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Early freezing phase of shoulder adhesive capsulitis: A correlation between shoulder pain and shoulder joint mobility

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Abstract
The Objective of this study was to study the correlation of shoulder pain and shoulder passive range of motion in patients with early freezing phase of adhesive capsulitis.(Materials and Methods)-In this Observational, Correlational analytical study,50 participants of early freezing phase of adhesive capsulitis of both gender between the age group 45-70 were included using purposive sampling method. All participants were assessed for pain using visual analog scale, passive range of motion using universal goniometer. The obtained data was analyzed using Pearson correlation coefficient. (Result)-The result showed mean range of motion for shoulder flexion, extension, abduction, medial rotation, lateral rotation was 138±2.54, 51.34±0.82, 123.67±2.87, 56.44±1.29, 46.59±1.57 respectively and mean pain score 7.48±0.95 among patients. There was significant correlation found between variables shoulder pain and shoulder joint mobility. (Conclusion)-A negative correlation exists between the shoulder pain and shoulder mobility (Passive range of motion) in patients with early freezing phase of shoulder adhesive capsulitis.

Keywords: adhesive capsulitis, early freezing phase, passive range of motion, shoulder pain

1. Introduction
Frozen shoulder is most common musculoskeletal condition encountered in general orthopedic practice. It is a self-limiting condition. Precise cause of frozen shoulder is still not clear. Available literature described the various causes of frozen shoulder as perivascular inflammation and fibroblastic proliferation, followed by capsular fibrosis, contracture, and alterations in other non-contractile structures around the shoulder.

It occurs as a result of pathology which is characterized by progression of pain and disability in stages. Understanding the pathological process to cause frozen shoulder, identifying the other related risks factors associated may guide the therapist for early diagnosis and may be important in the prompt, accurate and effective management of this condition

It is characterized by pain, stiffness and loss of range of motion at shoulder joint. It progresses in stages as follows- early freezing stage, freezing stage, frozen and thawing stage. Early freezing stage is represented by Mild to moderate pain and deficits in mobility which may persists at 12-18 months. At this stage, which lasts for 3 months, patient experiences intense sharp pain during end range of motion and even at rest due to which sleep is disturbed [1] houlder pain not only causes functional limitations and disability but also leads to decreased quality of life. The deficit in mobility is particularly seen in external rotation. It is most common in patients with diabetes than without diabetes [2].

It not only affects the active range but passive ranges of shoulder also gets affected, in multiple planes, mostly external rotation and in varying degrees of abduction [3].

Recent evidences states that patients with adhesive capsulitis face long term disability for many years. The disability at shoulder in this condition is defined as a result of contributing factors like pain, stiffness and mobility deficit [4]

As in early freezing stage the pain is more intense and along with reduced shoulder movements especially external rotation, but it will be interesting to know whether the decreased movements are because of increased pain levels or not. And it is expected that the reduced range of shoulder may be because of increased severity of pain in early stage of adhesive capsulitis rather than because of reduced joint play movements. Because intra-articular hypomobility may occur in the later stages of adhesive capsultits. Therefore, the present study was carried out to find the correlation between shoulder pain and range of motion. Knowing this would guide us to decide the goal to be focused during planning the proper treatment protocol for early stage of adhesive capsulitis.

2. Materials and Methods
In this study 50 participants were evaluated at Department of physiotherapy, Vikhe Patil Hospital, Ahmednagar, Maharashtra, India. Subjects included were of both genders between the age group of 45 – 70 years and medically diagnosed with early freezing phase of unilateral adhesive capsulitis. Subjects with adhesive capsulitis of shoulder joint secondary to trauma causing soft tissue injury, tendinopathies, and fracture around the shoulder, Shoulder arthritis, and Shoulder dysfunction in hemiplegic or any other known causes for shoulder disorders were excluded from the study.

Before implementing study, college ethical committee approval was obtained. Participants were explained about the procedure, importance, benefits of the study. Verbal and written informed consent was signed by all the participants. Demographic information of participants including name, age, gender, occupation, duration of symptoms, chief complaints was documented. Further the patients with shoulder adhesive capsulitis were assessed using routine clinical examination protocol including pain, Passive range

of motion, capsular pattern, and joint play.

In the recent study, Visual analog scale was used for pain assessment whereas universal goniometer for measuring passive range of motion of shoulder joint. Visual analog scale is a scale for measuring pain and other symptoms. It is a 10 cm straight line placed horizontally on a paper. The endpoints of the line are labeled with descriptive or numeric terms to anchor the extremes of the scale and provide a frame of reference for any point in the continuum between them. The scale is anchored by "no pain" (score of 0) and "most severe pain" (score of 10). The patient is asked to mark the line at the point that corresponds to the degree of pain or severity of symptoms that are experienced. The reliability of this test was reported to be 0.94 for literate and 0.71 for illiterate patients [5]. Criterion validity has not been evaluated because of the absence of a gold standard for pain measurement [6]

The shoulder ranges of flexion, extension, abduction, lateral rotation and medial rotation were measured in ideal position with the goniometer in the study. Goniometer is an instrument which measures the available range of motion at the joint. Goniometric measurements are highly reliable provided measurements are conducted by same Therapist. (test-retest reliability: 0.94–0.98 [7, 8, 9]. Three clinical trials of Passive range of motion measurement were taken and mean of all three was calculated and noted.

