed in two widely used electronic database, Pubmed and Google Scholar from 1943 up to 2024. The search approach used “adhesive capsulitis” or “frozen shoulder” as keywords. Articles assessing stiffness of shoulder following any surgery related to shoulder joint such as shoulder replacement, rotator cuff repair, any fracture around shoulder joint or any type of other shoulder surgery were not included in the review. Articles if not written in English language were not included. Painful stiff shoulder with idiopathic onset, also known as frozen shoulder, adhesive capsulitis, and periarthritis of shoulder, is an old clinical entity. In order to understand the etiology of this condition, the review has been conducted in three steps:

Step 1: History of term “adhesive capsulitis” and its relation with soft tissue around shoulder.

Step 2: Is there any evidence of rotator cuff dysfunction in people with adhesive capsulitis?

Step 3: Do we have any evidence to recommend rotator muscle cuff strengthening exercise in treatment of adhesive capsulitis?

3. Discussion

History of term “adhesive capsulitis “and its relation with soft tissue around shoulder

In 1872, DUPLAY was the first to distinguish between the causes of painful, stiff shoulder. He described “humeroscapular periarthritis,” a complaint which is caused in extra-articular tissue caused by subacromial bursitis.⁽¹⁸⁾

Sixty times later, Pasteur described the same clinical picture and nominated it as “tenobursitis.” PASTEUR and MEYER were the first to relate bicipital tendinitis with this condition.⁽¹⁹⁾

In 1934 CODMAN described the same clinical picture in further detail using the term frozen Shoulder for the first time. He linked frozen shoulder with supraspinatus tendinitis.^(15,20)

In 1945, JULIUS NEVIASER, on the bases of clinical observation, surgical disquisition and necropsy studies. He reported that the capsule stuck to the underpinning humeral head. He further reported that, the capsule could be fluently separated from the cartilage. During manipulation, the capsule peel from the head much as tape peels from skin. Therefore, he chased the term “ADHESIVECAPSULI” as a more applicable description than Frozen shoulder.^(21,22)

Is there any evidence of rotator cuff dysfunction in people with adhesive capsulitis?

Nathaniel Crubbs reported that intrinsic and extrinsic factors may precipitate the condition.^[23] Many authors believe that the pathogenesis of the frozen shoulder syndrome is the consequence of a musculotendinous or tenosynovitis-induced inflammation giving rise to the formation of adhesions and capsular thickening.^[24,25,26,27,28]

Hsiu –chenlin concluded that high speed external rotator strength and isometric internal rotator strength of the affected shoulder were decreased in people with adhesive capsulitis.

Kinematics of the shoulder joint can be significantly altered by the tightness of the shoulder capsule and associated muscles such as rotator cuff muscle and ligaments.^[29,30] Most types of shoulder pathology are associated with alterations in the position of the scapula through disrupted scapulohumeral rhythm, anterior scapular tipping, upward position of scapula or abnormal kinematics in the scapulothoracic joint. Although nearly all functions of the shoulder rely on proper alignment of the scapula and appropriate coordination of scapular stabilizing muscles. Altered glenohumeral joint biomechanics often result in impingement of the rotator cuff beneath the acromion, causing pain and inflammation. Jiu-jenq Lin et. al conducted a study which concluded that anterior/posterior shoulder tightness affects shoulder kinematics such as scapulohumeral rhythm, translation of the humeral head, and scapular tilt. A more anteriorly tipped position of the scapula and more excessive scapular upward rotation were found in subjects with anterior shoulder tightness, whereas more superior and less posterior translations of the humeral head occurred in subjects with posterior shoulder tightness. These kinematic changes may contribute to the development of subacromial impingement, tendinitis, and degenerative changes. Due to alterations in normal kinetic chain of shoulder joint, there may be muscle imbalance and weakness of shoulder muscles.^[31]

Cheuk -kin kwan et al. hypothesized that internal rotators and external rotators muscle weakness may have contributed in developing the rotator cuff tendinopathy. Jing-lan Yang suggested that regardless of the potential factors related to frozen shoulder symptoms, altered shoulder kinematics is believed to exacerbate the condition and predispose patients to subacromial impingement, rotator cuff tendonitis, altered shoulder joint forces and possible degenerative changes.^[32] Thus, a more difficult and chronic course of frozen shoulder symptoms may develop.^[32]

Thus, available literature from various authors concluded that there is some disturbance in soft tissue that is tendons, and/or muscles around shoulder which further leads to development of adhesion in capsule which results in development of adhesive capsulitis / frozen shoulder. Hence, available literature is clearly pointing towards a critical pathway for development of adhesive capsulitis, through rotator cuff dysfunction.

