# *Adhesive capsulitis: A new evolving clinical sign; Coracoid pain test – A validation study*

***Dissertation***

*Submitted to The Tamilnadu Dr.MGR Medical University*

*In partial fulfillment of rules*

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**in**

**Physical Medicine and Rehabilitation**

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# CERTIFICATE

The dissertation – *Adhesive capsulitis: A new evolving clinical sign; Coracoid pain test – A validation study* is submitted by

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In partial fulfillment of rules and regulations of the Tamilnadu Dr.MGR Medical University for the MD – Physical Medicine and Rehabilitation conducted in May 2011.

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# CONTENTS

# INTRODUCTION

Adhesive capsulitis, which is also known as Frozen shoulder is a common disease affecting the shoulder joint. Codman has stipulated the diagnostic criteria for adhesive capsulitis and it holds true to this date[1]. These criteria include: pain in the shoulder which comes on slowly and is felt at the insertion of the deltoid, inability to sleep on the affected side, atrophy of the scapular muscles, and local tenderness. To this date there is no specific sign or test which is characteristic of Adhesive capsulitis. Recently in a study, S.Carbone [2]et.al, have identified a new clinical test Coracoid pain test, where in the patients with adhesive capsulitis characteristically demonstrated tenderness on pressure over Coracoid process. Here in this study, an attempt is made to validate this Coracoid pressure test in series of patients seen at Physical Medicine and Rehabilitation department at Kilpauk Medical College Hospital, Chennai – 10. Patients attending the department were evaluated and a set of age matched controls were also simultaneously assessed and results were reported. It was hypothesized that the Coracoid pain test is pathognomonic sign of Adhesive capsulitis and study makes an unbiased attempt to reach an outcome based on the analysis.

# REVIEW OF LITERATURE

## History and Epidemiology

Diagnosis of pain around the shoulder is one of the common problems faced by the Physiatrists in day today practice.

In a study, self reported prevalence of shoulder pain is estimated to be between 16% and 26%; it is the third most common cause of musculoskeletal consultation in primary care, and approximately 1% of adults consult a general practitioner with new shoulder pain annually[3].

Occupations as diverse as construction work and hairdressing are associated with a higher risk of shoulder disorders. Physical factors such as lifting heavy loads, repetitive movements in awkward positions, and vibrations influence the level of symptoms and disability. Recent studies suggest that chronicity and recurrence are common[4].

Causes of painful shoulder are primarily grouped in to 2 categories. One arising from the shoulder and the other is pain referred from elsewhere like neck, Myocardial infarction etc[5]. One primary care study that used standardized clinical tests for shoulder disorders found rotator cuff tendinopathy in 85% of patients, but in 77% of patients a clinical diagnosis of more than one shoulder problem was made—for example, tendinosis and impingement (57%);

tendinosis, impingement, acromioclavicular disease, and adhesive capsulitis (6%)[6].

- Common decade of incidence – 6 decade, with peak age incidence is 56 years
- More common in women than men
- Non dominant shoulder slightly more affected than dominant shoulder
- Incidence of other shoulder involvement is around 6 – 17%
- In a Scandinavian population study the life time risk of Adhesive capsulitis is 2%
- Recurrence is uncommon[7]

**History of nomenclature of Adhesive capsulitis:**

Duplay (1896) was the first investigator to recognize pathologic disorders of extra-articular tissues as possible factors responsible for stiff and painful shoulders. He designated the entity **‘‘scapulohumeral periarthritis**.[8,’’]

The term **“frozen shoulder”** was first introduced by Codman in 1934. He described a painful shoulder condition of insidious onset that was associated with stiffness and difficulty sleeping on the affected side. Codman

also identified the marked reduction in forward elevation and external rotation that are the hallmarks of the disease[9].

In 1945, Naviesar coined the term **"adhesive capsulitis."** Although still in use, this more recent term is unfortunate since, although a frozen shoulder is associated with synovitis and capsule contracture, it is not associated with capsular adhesions.

In order to understand the importance of the clinical test under study, it becomes imperative that the understanding of the anatomy, biomechanics of shoulder joint, pathophysiology, clinical, radiological assessment and differential diagnosis of the Adhesive capsulitis is vital to this study. Hence in subsequent sections issues attempt is made in this direction to understand the fundamentals behind the natural history of Adhesive capsulitis.

**Anatomy of the Shoulder joint:**

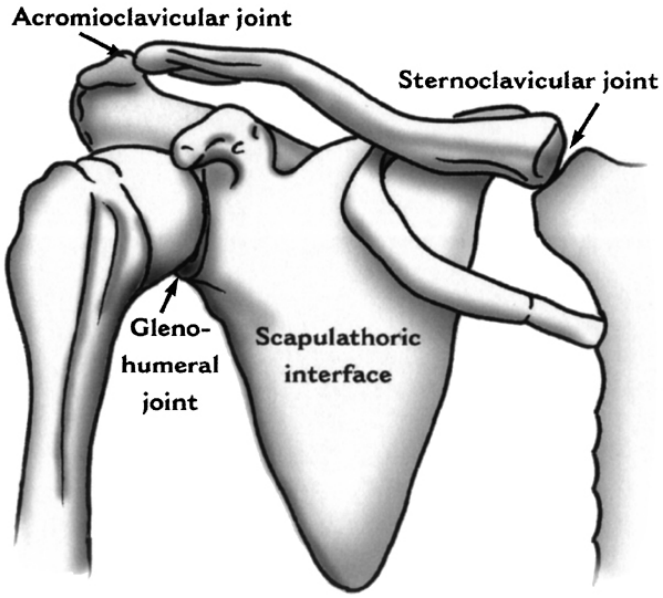
Shoulder girdle[10] is better understood on studying its component structures, namely the

(1) Bony anatomy (humerus, clavicle, scapula),

(2) Bony and muscular articulations (glenohumeral, acromioclavicular, sternoclavicular, and scapulothoracic),

(3) Static stabilizers (labrum, capsule, ligaments), and

(4) muscles or dynamic stabilizers (rotator cuff and scapular stabilizers).




**Humerus**

The humerus is the largest and longest bone of the upper extremity, with its proximal portion consisting of the half spheroid articulating surface or head, greater tuberosity, bicipital groove, lesser tuberosity, and proximal humeral shaft. The head is inclined relative to the shaft at the anatomical neck at an angle of 130° to 150° and is retroverted 26° to 31° from the medial and lateral epicondylar plane.

**The Scapula**

This bone is quite complex and is an attachment site for numerous muscles which support movement and stabilization of the shoulder. It overlies the 2nd – 7th ribs, is tilted forwards by an angle of 30°, and is encased by 17 muscles which provide control and stabilization against the thoracic wall (the

ribcage). This is sometimes referred to as the "**Scapulothoracic Joint**" although it is not technically an actual joint. The **acromion** serves as a lever arm for function of the deltoid and articulates with the distal end of the clavicle, forming the acromioclavicular joint. The acromion forms a portion of the roof of the space for the rotator cuff, and variations in acromial shape can affect contact and wear on the cuff (impingement).

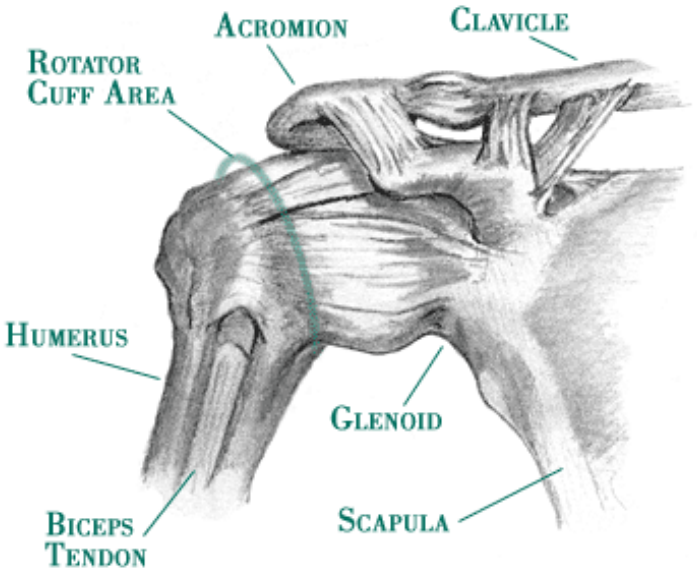
**The Coracoid process** projects anteriorly and laterally from the upper border of the head of the scapula. The superior surface serves as the origin of the 2 coracoclavicular ligaments; conoid and trapezoid ligaments. The coracoids tip serves as the origin of the coracobrachialis muscle and the short head of the biceps brachii, as well as the insertion of the pectoralis minor muscle. The coracohumeral and coracoacromial ligaments originate on the Coracoid as well. The scapular notch lies just medial to the base of the Coracoid and is spanned by the transverse scapular ligament. The suprascapular nerve passes beneath the ligament to innervate the supraspinatus and infraspinatus muscles[11]

**The Clavicle**

The clavicle is an S-shaped bone and is the main connection between the upper arm and the rest of the axial skeleton. The clavicle serves as a site for muscle attachments, a barrier to protect underlying neurovascular structures, and a strut to stabilize the shoulder complex and prevent it from displacing

medially. Additionally, the clavicle prevents inferior migration of the shoulder girdle through the strong coracoclavicular ligaments[12].

**The Glenohumeral Joint**




The Glenohumeral Joint is a ball and socket joint which provides a large proportion of the movement at the shoulder girdle. The head of the humerus articulates with the glenoid fossa of the scapula. The head of the humerus is, however, quite large in comparison to the fossa, resulting in only one third to one half of the head being in contact with the fossa at any one time. The humerus is further supported by the glenoid labrum – a ring of fibrous cartilage which extends the fossa slightly making it wider and deeper. However, despite this lack of articulating surface coverage, the normal shoulder precisely constrains the humeral head to within 1 to 2 mm of the center of the glenoid cavity throughout most of the arc of motion. This precise constraint of the

center of rotation through a large arc of motion is the result of an interplay of static (no active energy required, i.e., capsule, labrum, ligaments) and dynamic (muscle) forces. The stabilizing effect of the articular surfaces and capsulolabral ligamentous complex is magnified by muscle forces, which produces a concavity compression effect directed toward the glenoid center[13].

