ROLE OF USG AS A FIRST HAND SCREENING MODALITY IN FROZEN SHOULDER – A PROSPECTIVE STUDY

Dr Monojit Chakrabarti and Dr Satarupa Roy

Department of Radiology, Calcutta National Medical College and Hospital, Kolkata-700014, West Bengal, India

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ABSTRACT

This prospective study was carried out in the department of Radio-diagnosis, in a tertiary care hospital from a period of April 2018 to September 2018 to evaluate the efficiency of high resolution USG in first hand detection of adhesive capsulitis (AC). Total of 50 patients (25 male and 25 female) with provisional clinical diagnosis of AC were evaluated by USG using 7.5 to 12 MHz linear array transducer with color and power doppler modes and 3.5 to 5 MHz convex transducer for anterior labrum and glenoid rim and employing proper patient positioning optimum techniques and using standardized diagnostics criteria. In all cases proper history taking, clinical examination and supportive investigation were performed. Patients were followed up according to clinical problems and its magnitude, consent of the patient and clinical course and treatment plan. cases were planned for other imaging modalities like CT scan and MR. Cases were planned for conservative management and evaluation of the course of the disease clinically and sonographically to establish a final diagnosis. Dynamic sonography was highly sensitive 100% and specific 100% for AC but most importantly excluded other rotator cuff and traumatic pathologies like occult fracture of humeral head, supraspinatus tendon tear, long head of biceps tear, impingement syndrome which simulated AC. Color doppler and power Doppler was used to evaluate hypervascularity around the affected shoulder joint in injective and inflammatory conditions.

INTRODUCTION

Frozen shoulder is regarded as one of the most common causes of shoulder pain encountered in practice. The term “frozen shoulder” should be reserved for a well defined disorder characterized by progressive pain and stiffness of the shoulder which usually resolves spontaneously about 18 months. It can be clinically divided into:

Painful phase - Which begins insidiously. The pain interferes with sleep and is increased by movement.

Stiff phase - Restriction of movement is maximal in this phase which facilitates diagnosis. There is near total obliteration of external rotation.

Recovery phase - Follows stiff phase during which patients regain movement and function over a period of time (Ref: Paincyclopaedia vol 3) (ref 1). The histological features are reminiscent of Dupuytrens disease which is active fibroelastic proliferation of rotator interval, anterior capsule, and coracoacromial ligament (Bunker and Anthony)(ref2). The above pathogenesis hallmarks adhesive capsulitis in contrast to its nearest clinical differential diagnosis Impingement syndrome where active arm abduction or elevation creates pain as the supraspinatus tendon slides beneath the coracoacromial arch which is because of decreased space containing the supraspinatus tendon is bounded by the scapula and the coracoacromial arch. The condition is particularly associated with diabetes, Dupuytrens disease, hyperlipidaemia, hyperthyroidism, cardiac disease, and hemiplegia.

AFFECTED patients who are generally in their middle age to slightly elderly age group often give a history of trivial trauma followed by aching in the arm or shoulder. The pain gradually increases in severity and prevents patient from sleeping on affected side after several months it begins to subside but as it does stiffness becomes an increasing problem. Gradually movement is regained but it may not return to normal and some pain may persist (Ref: Appleyes text book of orthopaedics)(ref 3). Mild wasting of the shoulder persists with the cardinal feature of limitation of active and passive movements in all directions.

USG being primary diagnostic modality for investigating the rotator cuff diseases also has the added advantage of offering a...
dynamic examination enabling an assessment of both range of motion and muscular coordination about the joint.

Use of high linear array probes, tissue harmonic imaging, 2D matrix probe technology, extended field of view images, color Doppler sonography have enabled musculoskeletal USG to be used in evaluation of the painful and stiff shoulder.

AIMS AND OBJECTIVES

1. Evaluation of the patient clinically suspected to have frozen shoulder by High resolution ultrasonography and color Doppler.
2. Following up according to clinical problems and its magnitude and clinical course and treatment plan.
3. Comparing cases with gold standard diagnostic modality like CT scan or MRI.