Do we have any evidence to recommend rotator muscle cuff strengthening exercise in treatment of adhesive capsulitis?

A randomized control trial has been conducted by Pallavi Rawat and others in 2017 to see the effect of rotator cuff strengthening exercises in adhesive capsulitis. In their study, forty-two participants were included and divided into two groups and rotator cuff strengthening along with TENS (Transcutaneous Electric Nerve Stimulation) and mobilization and concluded that the group which was given strengthening of rotator cuff muscles have shown more benefit than other group.

There are no any other RCT studies, which are carried out to see the additive or comparative effects of the rotator muscle strengthening with conventional exercises in people with adhesive capsulitis [33]

4. Conclusion

The study highlights that potential pathway for development of adhesive capsulitis is through rotator cuff dysfunction, yet there is sparse literature on retraining rotator cuff muscles in people with adhesive capsulitis. The study urges need researches to explore and develop structured rotator cuff strengthening programs for people with adhesive capsulitis.

References

- [1] Bridgman JF. Periarthritis of the shoulder and diabetes mellitus. *Ann Rheum Dis* [Internet]. 1972;31(1):69–71. Available from: <http://dx.doi.org/10.1136/ard.31.1.69>
- [2] Lesquesne M, Dang N, Bensasson M, Merry C. Increased association of diabetes mellitus with capsulitis of the shoulder and shoulder-hand syndrome. *Scand J Rheumatol* 1977;53–6.
- [3] Sheridan MA, Hannafin JA. Upper extremity: emphasis on frozen shoulder. *Orthop Clin North Am* [Internet]. 2006;37(4):531–9. Available from: <http://dx.doi.org/10.1016/j.ocl.2006.09.009>
- [4] Connolly J, Regen E, Evans OB. The management of the painful, stiff shoulder. *Clin Orthop Relat Res* [Internet]. 1972; 84:97–103. Available from: <http://dx.doi.org/10.1097/00003086-197205000-00018>
- [5] Steven L. Wolf, *The Shoulder and Neck, Physical Therapy, Volume 59, Issue 10, October 1979, Page 1312*, <https://doi.org/10.1093/ptj/59.10.1312a>
- [6] Kozin F. Painful shoulder and the reflex sympathetic dystrophy syndrome. In: McCarty DJ, editor. Philadelphia: Lea & Febiger. 1979. p. 1091–120.
- [7] Kessler RM, Hertling D. Management of common musculoskeletal disorders: physical therapy principles and methods. (No Title). 1983.
- [8] Neviasser JS. Adhesive capsulitis and the stiff and painful shoulder. *Orthop Clin North Am* [Internet]. 1980;11(2):327–31. Available from: [http://dx.doi.org/10.1016/s0030-5898\(20\)31482-6](http://dx.doi.org/10.1016/s0030-5898(20)31482-6)
- [9] Owens-Burkhart H. Management of frozen shoulder. In: Donatelli RA, editor. *Physical Therapy of the Shoulder*. Churchill Livingstone; 1991. p. 1–1.
- [10] Rizk TE, Pinals RS. Frozen shoulder. *Semin Arthritis Rheum* [Internet]. 1982;11(4):440–52. Available from: [http://dx.doi.org/10.1016/0049-0172\(82\)90030-0](http://dx.doi.org/10.1016/0049-0172(82)90030-0)
- [11] Wright V, Haq AM. Periarthritis of the shoulder. II. Radiological features. *Ann Rheum Dis* [Internet]. 1976;35(3):220–6. Available from: <http://dx.doi.org/10.1136/ard.35.3.220>
- [12] Reeves B. The natural history of the frozen shoulder syndrome. *Scand J Rheumatol* [Internet]. 1975;4(4):193–6. Available from: <http://dx.doi.org/10.3109/03009747509165255>
- [13] Mary C. Singleton, *Surgery of the Shoulder 2nd ed, Physical Therapy, Volume 54, Issue 1, January 1974, Page 97*, <https://doi.org/10.1093/ptj/54.1.97>
- [14] Lundberg BJ. The frozen shoulder. Clinical and radiographical observations. The effect of manipulation under general anesthesia. Structure and glycosaminoglycan content of the joint capsule. Local bone metabolism. *Acta Orthop Scand Suppl.* 1969; 119:1-59. PMID: 4952729.
- [15] Loss of scapulohumeral motion (Frozen La tenobursite bicipitale). *4DePalma AF.* 1932; 16:193–204.
- [16] Lippmann RK. Frozen shoulder; periarthritis, bicipital tenosynovitis. *Arch Surg.* 1943; 47:283–96.
- [17] Grubbs N. Frozen shoulder syndrome: a review of literature. *J Orthop Sports Phys Ther* [Internet]. 1993;18(3):479–87. Available from: <http://dx.doi.org/10.2519/jospt.1993.18.3.479>
- [18] Rizk TE, Pinals RS. Frozen shoulder. *Semin Arthritis Rheum* [Internet]. 1982;11(4):440–52. Available from: [http://dx.doi.org/10.1016/0049-0172\(82\)90030-0](http://dx.doi.org/10.1016/0049-0172(82)90030-0)
- [19] Pasteur F. Les algies de l'épaule et al physiotherapie. 5. *DePalma AF.* Loss of scapulohumeral motion (FrozenLa tenobursite bicipitale). *J Radiol Electrol.* 1932; 16:419–26.
- [20] E. A. Codman, "The Shoulder: Rupture of the Supraspinatus Tendon and Other Lesions in or about the Subacromial Bursa," Thomas Todd Co., Boston, 1934.
- [21] Neviasser JS. Adhesive capsulitis of the shoulder: A study of the pathologic findings in periarthritis of the shoulder. *J Bone Joint Surg.* 1945; 27:211–22.
- [22] Neviasser JS. Adhesive capsulitis of the shoulder (the frozen shoulder). *Med Times.* 1962; 90:783–807.
- [23] Grubbs N. Frozen shoulder syndrome: a review of literature. *J Orthop Sports Phys Ther* [Internet]. 1993;18(3):479–87. Available from: <http://dx.doi.org/10.2519/jospt.1993.18.3.479>
- [24] Fareed DO, Callivan WR. Office management of frozen shoulder syndrome: Treatment with hydraulic distension under local anesthesia. *Clin Orthop.* 1989; 242:177–83.
- [25] Loyd JA, Loyd HM. Adhesive capsulitis of the shoulder: arthrographic diagnosis and treatment. *South Med J* [Internet]. 1983;76(7):879–83. Available from: <http://dx.doi.org/10.1097/00007611-198307000-00016>
- [26] Neviasser RJ. Painful conditions affecting the shoulder. *Clin Orthop Relat Res* [Internet]. 1983;173(173):63–9. Available from: <http://dx.doi.org/10.1097/00003086-198303000-00009>
- [27] Rj N, Neviasser TI. Neviasser TI: The frozen shoulder: Diagnosis and management. *Clin Orthop.* 1987; 223:59–64.
- [28] Nobuhara K, Sugiyama D, Ikeda H, Makiura M. Contracture of the shoulder. *Clin Orthop Relat Res*