There is a specific laxity of the capsule on the inferior aspect of the glenohumeral joint which permits hassle free abduction and flexion of the shoulder, which is obliterated in the pathogenesis of the Adhesive capsulitis.

The normal glenohumeral joint is fully sealed by the capsule and normally contains less than 1 ml of joint fluid under slightly negative intra-articular pressure, which provides a suction effect to resist humeral head translation, thereby increasing stability. In addition, adhesion and cohesion forces are created when fluid separates 2 closely opposing surfaces and, thus, the surfaces cannot be pulled apart easily[14].

The **coracohumeral ligament** is a thick band of capsular tissue originating from the base of the lateral coracoids and inserting into the lesser and greater tuberosities. This ligament is taut with the arm in the adducted position and constrains the humeral head on the glenoid[15]. Superior **glenohumeral ligament**, middle glenohumeral ligament and inferior glenohumeral ligament act as the primary stabilizer of the gleno-humeral joint.

**The Acromioclavicular Joint**

The Acromioclavicular Joint (ACJ) is formed by the lateral end of the clavicle articulating with the medial aspect of the anterior acromion.

The ACJ is important in transmitting forces through the upper limb and shoulder to the axial skeleton. The ACJ has minimal mobility due to its supporting ligaments:

- Acromioclavicular Ligament which is composed of strong superior and inferior ligaments, and weak anterior and posterior ligaments restricting anterior-posterior movement of the clavicle on the acromion.

- Coracoclavicular Ligament is composed of the Conoid and Trapezoid ligaments. It forms a strong heavy band to prevent vertical movement.

**The Sternoclavicular Joint**

The Sternoclavicular Joint occurs at the sternal end of the clavicle, the cartilage of the first rib, and the upper and lateral parts of the manubrium sterni. It is the only joint that truly links the upper extremity to the axial skeleton, via the clavicles. The costoclavicular ligament arises from the upper surface of the first rib to attach to the inferior surface of the medial clavicle; anterior fibers resist excessive upward rotation and the posterior fibers resist excessive downward rotation. The Sternoclavicular Joint functions in all movements of

the upper limbs, and is particularly important in throwing and thrusting movements.

Under normal circumstances, the sternoclavicular joint is capable of 30° to 35° of upward elevation, 35° of combined forward and backward movement, and 45° to 50° of rotation around its long axis.

**The Scapulothoracic Joint**

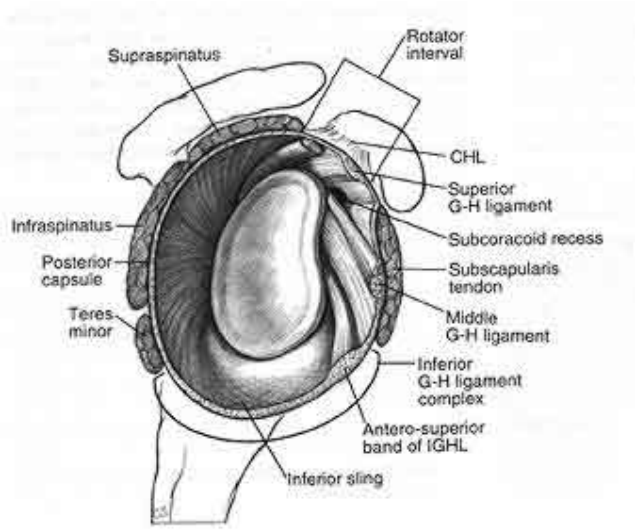
Not a true joint, the scapulothoracic articulation represents a space between the convex surface of the posterior thoracic cage and the concave surface of the anterior scapula. With the scapula serving as the bony foundation of the shoulder girdle, the scapulothoracic articulation allows increased shoulder movement beyond the 120° offered solely by the glenohumeral joint. On average, there are approximately 2° of glenohumeral elevation for every 1° of scapulothoracic elevation, although the actual ratio can vary for any portion of the arc of motion.

This joint relies entirely on the surrounding musculature for its control. The main muscles which control this joint are:

- Serratus Anterior which holds the medial angle of the scapula against the chest wall.
- Trapezius which rotates and elevates the scapula with elevation of the upper arm.

**Dynamic Stabilizers**

**Rotator Cuff Muscles:**




The rotator cuff is a group of muscles consisting of the subscapularis, supraspinatus, infraspinatus, and teres minor, which act as a dynamic steering mechanism for the humeral head. Three dimensional movements or rotations of the humeral head are the result of the dynamic interplay between the muscles comprising the rotator cuff and the static stabilizers. Rotator cuff activation results in humeral head rotation and depression in positions of abduction.

As a group, the rotator cuff muscles are smaller in cross-sectional area and size when compared with the larger, more superficial muscles such as the deltoid, pectoralis major, latissmus dorsi, and trapezius. Also, because they lie much closer to the center of rotation on which they act, their lever arm is shorter, and a smaller generated force results. Given this anatomical location,

the rotator cuff is very well situated to provide stability to a dynamic fulcrum during glenohumeral abduction.

The **supraspinatus** stabilizes the glenohumeral joint and serves, along with the deltoid, to elevate the arm. The **infraspinatus,** along with the **teres minor**, provides the primary external rotation force and also stabilizes the glenohumeral joint against posterior subluxation. The **subscapularis** functions as an internal rotator, especially in maximum internal rotation. The **long head of the biceps** functions intimately with the rotator cuff as a humeral head depressor.

**Biomechanics of the shoulder movement**

As explained earlier, in scapulothoracic movement, on average, there are approximately 2° of glenohumeral elevation for every 1° of scapulothoracic elevation. Shoulder motion is thus the result of the complex interplay of static and dynamic stabilizers. All 4 joints of the shoulder (glenohumeral, acromioclavicular, sternoclavicular, and scapulothoracic) must have free movement as a prerequisite. The bony anatomy provides the structural foundation from which the forces are generated and subsequently acted on. With regard to the glenohumeral joint, the capsuloligamentous complex provides static restraint, while the rotator cuff muscles (along with their respective force-couple antagonists) guide, steer, and maintain the head dynamically in the glenoid fossa. The major shoulder muscles Deltoid, Teres

major, Lattismus dorsi, Pectrolaris major act on the shoulder and move the shoulder as the rotator cuff muscles stabilize the humeral head on the glenoid fossa.

The basic biomechanic principles of the shoulder movements and role played by the muscles are well illustrated. The muscles about the shoulder can be thought of as primary movers i.e., the primary major muscles and primary stabilizers i.e., rotator cuff muscles. This situation is somewhat analogous to that of a large man and small boy teaming up to raise a long, heavy ladder. Typically the stronger one will lift (move) the ladder while the weaker one will hold it from sliding or lifting off the ground (stabilize it)[16].

Thus, a thorough knowledge of the functional anatomy of the shoulder allows the medical provider to take a sound approach in the evaluation and management of any pathology affecting shoulder.

**Pathophysiology of the Adhesive capsulitis:**

The aetiology of frozen shoulder remains unclear. The disease process particularly affects the anterosuperior joint capsule and the coracohumeral ligament[17].

There is always debate whether there is inflammation or not. But the evidence shows a synovial inflammation with subsequent reactive capsular fibrosis. A dense matrix of type I and type III collagen is laid down by

fibroblasts and myofibroblasts in the joint capsule. Subsequently, this tissue contracts. Increased growth factors, cytokines, and expression of matrix metalloproteinases in capsular biopsy specimens obtained from patients with primary and secondary frozen shoulder indicate that these are involved in the inflammatory and fibrotic cascades seen in frozen shoulder. Cytokines and growth factors are involved in the initiation and termination of repair processes in musculoskeletal tissues through regulating fibroblasts, and the remodelling process is controlled by matrix metalloproteinases and their inhibitors.

Thickening of the coracohumeral ligament (CHL) and of the joint capsule in the rotator cuff interval (RCI), as well as the subcoracoid triangle sign, are characteristic magnetic resonance (MR) arthrographic findings in frozen shoulder[18].

Arthroscopy shows a small joint with loss of the axillary fold and tight anterior capsule, mild or moderate synovitis, and no adhesions[20].

***The Rotator Cuff Interval,*** in fact, is the region in the anterosuperior aspect of the glenohumeral joint formed by a complex intersection of the fibres of the coracohumeral ligament, the superior glenohumeral ligament, the glenohumeral joint capsule, and the supraspinatus and subscapularis tendons[19]. To this date no clinical tests were reported as specifically related to adhesive capsulitis. In their study[2], it was analyzed whether pain causing deep palpation on the Coracoid area, which is located just above the anatomical area involved

in the disease (RCI), may be a pathognomonic sign of shoulder adhesive capsulitis. They named this test as **Coracoid pain test.** This is the basis of present study to validate the Coracoid pain test in the sample studied.

Frozen shoulder can be a *primary or idiopathic* problem or it may be associated with another systemic illness. By far the most common association of a secondary frozen shoulder is *diabetes mellitus*[21]. The incidence of frozen shoulder in diabetes patients is reported to be 10%-36%. The incidence in type 1 and type 2 diabetes is similar. Unfortunately, frozen shoulder in diabetes is often more severe and is more resistant to treatment. Studies reported on the natural history of the diabetic painful stiff shoulder and found a restriction in the range of motion in 35 (65%) of 54 shoulders at a mean follow-up of 29 months[22].