MATERIAL AND METHOD

MATERIAL

This prospective study of shoulder joint imaging was done in the department of Radio diagnosis and imaging, Calcutta National Medical College and Hospital, Kolkata, from a period of April 2018 to September 2018.

A number of patients 50 (25 male and 25 female) with symptoms related to shoulder joint pathology, were taken for this study. Age of the patients ranged from 20 years to 80 years. With complaints shoulder pain and stiffness these patients were referred to our department for ultrasonographic examinations followed by normal shoulder radiography except one in whom X-ray revealed osteoarthritis and soft tissue calcification.

Follow up study was done for confirmation of the pathology.

METHOD

Following methods were adopted for the study.

History

1. Name, age, sex were recorded.
2. CHIEF COMPLAINTS: (following points were asked for)

Pain

Which shoulder?
1. Onset – acute or gradual
2. Duration
3. Pain in any particular position
4. Night pain or pain on rest

Limitation of movement or stiffness

1. Which shoulder?
2. Complete or partial
3. Which movement / movements?
4. Initial of abduction

History of instability

1. Unilateral or bilateral
2. Recurrent or not
3. Any intervention or not

Any history of trauma or injury
1. Any history of surgery or injection.
2. Any significant medical history, like Diabetes, Hypertension.
3. Past history of illness.
4. Occupational history
5. Previous investigation if any.

General Survey: Anemia, Neck gland, neck vein, Pulse, Blood Pressure etc.

Clinical Examination

Observation

1. Asymmetry of shoulder position,
2. Abnormality in contour of shoulder girdle,
3. Any muscle atrophy (particularly supraspinatus, infraspinatus and deltoid).

Palpation

Any tenderness over – anterior acromian, anterior and posterior glenoid margin.

Specific Test

According to the clinical presentation following tests were performed
1. Supraspinatus isolation test to evaluate the supraspinatus.
2. Elicitation of Neer impingement sign (in case of suspected impingement syndrome)

Equipment: Ultrasound was done in all patients with high frequency (7.5 to 12 MHz) linear array transducer. Convex transducer (3.5 MHz) was used for evaluation of anterior labrum and anterior glenoid rim. (PHLIPS HD 7, GE LOGIQ P9, GE LOGIQ L5 and L7 machines having colour and power Doppler were used for sonography.)

Patient Positioning: The patient was scanned while seated on a revolving stool that permits easy positioning during the scanning of the both shoulders.

Examination Techniques: Both shoulders were examined, starting with the asymptomatic or less symptomatic side. This allows comparison views. Normal and abnormal anatomy were always visualized in two orthogonal planes.

Check List for Shoulder Ultrasound

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Parts/ Structures</th>
<th>Seen</th>
<th>Normal</th>
<th>Abnormal</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Biceps tendon</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Subscapularis</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Supraspinatus</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Infraspinatus</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Teres minor</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Posterolabrum</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Anterior labrum</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Bony cortex of humeral head</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Bony glenoid rim</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Subacromial sub deltoid bursa</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Any joint effusion</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Acromial</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Calvarial joint</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Other</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Periarticular</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
areas
14 Dynamic study
15 Diagnosis

Figure 1 normal view of biceps tendon

Figure 2 normal view of subscapularis

Figure 3 noraml view of supraspinatus

Image 4 fluid in infraspinatus tendon right side as compared to the normal infraspinatus tendon on the left.

Image 5 posterior glenoid laberal tear in same patient as above

Image 6 fluid around biceps tendon in biceps groove and also in ls distenction of biceps tendon sheath

Image 7 usg showing thickened and hetrogenous appearance of rt subscapularis tendon compared with lt side suggestive of tendinitis.
Role of USG as a First Hand Screening Modality in Frozen Shoulder – A Prospective Study

**Image 8** Dynamic study of rt shoulder joint in abduction in a case of adhesive capsulitis

**Image 9** Free fluid in sub acromial sub deltoid bursa rt side

**Image 10** T2 WTD axial MR scans of the same patient showing fluid in the subdeltoid bursa

**Image 11** Bony irregularity of the humeral head of the left shoulder which was occult on radiograph.

**Image 12** CT scan of the same patient confirming the fracture of the left shoulder.

**Image 13** USG in a 66 year old female patient showing a partial thickness supraspinatus tear.

**Image 14** Coronal T2WTD image of the same patient confirming partial thickness supraspinatus tear also seen are fluid along subacromial and sub-deltoid bursa.