- [Internet]. 1990; 254(254):105–10. Available from: <http://dx.doi.org/10.1097/00003086-199005000-00016>
- [29] Harryman DT 2nd, Sidles JA, Clark JM, McQuade KJ, Gibb TD, Matsen FA 3rd. Translation of the humeral head on the glenoid with passive glenohumeral motion. *J Bone Joint Surg Am* [Internet]. 1990;72(9):1334–43. Available from: <http://dx.doi.org/10.2106/00004623-199072090-00009>
- [30] Werner CML, Nyffeler RW, Jacob HAC, Gerber C. The effect of capsular tightening on humeral head translations. *J Orthop Res* [Internet]. 2004;22(1):194–201. Available from: [http://dx.doi.org/10.1016/S0736-0266\(03\)00137-2](http://dx.doi.org/10.1016/S0736-0266(03)00137-2)
- [31] Effect of Shoulder Tightness on Glenohumeral Translation, Scapular Kinematics, and Scapulohumeral Rhythm in Subjects with Stiff Shoulders Jiu-jenq Lin,1 Hyun K. Lim,2 Jing-Lan Yang1.
- [32] Yang J-L, Chang C-W, Chen S-Y, Lin J-J. Shoulder kinematic features using arm elevation and rotation tests for classifying patients with frozen shoulder syndrome who respond to physical therapy. *Man Ther* [Internet]. 2008;13(6):544–51. Available from: <http://dx.doi.org/10.1016/j.math.2007.07.006>
- [33] Effect of rotator cuff strengthening as an adjunct to standard care in subjects with adhesive capsulitis: A randomized controlled trial Pallavi Rawat MPT. Charu Eapen MPT.

Author Profile



Riddhi Ghodasara received the degree bachelor of physiotherapy from Saurashtra University in 2023. And currently pursuing the masters of physiotherapy in musculoskeletal condition from C.U. Shah Physiotherapy Collage, Surendranagar.



Urmi Bhatt received the degree of bachelor of physiotherapy from civil hospital Ahmedabad, further she pursued masters of physiotherapy in musculoskeletal condition from V. S Physiotherapy collage, Ahmedabad from Gujarat University. She is PhD scholar from Gujarat University. Since 2012 professor in C.U. Shah Physiotherapy Collage, Surendranagar.