Studies have shown an association with Dupuytren's disease in the hand, proposing that the contracting shoulder tissue itself represents a form of fibromatosis[23]. Much more rarely, secondary frozen shoulder may be associated with conditions[2] such as

- Thyroid disease,
- hypoadrenalism,
- parkinsonism,
- cardiac disease

- Hyperlipedemia
- pulmonary disease
- Stroke
- cardiac surgery,
- cardiac catheterisation through the brachial artery,
- neurosurgery, and
- radical neck dissection

**Clinical presentation:**

As mentioned earlier, Codman has stipulated the diagnostic criteria for adhesive capsulitis and it holds true to this date[1]. These criteria include:

- pain in the shoulder which comes on slowly and is felt at the insertion of the deltoid,
- inability to sleep on the affected side,
- atrophy of the scapular muscles, and
- local tenderness.

In true frozen shoulder there is almost complete loss of external rotation. This is the pathognomonic sign of a frozen shoulder[7]. Apart from these

findings there is no specific clinical test except Coracoid pain test which is more specific to adhesive capsulitis.

***The natural history of adhesive capsulitis***

Although the natural history of frozen shoulder is for ultimate resolution, this may not be complete. In a prospective study of 41 patients with 5-10 years follow-up, found that 39% had full recovery, 54% had clinical limitation without functional disability, and 7% had functional limitation[24].

In another study 50% of total 61 patients with frozen shoulder had some degree of pain and stiffness an average of seven years after onset of the disease[25].

***Clinical stages:***

Its clinical course is divided into three stages:

- the painful stage,
- the adhesive stage and
- the recovery stage.

**The painful freezing stage** involves gradually increasing pain and stiffness and lasts between three and eight months. Muscle spasms in the trapezius also commonly occur during this phase. A history of a minor strain or

injury before onset may be noted; however, it is unclear whether the initial strain is an independent phenomenon or an early awareness of the pain associated with the onset of adhesive capsulitis.

Commonly, patients note a decreased ability to reach behind the back when fastening a garment or removing a wallet from a back trouser pocket. The initial discomfort is described by many patients as a generalized shoulder ache with difficulty pinpointing the exact location of the discomfort. The pain may radiate both proximally and distally, is aggravated by movement and alleviated with rest. Sleep may be interrupted if the patient rolls on the involved shoulder.

This condition progresses to one of severe pain accompanied by stiffness and decreased range of motion. The stiffening increases to the point where the natural arm swing that accompanies normal gait is lost. The patient tries to compensate for this loss by using other muscles and increasing scapular rotation to accomplish various activities. This places additional strain on the other muscle groups, leaving them overworked and tender[7].

The physical examination during the painful stage of adhesive capsulitis may reveal muscle spasm and diffuse tenderness about the glenohumeral joint and the deltoid muscle. An area of pinpoint tenderness is seldom found. With disease progression and in long-standing cases, disuse atrophy of the shoulder girdle may result. Passive and active range of motion in all planes of shoulder movement are lost. This global loss of motion is the primary factor

distinguishing adhesive capsulitis from many of the conditions associated with secondary adhesive capsulitis.

***Apley scratch test***: The patient attempts to touch the opposite scapula to test range of motion of the shoulder. It reveals the significant degrees of loss of movements in shoulder.

The second stage, the ***adhesive stage***, involves increasing stiffness with diminishing pain. Pain decreases at night, and discomfort occurs only at the extremes of motion, although movement is dramatically decreased. This stage lasts four to six months.

The final stage, called the **recovery stage**, lasts from one to three months and is characterized by minimal pain but severe restriction of movement. This latter stage is self-limiting, with a gradual and spontaneous increase in range of motion. Complete recovery, however, is infrequent. The external rotation range of motion improves first, followed by abduction and internal rotation. Short recovery periods may have associated bouts of pain before each phase of improvement. Although approximately 7 to 15 percent of patients permanently lose their full range of motion, only a few have a true functional disability[24]

In an another study in the year 2000[26] the adhesive capsulitis is divided in to 4 stages

**Stage 1**

Duration of symptoms 0–3 months

Pain with active and passive ROM

Limitation of forward flexion, abduction, internal rotation, external rotation

***Examination Under Anesthesia***: normal or minimal loss of ROM

***Arthroscopy***: diffuse glenohumeral synovitis

***Pathology***: hypertrophic, hypervascular synovitis; rare inflammatory cell infiltrates, normal capsule.

**Stage 2**

Duration of symptoms 3 to 9 months

Chronic pain with active and passive ROM

Significant limitation of forward flexion, abduction, internal rotation, external rotation

***Examination Under Anesthesia:*** no change in ROM compared with when patient is awake

***Arthroscopy:*** diffuse, pedunculated synovitis

***Pathology***: hypertrophic, hypervascular synovitis with perivascular and subsynovial scar, fibroplasias, and scar formation in the underlying capsule

**Stage 3**

Duration of symptoms 9 to 15 months

Minimal pain except at end ROM

Significant limitation of ROM with rigid “end feel”

***Examination Under Anesthesia*** : no change in ROM compared with when patient is awake

***Arthroscopy***: no hypervascularity seen; remnants of fibrotic synovium. Diminished capsular volume

***Pathology***: “burned out” synovitis without significant hypertrophy or hypervascularity.

Dense scar formation of the capsule

**Stage 4**

Duration of symptoms: 15 to 24 months

Minimal pain

Progressive improvement in ROM.

***Radiology:***

When plain radiographs of the frozen shoulder are taken they may well be reported as normal, although they may show periarticular osteopenia as a result of disuse[27].

***MRI correlation of the clinical staging[28]:***

MRI of the shoulder is an effective and noninvasive means of diagnosing suspecting cases and also provides information that may assist the clinician in differentiating between the early and late stages.

*Stage 1:*

There is thickening of then axillary pouch, which is only mildly hyperintense. There is moderate scarring of the rotator interval.

*Stage 2*:

There is moderately thickened, hyperintense capsule at the level of the axillary pouch. There is mild hyperintensity in the rotator interval.

*Stage 3*:

There is mild thickening of the capsule, which is hypointense. There is mild scarring in the rotator interval.

*Stage 4:*

The capsule is mildly thickened, redundant, and hypointense. There is mild scarring in the rotator interval.

Capsule and synovial thickness, as measured in the axillary pouch, demonstrates the greatest correlation with clinical stage of adhesive capsulitis. Earlier, more hypervascular stages exhibit greater combined synovial and capsular thickening, while later more fibrotic stages demonstrate only capsular thickening. Hyperintensity of capsular signal was most closely associated with stage 2 disease. *Rotator interval scarring is a non-specific signs* of Adhesive Capsulitis and was not found to correlate with clinical stage.

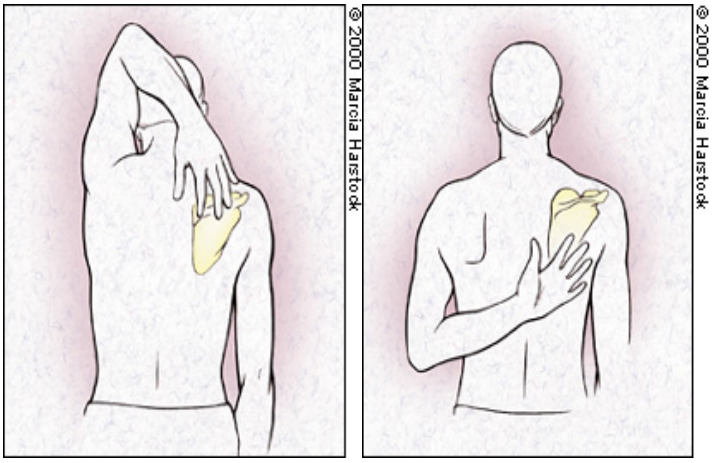
**Differential diagnosis:**

Shoulder pain is a frequent clinical problem facing Physiatrists. It requires a pragmatic approach to the initial history, with particular attention to differentiating extrinsic and intrinsic etiologies. Specific disorders[29] covered include, in addition to the adhesive capsulitis

- supraspinatus tendonitis, subdeltoid bursitis, biceps tendonitis, and
- acromioclavicular (AC) joint arthritis
- Lastly, not the least the radiating pain from neck[30].

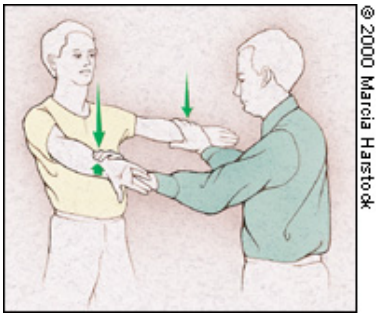
| Tests Used in Shoulder Evaluation and Significance of Positive Findings[32] | | |
|---|---|---|
| **Test** | **Maneuver** | **Diagnosis suggested by positive result** |
| Apley scratch test | Patient touches superior and inferior aspects of opposite scapula | Loss of range of motion: rotator cuff problem |
| Neer's sign | Arm in full flexion | Subacromial impingement |
| Hawkins' test | Forward flexion of the shoulder to 90 degrees and internal rotation | Supraspinatus tendon impingement |
| Drop-arm test | Arm lowered slowly to waist | Rotator cuff tear |
| Cross-arm test | Forward elevation to 90 degrees and active adduction | Acromioclavicular joint arthritis |
| Spurling's test | Spine extended with head rotated to affected shoulder while axially loaded | Cervical nerve root disorder |
| Apprehension test | Anterior pressure on the humerus with external rotation | Anterior glenohumeral instability |
| Relocation test | Posterior force on humerus while externally rotating the arm | Anterior glenohumeral instability |
| Sulcus sign | Pulling downward on elbow or wrist | Inferior glenohumeral instability |
| Yergason test | Elbow flexed to 90 degrees with forearm pronated | Biceps tendon instability or tendonitis |
| Speed's maneuver | Elbow flexed 20 to 30 degrees and forearm supinated | Biceps tendon instability or tendonitis |
| "Clunk" sign | Rotation of loaded shoulder from extension to forward flexion | Labral disorder |

***Apley's scratch test: -*** *to test the loss of range of motion*



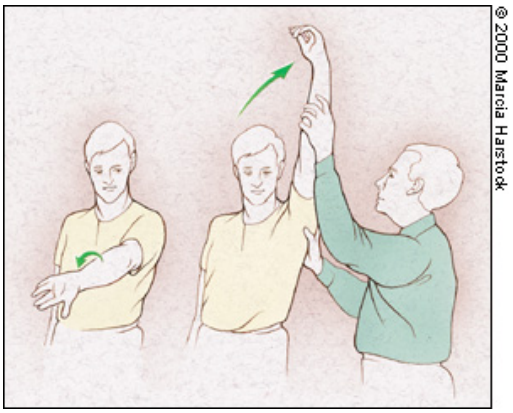

**Apley scratch test:** The patient attempts to touch the opposite scapula to test range of motion of the shoulder. *(Left)* Testing abduction and external rotation. *(Right)* Testing adduction and internal rotation.