**Image 15** Axial T2WTD fat saturated image demonstrating the partial thickness supraspinatus tendon tear.
Image 16: Shoulder joint effusion

Image 17: MRI of the same patient confirming the shoulder joint effusion

Image 18: USG showing tear anterior glenoid labrum on the right side and compared with the normal glenoid labrum on the left side

Image 19: Axial merge sequence confirming the anterior labral tear

Image 20: X-ray showing gross osteoarthritis left shoulder and soft tissue calcification

Image 21: USG of the same patient confirming soft tissue calcification of the infraspinatus muscle

Image 22: USG picture showing tear of long head of biceps of right shoulder

Image 23: USG picture showing dislocated biceps tendon from biceps groove.
RESULTS AND ANALYSIS

This prospective study was carried out in the department of Radiodiagnosis and Imaging, Calcutta National Medical College and Hospital, Kolkata to evaluate the role of X-ray, USG and color Doppler in cases of Adhesive Capsulitis. This study group consisted of 50 patients who were referred to department with symptoms related to the shoulder joint.

Clinical Status

Age

Table 1 Age Incidence of Patients Having Shoulder Joint Related Complaints

<table>
<thead>
<tr>
<th>Sl.no</th>
<th>Age range(year)</th>
<th>No. Of cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>20 - 30</td>
<td>3</td>
<td>6.0 %</td>
</tr>
<tr>
<td>2</td>
<td>31 – 40</td>
<td>6</td>
<td>12.0%</td>
</tr>
<tr>
<td>3</td>
<td>41 – 50</td>
<td>14</td>
<td>24.0%</td>
</tr>
<tr>
<td>4</td>
<td>51 – 60</td>
<td>18</td>
<td>36.0%</td>
</tr>
<tr>
<td>5</td>
<td>61 – 70</td>
<td>5</td>
<td>10.0%</td>
</tr>
<tr>
<td>6</td>
<td>71 – 80</td>
<td>4</td>
<td>8.0%</td>
</tr>
</tbody>
</table>

Most patients who present with shoulder joint related complaints were between 50 - 70 years. However those with associated previous history of trauma presented at younger age.

Bar Diagram 1 The Age Incidence of the Patients

Table 2 Age distribution of the different shoulder pathologies found in our patients.

<table>
<thead>
<tr>
<th>Lesions</th>
<th>20-30 yrs</th>
<th>31-40 yrs</th>
<th>41-50 yrs</th>
<th>51-60 yrs</th>
<th>61-70 yrs</th>
<th>71-80 yrs</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cervical Spondylosis</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>1</td>
<td>---</td>
<td>3</td>
<td>1</td>
<td>2.0%</td>
</tr>
<tr>
<td>Adhesive Capsulitis</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>2</td>
<td>5</td>
<td>9</td>
<td>18.0%</td>
</tr>
<tr>
<td>Tears Of rotator Cuff</td>
<td>---</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>---</td>
<td>---</td>
<td>4</td>
<td>8.0%</td>
</tr>
<tr>
<td>Impingement Syndrome</td>
<td>---</td>
<td>---</td>
<td>1</td>
<td>---</td>
<td>1</td>
<td>---</td>
<td>2</td>
<td>4.0%</td>
</tr>
<tr>
<td>Dislocated biceps groove</td>
<td>1</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>1</td>
<td>2%</td>
</tr>
<tr>
<td>Osteoarthritis And</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>4.0%</td>
</tr>
<tr>
<td>Degenerative Conditions</td>
<td>---</td>
<td>---</td>
<td>1</td>
<td>1</td>
<td>---</td>
<td>---</td>
<td>2</td>
<td>4.0%</td>
</tr>
<tr>
<td>labral tears and others</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>1</td>
<td>---</td>
<td>1</td>
<td>2%</td>
</tr>
<tr>
<td>rotator cuff</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>1</td>
<td>---</td>
<td>1</td>
<td>2%</td>
</tr>
<tr>
<td>tendinopathy</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>1</td>
<td>1</td>
<td>2%</td>
</tr>
<tr>
<td>total</td>
<td>1</td>
<td>6</td>
<td>13</td>
<td>18</td>
<td>6</td>
<td>6</td>
<td>50</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Table 3 Sex distribution of patients presenting with shoulder pain