The results were statistically calculated using SPSS version 16. The correlation between shoulder pain and shoulder joint mobility was shown using Pearson correlation coefficient.

3. Results & Discussion

Different shoulder pathologies are associated with pain and restricted ROM affecting activities of daily living. Shoulder adhesive capsulitis is one among the shoulder pathology that affects activities of daily living of an individual. In the previous studies it has been proven that there is association between shoulder pain and disability. Thus, in early stage moderate level of disability is present which affects functional activities in an individual. According to previous study done by Amy Davidson *et al.* on frozen shoulder pathophysiology it is clear that, in early freezing phase of shoulder adhesive capsulitis there is intense pain which is present even at rest, thus disturbing sleep and affecting end range shoulder Movements. The pain intensity differ according to the phase of adhesive capsulitis [10].

In this study the aim was to find a correlation between shoulder pain and shoulder joint mobility in adhesive capsulitis patients. 50 individuals with early freezing phase of adhesive capsulitis with complain of shoulder pain and reduced joint mobility were assessed.

Present study demonstrated a negative association of shoulder pain with shoulder ROM (Flexion, Extension, Abduction, Medial rotation, Lateral rotation) as expected. This suggests that the pain has strong influence on shoulder ROM in early freezing phase of adhesive capsulitis which is already published earlier in the literature. Our finding are supported by the study done by Nishchal Ratna Shakya *et al.*. (2018) [4] which concluded that pain and level of disability are associated in individuals of early freezing stage of adhesive capsulitis. Pain is causative factor for moderate level of disability in individuals with early freezing phase of adhesive capsulitis [4]. Also a study done by binder *et al.*. (1984) [11] concludes there is restriction in all active and passive shoulder movements, and at least a 50% reduction in external rotation motion in early phase of adhesive capsulitis [11]. Also Trevor A Lentz *et al.* (2009) [12] conducted a study which concluded that pain-related fear is a statistically significant variable which contributes to disability. The pain-related fear and pain intensity both contributes to disability and restricted shoulder movements [12].

From our study we recommend to concentrate on pain reduction during early freezing phase of shoulder adhesive capsulitis. There are many studies which showed the effectiveness of various modalities to reduce pain in early freezing phase of adhesive capsulitis.

Additionally, we have evaluated intra-articular mobility during the study but we did not found any reduction in the joint play of shoulder during early phase. However, we did not calculate the joint play statistically.

But as per the kinematics of shoulder joint, arthrokinematic motion also takes place during osteokinematic movements of joint. This arthrokinematic motion plays important role achieving full range of motion at joint. Normally in shoulder antero-posterior glide, postero-anterior glide and inferior glide occurs during flexion, external rotation extension, medial rotation and abduction respectively. This arthrokinematics may get affected in different shoulder pathologies which affect overall range of motion. In frozen shoulder this arthrokinematic motion gets affected. This is mentioned in previous studies done by on frozen shoulder pathology. In early freezing phase it remains unaffected. But as the disease progress the joint becomes stiff due to adhesion formation in the capsule of joint thus limiting the joint play.

The previously conducted study states that there is loss of active and passive shoulder ROM usually more than 50% loss of external rotation along with extreme pain during all shoulder motion and overall limited glenohumeral translation in individuals of stage 2 adhesive capsulitis [13].

The result of this study revealed that a correlation exists between shoulder pain and shoulder ROM, however intra articular mobility was observed to be normal. Thus as the intensity of pain increases the range of shoulder movements observed to be reduced. Pain is an important factor for completing full range of motion of shoulder in patients with early freezing stage of adhesive capsulitis.

Table 1: Demographic data of participants

Sr no	Demographic data	Mean±SD
1	Age (in years)	48.46±11.62195319
2	Gender (Male/female)	24/26
3	Duration of symptoms (in months)	9.68±15.10566862

Table 2: A correlation between shoulder pain and shoulder Passive range of motion using Pearson Correlation test"

Shoulder Mobility	Movement (Degrees)	Mean±SD	Pain (Mean±SD)	Coefficient of correlation (r value)	P value
ROM	Flexion	138±2.54	7.48±0.95	-0.5272	<0.0001*
	Extension	51.34±0.82		-0.1975	0.1693
	Abduction	123.67±2.87		-0.5591	<0.0001*
	Medial rotation	56.44±1.29		-0.4611	0.0008*

	Lateral rotation	46.59±1.57		-0.63	<0.0001*

*statistically significant

5. Conclusion

From this study it was concluded that a negative correlation exists between the shoulder pain and shoulder mobility (Passive range of motion) in patients with early freezing stage of shoulder adhesive capsulitis.

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