***Hawkin's test - Empty can test:-*** *to assess the supraspinatus tendonitis*



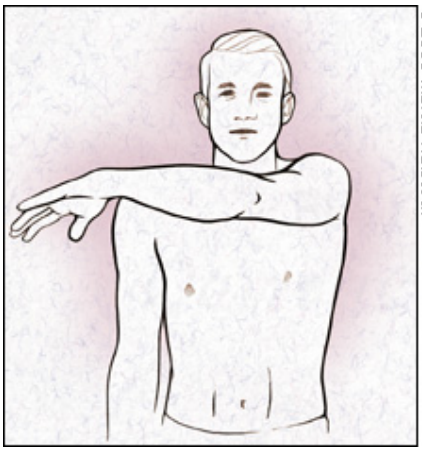

Supraspinatus examination: **("empty can" test)**. The patient attempts to elevate the arms against resistance while the elbows are extended, the arms are abducted and the thumbs are pointing downward

***Neer's test for impingement under coracoacromial arch***



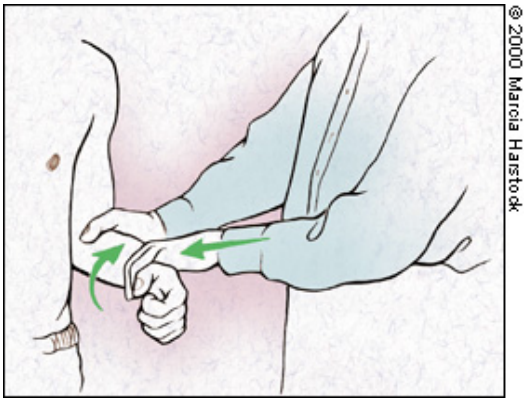

**Neer's test for impingement** of the rotator cuff tendons under the coracoacromial arch. The arm is fully pronated and placed in forced flexion.

***Cross arm test for acromioclavicular joint disorder:***

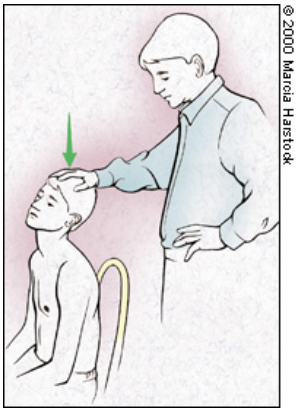



**Cross-arm test** for acromioclavicular joint disorder. The patient elevates the affected arm to 90 degrees, then actively adducts it

***Yergason's test for bicipital tendonitis:***




**Yergason test** for biceps tendon instability or tendonitis. The patient's elbow is flexed to 90 degrees, and the examiner resists the patient's active attempts to supinate the arm and flex the elbow




**Spurling's test** for cervical root disorder. The neck is extended and rotated toward the affected shoulder while an axial load is placed on the spine.

***Supraspinatus tendonitis:***

It is also known as Rotator cuff tendinopathy; the most common cause of shoulder pain. An occupational history may reveal heavy lifting or repetitive movements, especially above shoulder level. Although related to activity, it often occurs in the non-dominant arm and in non-manual workers. Wasting may be present on examination; active and resisted movements are painful and may be partially restricted, whereas passive movements are full, albeit painful. A key finding, particularly with rotator cuff problems, is pain accompanied by weakness.

Although **a painful arc is neither specific nor sensitive as a clinical sign,** its presence reinforces the diagnosis of a rotator cuff disorder.

The supraspinatus can be tested by having the patient abduct the shoulders to 90 degrees in forward flexion with the thumbs pointing downward. The patient then attempts to elevate the arms against examiner resistance. This is often referred to as the **"empty can" test.**

Partial tears may be difficult to differentiate from rotator cuff tendinopathy on examination; weakness in resisted movement may occur in either condition. The **“drop arm test”** may be used to detect a large or complete tear[31]

***Acromioclavicular Arthritis:***

AC arthritis is the result of repeated movements that wear away the cartilage surface found at the acromioclavicular joint. Because the shoulder is used so commonly, it is not surprising that after years of use the joint surface may wear thin. Injury, such as shoulder separation, is thought to contribute to the development of AC arthritis

Clinically the patient presents with pain on the shoulder and there will be localized tenderness at AC joint, along with pain on extremes of abduction. The clinical test is ***cross adduction arm test***[32] which increase the pain at the AC joint.

***Glenohumeral arthritis:***

The glenohumeral joint normally functions through a wide range of motions in a smooth, congruent fashion. When the articular surfaces of the humeral head or the glenoid are damaged, the smooth, fluid motion is compromised, and arthritis commonly is the result.

Glenohumeral arthritis may result from degeneration, trauma (including iatrogenic), inflammation, infection, or neuropathy. Arthritis that occurs post trauma is also referred to as secondary degenerative arthritis. Inflammatory arthritis makes up the second largest category of glenohumeral arthritis. The major inflammatory arthritis is Rheumatoid arthritis. Other inflammatory

diseases that may affect the shoulder include systemic lupus erythematosus (SLE), gout, pseudo gout, ankylosing spondylitis, and psoriatic arthritis.

A thorough examination begins with inspection of the entire upper torso for signs of muscle wasting and asymmetry. Palpation of the entire shoulder region is invaluable in arriving at the proper diagnosis. Look for areas of tenderness, defects in muscles or tendons, and masses. Strength testing consists of analyzing the power of the rotator cuff, as well as the deltoid, biceps, and scapulothoracic musculature. However, passive motion restriction often limits strength testing to rotation and abduction strength with the arm at the side.

Standard radiographic series for evaluation of the glenohumeral joint include an anteroposterior (AP) film in the plane of the scapula and a good-quality axillary view. These films provide information on the status of the joint space, the position of the humeral head in relation to the glenoid, the presence of bony defects or deformity, the presence of osteophytes, and the quality of the bone. In osteoarthritis, radiographs demonstrate joint-space narrowing and osteophyte and cyst formation with subchondral sclerosis.

***Radiating pain from the neck:***

Typically there is pain and tenderness of the lower neck and suprascapular area, referred to the shoulder and upper limb area; shoulder movement may be restricted. Movement of the cervical spine and shoulder may

reproduce more generalised upper back, neck, and shoulder pain. Upper limb paraesthesia may occur.

On clinical evaluation spurling test will be positive[32] wherein pain elicited on extending and rotating the neck along with axial compression. This produces the foraminal stenosis and recreates the pain which will radiate down the upper limb.

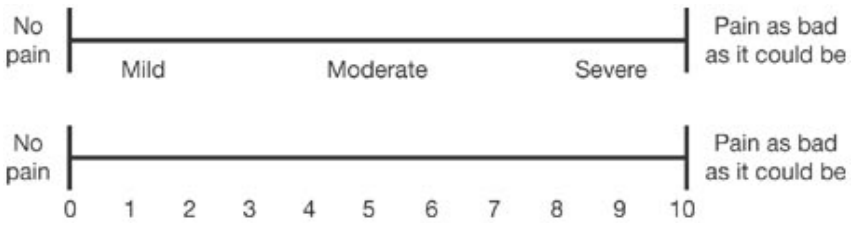
There may be presence of positive “hand on head test” where the pain of root irritation diminishes once the hand is rested on the head relieving the tension. There may be sensory, motor and reflex changes depending upon the root involvement.

**Pain assessment scales:**

Various instruments have been developed to evaluate the two key dimensions of the pain experience—pain intensity (how much a person hurts) and pain affect (how much a person suffers)[40]. These dimensions are conceptually and statistically different but are not wholly independent. Three methods have traditionally been used to measure pain intensity: visual analogue scales, verbal rating scales, and numerical rating scales. VASs and VRSs are also commonly used to assess pain affect[41].

***VAS – Visual Analog Scale:***

The Visual Analog Scale is a 10 point pain assessment score with 0 as no pain and 10 as the maximum score




***Verbal rating scale:***

Verbal rating scales (VRSs) consist of a list of adjectives that describe different levels of pain intensity. A VRS for pain includes adjectives that reflect the extremes (e.g. 'no pain' to 'pain as bad as it could be'), and sufficient adjectives to capture the gradations in between. VRSs are most frequently five-point or six-point scales. The patient is asked to select in a questionnaire or state verbally the adjective that best describes his or her level of pain intensity[42].

**a. SF-36 Bodily Pain subscale[42]**

How much physical pain have the patient had during the past 4 weeks?

- None
- Very mild
- Mild

- Moderate
- Severe
- Very severe

**b. McGill Pain Questionnaire[42]**

How strong is the pain? People agree that the following five words represent pain of increasing intensity. They are:

- Mild
- Discomforting
- Distressing
- Horrible
- Excruciating

**Numerical pain scale:**

The numeric rating scale (NRS) involves asking patients to rate their pain intensity by selecting a number on a scale from 0–10 (11-point scale), 0–20 (21-point scale), or 0–100 (101-point scale) by filling in a questionnaire or stating verbally a numerical level[43].

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|

**Management of Adhesive capsulitis:**

**Treatment in the painful freezing phase**

During the initial painful freezing stages, treatment is directed at pain relief. The patient is encouraged to use pain as a guide to limit activity, with all pain free activities allowed and all painful activities avoided. It is traditional to give patients non-steroidal anti-inflammatory drugs (NSAIDs) if they can tolerate these. Where necessary these should be supplemented with other analgesics.

Physiotherapy is the main stay of the management of the Adhesive capsulitis. In a prospective study[33] of 77 patients that compared exercise within the limits of pain with intensive physiotherapy in patients with frozen shoulder. They found better results with exercise performed within the limits of pain (64% reached near normal, painless shoulder movements at 12 months and 89% at 24 months) than with intensive physiotherapy (63% achieved a similar result at 24 months).

In a meta-analysis study on the use of intra-articular steroids it was reported that the success of the treatment depends on the duration of symptoms— patients who receive the injection earlier in the course of the disease recover more quickly. Early treatment with a steroid injection into the intra-articular glenohumeral joint may reduce the synovitis, thus shortening the natural history of the disease. It was concluded that when used alone,

supervised physiotherapy is of limited benefit, but that a single steroid injection in combination with physiotherapy is effective in reducing both pain and disability associated with frozen shoulder[34].

Suprascapular nerve blocks[35] may be beneficial in terms of pain relief (but not movement), and repeated joint distension may improve movement[36].

**Treatment during the adhesive phase**

Intra-articular steroid injections are not indicated in the adhesive phase as the inflammatory stage of the disease has passed. More aggressive stretching exercises will be tolerated and should be the focus of treatment, with the aim of regaining the range of motion. Low load, prolonged stretches produce plastic elongation of tissues as opposed to the high tensile resistance seen with high load, brief stretches[37].

**Manipulation under anaesthesia**

For patients who are unable to tolerate the pain and disability associated with the condition, manipulation under anaesthesia is the most reliable way to improve the range of movement in a frozen shoulder. It is indicated if the functional disability persists in spite of adequate non-operative treatment for six months[38].

**Surgical release**

More recently, arthroscopic release of the capsule has been advocated to allow a more controlled release of the contracted capsule than manipulation under anaesthesia. This is required if manipulation fails to release the capsule, which is a common problem in frozen shoulder in diabetes. Arthroscopic release[39] also avoids reported complications associated with manipulation, such as fracture of the humerus and iatrogenic, intra-articular shoulder lesions. Arthroscopic release and synovectomy in the painful freezing phase of the disease may be effective in controlling the progression of the disease, if synovitis is an essential factor in the development of frozen shoulder.

# OBJECTIVES

The primary objective of the study is to consider whether the Coracoid pressure test, a test proposed by the S.Carbone et al, in their study as a pathognomic clinical test for adhesive capsulitis is reproducible in our clinical set up. Here in addition to the conditions like supraspinatus tendinitis, Acromio clavicular dysfunction, Gleno humeral arthritis, already considered in the primary study, the response to Coracoid pressure test to cervical brachialgia with radiating pain down the arm is also considered, which was not considered in the original article. Age and sex matched controls are also included in the study and the secondary objective are to study the factors like Diabetes, occupation and specific overhead activities, religion and injury to the shoulder.

# MATERIAL AND METHODS

## POPULATION:

Government Kilpauk Medical College is one the three government medical colleges and one of major tertiary care centre in Chennai. Predominantly the patients come from within the state and particularly from Chennai.

About 49 consecutive patients with pain around the shoulder referred to out patient department were included in the study. About 49 persons; age and sex matched controls were also included in the study subsequently.

## SETTING:

Tertiary care centre, Physical Medicine and Rehabilitation department of Government Kilpauk Medical College, Chennai – 10

## CRITERIA FOR STUDY

Any patient who was assessed for complaints of pain around the neck and shoulder with a diagnosis of Adhesive capsulitis or supraspinatus tendinitis or Acromio clavicular dysfunction, or glenohumeral arthritis or finally Cervical brachialgia is included in the study.

Co existing systemic illness like Diabetes included

**EXCLUSION CRITERIA.**

1. Any patient with either UMN or LMN type of weakness in the shoulder
2. Any surgical procedures on shoulder
3. Patients with ulcerations on anterior shoulder
4. Extremely fatty individuals with difficulty in localizing the coracoids
5. Unable to understand VAS – Visual Analog Scale
6. Pain in the shoulder due to fractures of scapula or coracoids

Patients satisfying these criteria were included in the study and all patients were assessed according the Performa

**SAMPLE SIZE:**

About 49 patients conformed to the above criteria were taken up for the study. About 49 cases of age and sex matched controls were also recorded for the study.

**OUTCOME MEASUREMENTS:**

Each patient was assessed according to the Performa covering the various aspects like age, sex, occupation, history of Injury and clinical diagnosis.

The objective of the study is to identify whether the pressure over the Coracoid process elicits tenderness significantly or not. In addition to Coracoid process, acromioclavicular joint and anterolateral subacromial area about an inch below the lateral border of the acromion were also chosen as area to look for tenderness. **Visual analog scale** is utilized to analyze the pain. A value of above 3 is taken as significant.

**PROCEDURE:**

Patient will be in a sitting position; The examiner, while standing behind the patient elicits a digital pressure on the coracoids process anteriorly with his fingers, below the clavicle and medial to head of humerus. The other areas where digital pressure will be done are AC Joint and anterolateral subacromial area. Patients and controls will be instructed to record the severity of the pain on a Visual analog scale (VAS) of 0 (no pain) to 10 points (most severe pain). The test will be considered positive when the score is 3 points or above compared with other two areas. The examination will be consistently performed by the same examiner.

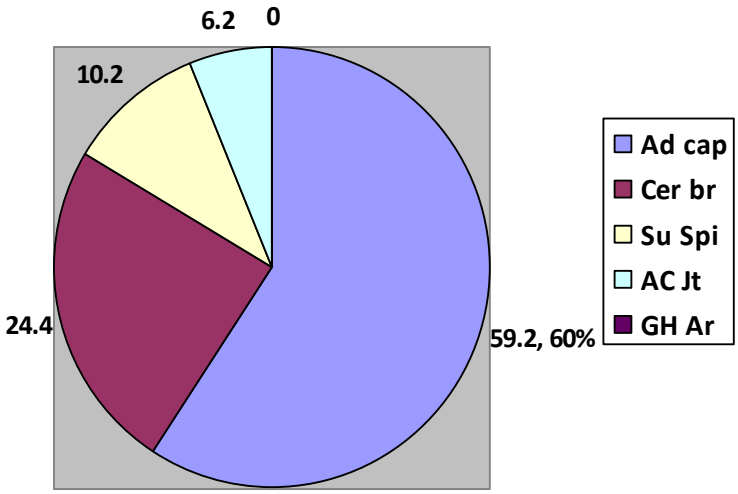
Patient will be sensitized about the VAS scale and a trial in Lower limb on Medial joint line of knee will be done before starting on upper limb

# OBSERVATIONS AND RESULTS

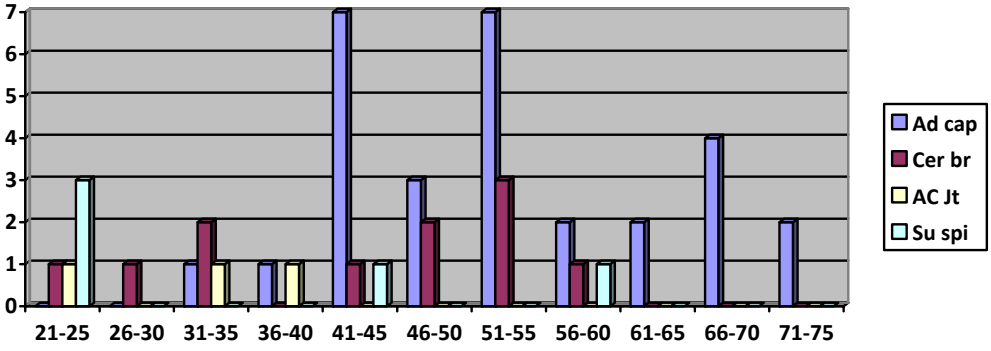
The number of patients taken up consecutively for the study is 49 and controls 49.

**1. Case distribution:**

Amongst the total number of 49 cases

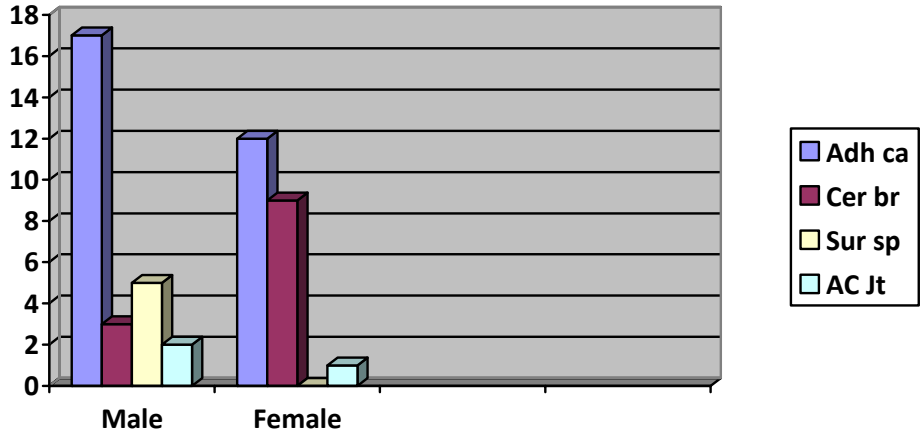



2. **Age distribution:**



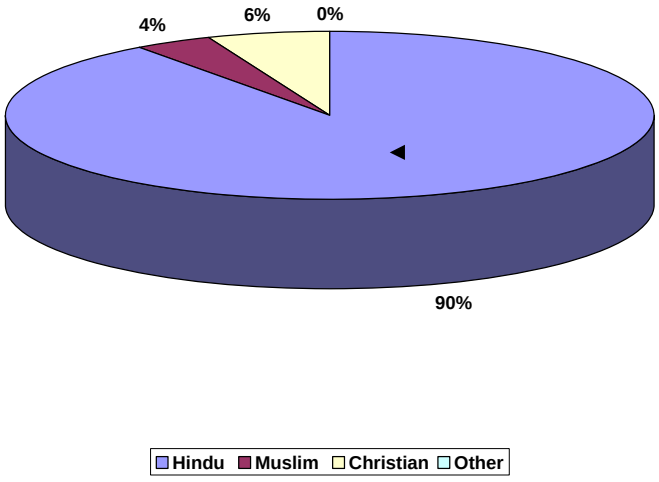

The maximum number of cases for adhesive capsulitis falls within 41-55 age group – 17 cases out of 29 cases.

3. **Sex distribution:**



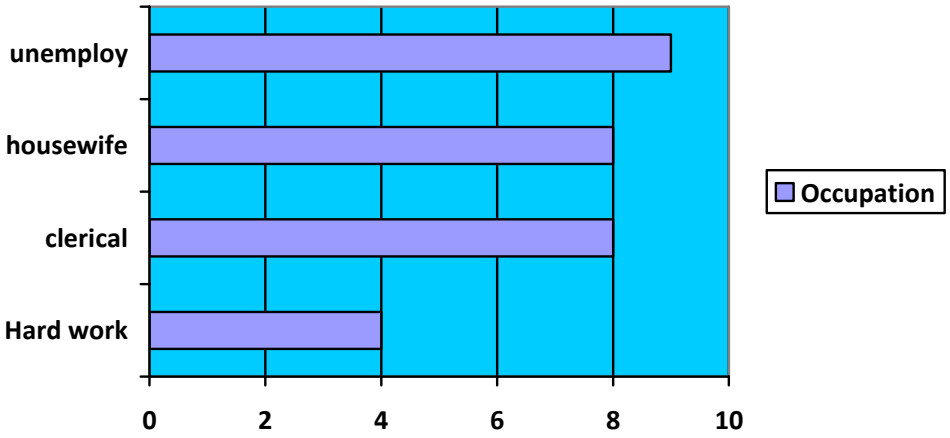

In the present study out of 29 cases of adhesive capsulitis the male: female ratio is 17:12

4. **Religion distribution:** All 49 cases



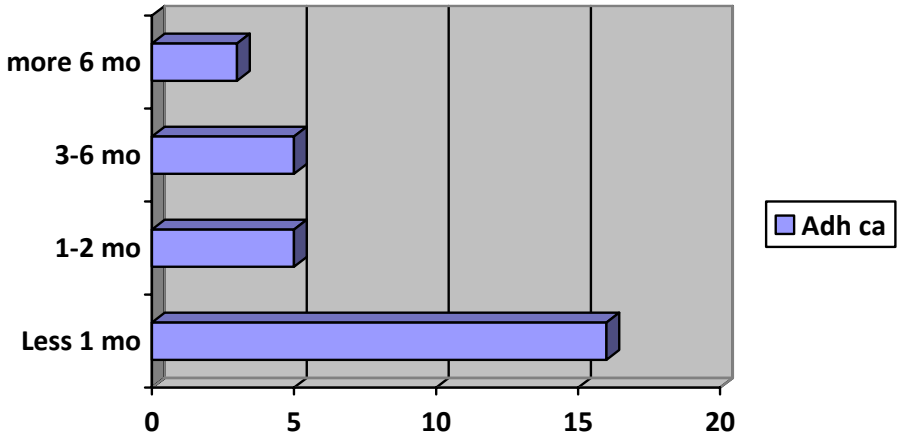

The majority of the patients among the Cases were Hindus.

5. **Vocation distribution** of Patients with adhesive capsulitis – 29 cases



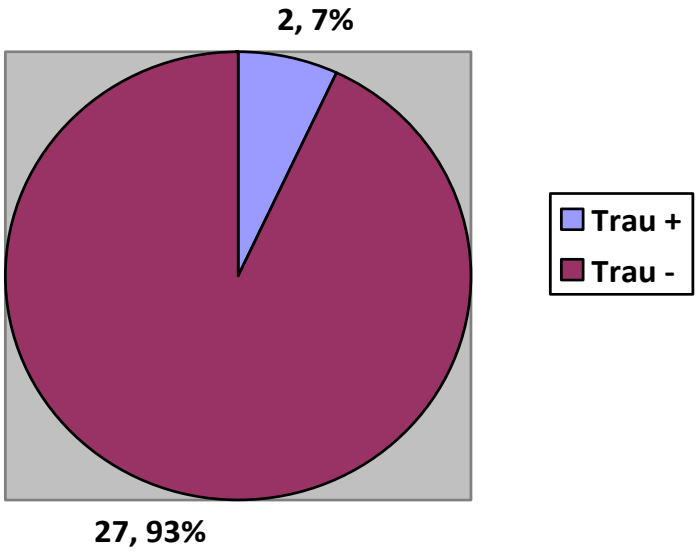

There is an equal distribution of occupation amongst the adhesive capsulitis

6. **Duration of illness** of patients with adhesive capsulitis – 29 cases



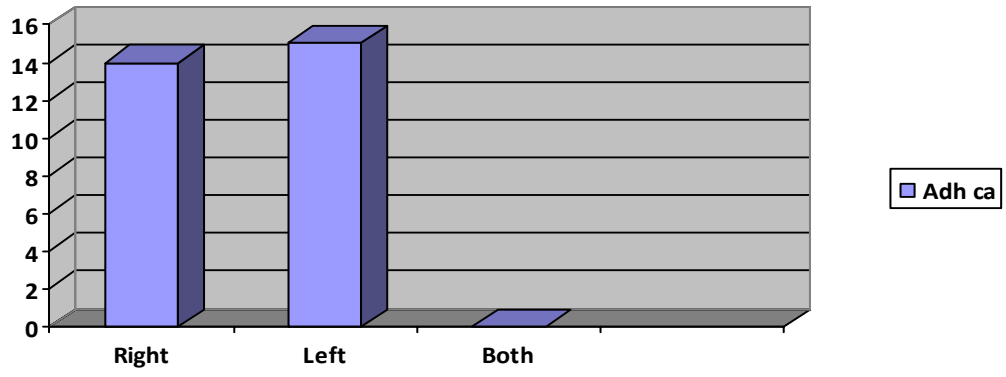

The majority of patients presented within one month of illness

7. **Significant trauma to the shoulder** in adhesive capsulitis (29 cases)



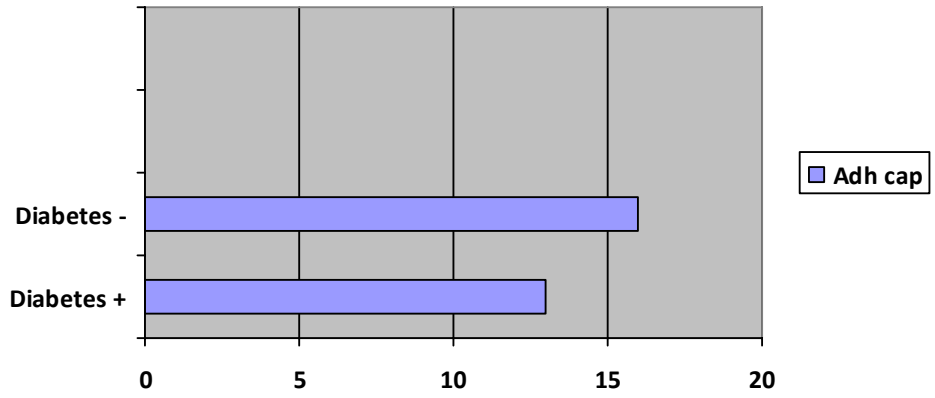

93% cases (27) did not provided history of the significant trauma to the shoulder.

8. **Side of the lesion** in adhesive capsulitis – 29 cases




There is equal involvement of both upper limbs

9. **History of Diabetes** in Adhesive capsulitis – 29 cases




There incidence of the adhesive capsulitis is more in the non diabetic group 16 cases (total 29)

**Analysis of results**

1. **Visual analog score – at Coracoid process – particularly those with above 3**

**Crosstab**

| | | | Diagnosis | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Adhesive capsulitis | Cervical Brachialgia | Supraspinatus tendinitis | AC Joint disruption | Normal | Total |
| VAS Coracoic above 3 | Yes | Count | 23 | 11 | 1 | 2 | 14 | 51 |
| | | % of Tota | 23.5% | 11.2% | 1.0% | 2.0% | 14.3% | 52.0% |
| | No | Count | 6 | 1 | 4 | 1 | 35 | 47 |
| | | % of Tota | 6.1% | 1.0% | 4.1% | 1.0% | 35.7% | 48.0% |
| Total | | Count | 29 | 12 | 5 | 3 | 49 | 98 |
| | | % of Tota | 29.6% | 12.2% | 5.1% | 3.1% | 50.0% | 100.0% |

**Chi-Square Test of significance**

| Test | Value | Asymp.sig | Level | Significance |
|---|---|---|---|---|
| Pearson Chi-Square | 29.328 | 0.000 | p<0.000 | 99.9% |

From the above results the tenderness elicited at Coracoid process is highly significant with the p value is less than 0

2. **Visual analog score – at Acromioclavicular joint – particularly those with above 3**

**Crosstab**

| | | | Diagnosis | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Adhesive capsulitis | Cervical Brachialgia | Supraspinatus tendinitis | AC Joint disruption | Normal | Total |
| VAS AC JT above 3 | Yes | Count | 12 | 5 | 0 | 2 | 0 | 19 |
| | | % of Total | 12.2% | 5.1% | .0% | 2.0% | .0% | 19.4% |
| | No | Count | 17 | 7 | 5 | 1 | 49 | 79 |
| | | % of Total | 17.3% | 7.1% | 5.1% | 1.0% | 50.0% | 80.6% |
| Total | | Count | 29 | 12 | 5 | 3 | 49 | 98 |
| | | % of Total | 29.6% | 12.2% | 5.1% | 3.1% | 50.0% | 100.0% |

**Chi-Square Test of significance**

| Test | Value | Asymp.sig | Level | Significance |
|---|---|---|---|---|
| Pearson Chi-Square | 30.063 | 0.000 | p<0.000 | 99.9% |

From the above results the tenderness elicited at Acromioclavicular joint is highly significant with the p value is less than 0

**3. Visual analog score – at Sub-acromial area particularly those with above 3**

**Crosstab**

| | | | Diagnosis | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Adhesive capsulitis | Cervical Brachialgia | Supraspinatus tendinitis | AC Joint disruption | Normal | Total |
| VAS Above 3 of Sub acromial area | Yes | Count | 5 | 3 | 0 | 1 | 2 | 11 |
| | | % of Total | 5.1% | 3.1% | .0% | 1.0% | 2.0% | 11.2% |
| | No | Count | 24 | 9 | 5 | 2 | 47 | 87 |
| | | % of Total | 24.5% | 9.2% | 5.1% | 2.0% | 48.0% | 88.8% |
| Total | | Count | 29 | 12 | 5 | 3 | 49 | 98 |
| | | % of Total | 29.6% | 12.2% | 5.1% | 3.1% | 50.0% | 100.0% |

**Chi-Square Test of significance**

| Test | Value | Asymp.sig | Level | Significance |
|---|---|---|---|---|
| Pearson Chi-Square | 7.952 | 0.093 | p>0.05 | Not Significant |

From the above results the tenderness elicited at subacromial area is not significant with the p value is more than 0.05 (0.093)

The findings suggest that the VAS score at Coracoid process and Acromioclavicular joint level are significant compared to the VAS at subacromial area.

## 4. Adhesive capsulitis – VAS Score values and its significance

**VAS Coracoid above 3**

| | Observed N | Expected N | Residual |
|---|---|---|---|
| Yes | 23 | 14.5 | 8.5 |
| No | 6 | 14.5 | -8.5 |
| Total | 29 | | |

**VAS AC JT above 3**

| | Observed N | Expected N | Residual |
|---|---|---|---|
| Yes | 12 | 14.5 | -2.5 |
| No | 17 | 14.5 | 2.5 |
| Total | 29 | | |

**VAS Above 3 of Sub acromial area**

| | Observed N | Expected N | Residual |
|---|---|---|---|
| Yes | 5 | 14.5 | -9.5 |
| No | 24 | 14.5 | 9.5 |
| Total | 29 | | |

## Chi-Square Test of significance

| Pearson Chi-Square test | Value | Asymp.sig | Level | significance |
|---|---|---|---|---|
| VAS coracoids | 9.966 | 0.002 | $p<0.01$ | 99% |
| VAS AC Joint | 0.862 | 0.353 | $p>0.05$ | Not significant |
| VAS Sub acromial area | 12.448 | 0.000 | $p<0.001$ | 99.9% |

The findings suggest that the VAS score of above 3 is highly significant (99%) in Coracoid process tenderness at p <0.01 (value while it is highly significant (99.9) if there is negative finding at the subacromial area at p<0.001, it is insignificant at AC joint area at p<005 as the value is 0.353.

## 5. Cervical brachialgia – VAS Score values and its significance

Chi square test frequencies

**VAS Coracoid above 3**

| | Observed N | Expected N | Residual |
|---|---|---|---|
| Yes | 11 | 6.0 | 5.0 |
| No | 1 | 6.0 | -5.0 |
| Total | 12 | | |

**VAS AC JT above 3**

| | Observed N | Expected N | Residual |
|---|---|---|---|
| Yes | 5 | 6.0 | -1.0 |
| No | 7 | 6.0 | 1.0 |
| Total | 12 | | |

**VAS Above 3 of Sub acromial area**

| | Observed N | Expected N | Residual |
|---|---|---|---|
| Yes | 3 | 6.0 | -3.0 |
| No | 9 | 6.0 | 3.0 |
| Total | 12 | | |

**Chi-Square Test of significance**

| **Pearson Chi-Square test** | **Value** | **Asymp.sig** | **Level** | **significance** |
|---|---|---|---|---|
| VAS coracoids | 8.333 | 0.004 | p<0.01 | 99% |
| VAS AC Joint | 0.333 | 0.564 | p>0.05 | Not significant |
| VAS Sub acromial area | 3.000 | 0.083 | p>0.05 | Not significant |

The findings suggest that the VAS score of above 3 is highly significant in Coracoid process tenderness while it is insignificant finding at AC Joint and Subacromial area.

**6. Supraspinatus tendinitis – VAS Score values and its significance**

Chi square test frequencies

**VAS Coracoid above 3**

| | Observed N | Expected N | Residual |
|---|---|---|---|
| Yes | 1 | 2.5 | -1.5 |
| No | 4 | 2.5 | 1.5 |
| Total | 5 | | |

**VAS AC JT above 3**

| | Observed N | Expected N | Residual |
|---|---|---|---|
| No | 5 | 5.0 | .0 |
| Total | 5[a] | | |

a. This variable is constant. Chi-Square Test cannot be performed.

**VAS Above 3 of Sub acromial area**

| | Observed N | Expected N | Residual |
|---|---|---|---|
| No | 5 | 5.0 | .0 |
| Total | 5[a] | | |

a. This variable is constant. Chi-Square Test cannot be performed.

**Chi-Square Test of significance**

| Pearson Chi-Square test | Value | Asymp.sig | Level | significance |
|---|---|---|---|---|
| VAS coracoids | 1.800 | 0.180 | p>0.05 | Not significant |

The findings suggest that the VAS score of above 3 is insignificant in Coracoid process and data not sufficient to analyze at AC Joint and Subacromial area

## 7. AC Joint disruption: VAS Score values and its significance

**VAS Coracoid above 3**

| | Observed N | Expected N | Residual |
|---|---|---|---|
| Yes | 2 | 1.5 | .5 |
| No | 1 | 1.5 | -.5 |
| Total | 3 | | |

**VAS AC JT above 3**

| | Observed N | Expected N | Residual |
|---|---|---|---|
| Yes | 2 | 1.5 | .5 |
| No | 1 | 1.5 | -.5 |
| Total | 3 | | |

**VAS Above 3 of Sub acromial area**

| | Observed N | Expected N | Residual |
|---|---|---|---|
| Yes | 1 | 1.5 | -.5 |
| No | 2 | 1.5 | .5 |
| Total | 3 | | |

**Chi-Square Test of significance**

| Pearson Chi-Square test | Value | Asymp.sig | Level | significance |
|---|---|---|---|---|
| VAS coracoids | 0.333 | 0.564 | p>0.05 | Not significant |
| VAS AC Joint | 0.333 | 0.564 | p>0.05 | Not significant |
| VAS Subacromial area | 0.333 | 0.564 | p>0.05 | Not significant |

The number of subjects is very low and the p value is also insignificant to all the 3 tender spots observed.

8. **In control Study - Gender presentation - VAS Coracoid above 3**

**Gender - VAS AC JT above 3**

**Crosstab**

| | | | VAS AC JT above 3 | |
|---|---|---|---|---|
| | | | No | Total |
| Sex | Male | Count | 27 | 27 |
| | | % of Total | 55.1% | 55.1% |
| | Female | Count | 22 | 22 |
| | | % of Total | 44.9% | 44.9% |
| Total | | Count | 49 | 49 |
| | | % of Total | 100.0% | 100.0% |

**VAS Above 3 of Sub acromial area**

**Crosstab**

| | | | VAS Above 3 of Sub acromial area | | |
|---|---|---|---|---|---|
| | | | Yes | No | Total |
| Sex | Male | Count | 0 | 27 | 27 |
| | | % of Total | .0% | 55.1% | 55.1% |
| | Female | Count | 2 | 20 | 22 |
| | | % of Total | 4.1% | 40.8% | 44.9% |
| Total | | Count | 2 | 47 | 49 |
| | | % of Total | 4.1% | 95.9% | 100.0% |

**Chi-Square Test of significance**

| **Pearson Chi-Square test** | **Value** | **Asymp.sig** | **Level** | **significance** |
|---|---|---|---|---|
| VAS coracoids | 5.576 | 0.018 | p<0.01 | 99% |
| VAS AC Joint | No statistics computed as VAS is constant. | | | |
| VAS Sub acromial area | 2.559 | 0.110 | p>0.05 | Not significant |

In controls study itself there was a significant finding with regards to the gender issue where normal female persons who don't have any shoulder pathology show significant tenderness at the Coracoid process.

# DISCUSSION

This is a study of consecutive 49 cases of painful shoulder and neck pain and are diagnosed and grouped as Adhesive capsulitis, cervical brachialgia, Acromioclavicular dysfunction and Supraspinatus tendinitis and Glenohumeral arthritis. This study also included 49 age and sex matched controls. Tenderness is looked for, at the Coracoid process, acromioclavicular joint, and sub – acromial area on outer arm both in cases and controls, findings are quantified by using the Visual analog score and recorded. Statistical analysis was made to understand whether there is a significant finding using standard analytical tools.

The findings suggest that the VAS score of above 3 is highly significant (99%) in Coracoid process tenderness at $p < 0.01$ (value while it is highly significant (99.9%) in cases with Adhesive capsulitis. Out of 29 cases, the coracoids pressure test was positive in 23(79.31%) cases with a mean VAS values as 5.10, statistically very significant.

In cervical brachialgia, the findings suggest that the VAS score of above 3 is highly significant in Coracoid process tenderness while it is insignificant finding at AC Joint and Subacromial area. Out of 12 cases, 11(91.66%) cases with mean VAS value of 6.25 the Coracoid pressure test were positive.

The supraspinatus tendinitis 20% (1 out of 5 cases), mean VAS value of 2 and Acromioclavicular joint arthritis (66.66% 2 out of 3 cases), mean VAS

value of 5.33 the test was insignificant, but the number of cases is very low. As no cases were reported under Glenohumeral arthritis, the significance of this test could not be assessed in this study.

In the controls study particularly out of 22 cases of females 12 (54.55%) members showed positive Coracoid pressure test with VAS score is more than 3. Thus in controls study itself there was a statistically significant finding with regards to the gender issue where normal female persons who don't have any shoulder pathology show significant tenderness at the Coracoid process. Out of 27 males of total 49 control study cases, only 4 cases (14.81%) showed positive Coracoid pressure test with VAS score more than 3.

The findings suggest that Coracoid pressure test is statistically significant in cases with adhesive capsulitis, cervical brachialgia and in normal controls female subjects as well.

In comparison to the study by S.Carbone et al[2] which shows statistically significant changes only with adhesive capsulitis., 82/85 (96.4%) with a mean VAS scale of 8.3 and they proposed this to be a pathognomonic test for adhesive capsulitis.

In adhesive capsulitis S.Carbone et al [2] discusses that Rotator cuff interval (RCI) is the region that corresponds to the coracoids process which is the region in the anterosuperior aspect of the glenohumeral joint formed by a complex intersection of the fibres of the coracohumeral ligament, the superior

glenohumeral ligament, the glenohumeral joint capsule, and the supraspinatus and subscapularis tendons. The coracohumeral ligament and the joint capsule of rotator cuff interval are thickened in adhesive capsulitis as revealed by the MR arthrogram findings. Hence a pressure at the Coracoid process in this vicinity is expected to be characteristic of frozen shoulder.

But in the present study, in addition to the diagnostic conditions like supraspinatus tendinitis, AC joint dysfunction, cervical brachialgia was included as a new clinical condition. Out of 12 cases, 11(91.66%) cases with mean VAS value of 6.25 the Coracoid pressure test were positive. The roots involved in the brachialgia were C5 (3cases), C 6 (5cases) and C 7 (4cases). In a study [44] the painful site at suprascapular, interscapular, scapular it correlated significantly with C 5 or C 6, C7 or C8, and C 8 radiculopathy thus suggesting that pain in these regions can originate directly from the compressed nerve root. The site of pain is valuable for determining localization of the nerve root.

In another study[45] the pain radiation from brachialgia or sciatica is either radicular pattern or non radicular pattern. In brachialgia non radicular pain radiation is 67%, while in sciatica it is 35%. The investigation also showed the radicular pattern of pain distribution is significantly correlated with an unequivocal radicular neurological deficit. In analyzing the reasons for predominant non radicular pattern of presentation in brachialgia it was proposed that it may be due to anatomic variations of cervical root anastamoses.

**In our study** *the association of the Coracoid pressure test to the brachialgia* from the C5, C6, and C7 nerve roots, is a new finding while assessing its specificity to adhesive capsulitis. But, it is not specific to brachialgia and it can be associated as one more additional clinical test to diagnose brachialgia. **The possible explanation** could be as follows. The Coracoid process is the site of origin to following muscles pectoralis minor, short head of biceps, and coracobrachialis muscles. Pectoralis minor muscle is innervated by medial pectoral nerve (C8, T1), short head of biceps by musculocutaneous nerve (C5, C6) and coracobrachialis by also musculocutaneous nerve (C5, C6, and C7). It is evident from these that any brachialgia involving the any of the cervical root can be related to the myotome and thus to Coracoid process. Any root compression with its radicular radiation of pain, will be referred to the muscles supplying the nerve root. The muscles attached to the Coracoid process are represented by all the nerve roots forming a Brachial plexus. Elicitation of tenderness at the Coracoid process is thus explainable in any brachialgia involving C5, C6, and C7 nerve root. However, it needs further study to accept this hypothesis involving C8 and T1 root compression as the present study did not present with any patients with these root involvement.

In this study, it was also revealed that the normal female population without any shoulder or neck pathology and those don’t have any pain around the site of shoulder presented significantly positive Coracoid pressure test

compared to male. This highlights well observed phenomena of sex differences in pain perception with females reacting to pain more aggressively than males. In a recent article[46], evidence has shown that women are more sensitive to experimental and clinical pain, but the mechanisms contributing to these sex differences are poorly understood. This may be the appropriate explanation in attempting to understand the reasons behind the positive Coracoid pressure test in normal healthy females due to their increased sensitivity to pressure and pain compared to normal males.

# CONCLUSION

Considering all the factors and results from this study, the following are the **major conclusions** that are arrived.

1. Coracoid pressure test which was proposed by Carbone et al [2] as a pathognomonic test for Adhesive capsulitis is not supported from this study.

2. Coracoid pressure test is instead more correlated to the Cervical brachialgia, as the Coracoid process is the site where muscles, innervated by the all nerve roots, arise from a common origin. This is a new clinical finding associated with cervical brachialgia though it is not specific to cervical brachialgia.

3. Normal females also have different and elevated pain sensitivity, compared to males; a well accepted finding is also supported in this study.

4. However, a randomized, controlled, double blind, prospective, large scale study is required to prove these results.

The other conclusions were

a. The major age incidence of adhesive capsulitis in this study was between 41 – 55 age category.

b. Males have higher incidence than females in adhesive capsulitis

c. Majority of patients (93%) did not provide the history of significant trauma to the shoulder in patients with adhesive capsulitis.

d. There is equal side distribution in the incidence of the Adhesive capsulitis in this study.

e. Contrary to studies[47] , the prevalence of the Adhesive capsulitis is more non diabetics than diabetic patients in this study.

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## ANNEXURE

## PERFORMA FOR THE STUDY

**Adhesive capsulitis: A new evolving clinical sign; Coracoid pain test – A validation study**

**Case / Control No:**

Name:

Age:

Sex:

OP No:

Religion:

Vocation:

Overhead lifting jobs – yes or No

**Medical data:**

Duration of illness:

Significant trauma to shoulder – yes or no

Side of Involvement:

Bilateralism:

Diabetes – Yes or No. If yes

Duration of Diabetes

on regular treatment – yes or no

**Procedure:**

Patient will be in a sitting position; The examiner, while standing behind the patient elicits a digital pressure on the coracoids process anteriorly with his fingers, below the clavicle and medial to head of humerus. The other areas

where digital pressure will be done are AC Joint and anterolateral subacromial area. Patients and controls will be instructed to record the severity of the pain on a Visual analog scale (VAS) of 0 (no pain) to 10 points (most severe pain). The test will be considered positive when the score is 3 points or above compared with other two areas. The examination will be consistently performed by the same examiner. Patient will be sensitized about the VAS scale and a trial in Lower limb on Medial joint line of knee will be done before starting on upper limb

**Adhesive capsulitis:**

1. Pain in the shoulder, gradual, felt at the insertion of the Deltoid.
2. Inability to sleep on affected side
3. Atrophy o f the scapular muscles
4. Shoulder stiffness – rotation and abduction
5. ADL affected

**Supraspinatus tendinitis:**

Neer's test - pain with passive abd. in scapula plane, shoulder internally rotated- arc of pain

Hawkins Kennedy test - The patient is examined in sitting with their arm at 90° and their elbow flexed to 90°, supported by the examiner to ensure maximal relaxation. The examiner then stabilizes proximal to the elbow with

their outside hand and with the other holds just proximal to the patient's wrist. They then quickly move the arm into internal rotation.

Jobe test or Empty or full can test - The patient is tested at 90° elevation in the scapula plane and full internal rotation (empty can) or 45°external rotation (full can). Patient resists downward pressure exerted by examiner at patients elbow or wrist.

**Calcifying tendinitis of the shoulder:**

1. Chronic presentation of mild pain
2. Acute presentation of exquisite tenderness over the insertion of Supraspinatus tendon.
3. Radiological evidence of calcification

**Acromioclavicular Joint dysfunction:**

1. Tenderness over the AC joint
2. Cross body adduction test in 90 degree arm elevation.
3. Radiological evidence if any

**Samilson Prieto Criteria of Gleno-humeral arthritis:**

Grade – 0 – normal

Grade – 1 – Mild – osteophyte less than 3 mm on the humeral head

Grade – 2 – Moderate – Osteophyte 3-7 mm on humeral head or glenoid

Grade – 3 – severe – Osteophyte more than 7 mm on humeral head.

**Cervical brachialgia:**

Classical description of excruciating shock like pain, radiating down the limb from neck

Hand on head test - positive

**Diagnosis of the Patient:**

Adhesive capsulitis

Supra spinatus tendinitis

Acromioclavicular Joint disruption

Gleno humeral Arthritis

Cervical Brachialgia

**Inclusion criteria:**

Any patient who complaints of pain around the shoulder with above diagnosis.

Co existing systemic illness like Diabetes included

**Exclusion criteria:**

1. Any patient with either UMN or LMN type of weakness in the shoulder
2. Any surgical procedures on shoulder
3. Patients with ulcerations on anterior shoulder
4. Extremely fatty individuals with difficulty in localizing the coracoids
5. Unable to understand VAS
6. Pain in the shoulder due to fractures of scapula or Coracoid

**Results:** **VAS Score**

**Coracoid Process** **:**

**Acromioclavicular Joint** **:**

**Anterolateral Subacromial area:**

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**Results:** **VAS Score**

**Coracoid Process** **:**

**Acromioclavicular Joint** **:**

**Anterolateral Subacromial area:**