<table>
<thead>
<tr>
<th>Total number of patients</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>25</td>
<td>25</td>
</tr>
</tbody>
</table>

Table 4 Sex Distribution of Patients with Ac

<table>
<thead>
<tr>
<th>Total number of patients</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>37</td>
<td>17</td>
<td>20</td>
</tr>
</tbody>
</table>

Table 5 Associated Histories of Patents with Frozen Shoulder (OF 37 Patients)

<table>
<thead>
<tr>
<th>History</th>
<th>No of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes</td>
<td>4</td>
</tr>
<tr>
<td>Previous Surgery</td>
<td>2</td>
</tr>
<tr>
<td>Neuropathies</td>
<td>1</td>
</tr>
<tr>
<td>Previous trauma</td>
<td>6</td>
</tr>
</tbody>
</table>

Table 6 Frequency of symptoms in frozen shoulder

<table>
<thead>
<tr>
<th>Sl.no</th>
<th>Symptoms / sign</th>
<th>No. Of cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pain Limitation of Movement of Shoulder Especially Abduction &amp; External Rotation</td>
<td>37</td>
<td>100.0%</td>
</tr>
<tr>
<td>2</td>
<td>Localised Tenderness</td>
<td>25</td>
<td>67.5%</td>
</tr>
<tr>
<td>3</td>
<td>Weakness</td>
<td>30</td>
<td>81.0%</td>
</tr>
</tbody>
</table>
1 patient had a tear of long head of biceps.
1 had dislocated biceps tendon with associated tear of subscapularis tendon and was surgically fixed.
2 patients who came with clinical diagnosis of Adhesive Capsulitis came out to be rotator cuff tendinopathy.
1 patient had gross osteoarthritis left shoulder associated with Adhesive Capsulitis.
And only 1 patient who came with clinical diagnosis of Adhesive Capsulitis came out to be cervical spondylosis.

Correlation of mild fluid, distention of the biceps tendon sheath and rotator cuff tear

During USG examination of the 37 patient with Adhesive Capsulitis. All of them had fluid distention of biceps tendon sheath, 37 patients showed continuous limitation of sliding movement of the supraspinatus tendon underneath the acromian during arm abduction and 35 of them demonstrated increased vascularity of the soft tissue structures in the rotator cuff interval and around the bicipital tendon in the biceps groove.

So in a nut shell

Adhesive Capsulitis

Present study shows sensitivity and specificity of 100% and 100% respectively which is in corroboration with a study by Ryu et al which showed sensitivity and specificity of dynamic sonographic examination to diagnose AC were 91% and 100% respectively.

Diagnosis of AC is usually clinical but sonographic examination is important to exclude other pathologies clinically simulating Adhesive Capsulitis (AC) with underline other pathologies, both of which have important prognostic implications. Thus sonography is an efficient screening tool for detecting adhesive capsulitis and excluding rotator cuff and other painful shoulder conditions.

AC shows a slight predilection for premenopausal women. Though it affects both sexes equally there may be a history of prior immobilization, but in many cases there is no obvious antecedent cause. Some times it is often difficult to distinguish clinically between AC and impingement syndrome. In some cases of clinical AC demonstrate underlying rotator cuff tear. So proper diagnosis has important implications. AC can be diagnosed arthrographically but USG can diagnose this entity non invasively based on characteristic restriction in range of movement.

Sex Distribution of ac

From Pie chart 2 we can see that 20 patients in the study group of 37 with AC were female. Table2 demonstrates that maximum cases of AC were in the age group of 40 to 60 years – supporting the statement of Ronnie Ptasznik(ref 8). It shows a predilection for perimenopausal women.
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Technical Falacies and Limitations

1. Due to tendon anisotropy if the direction of the USG beam is not perpendicular to the muscle or tendon, the muscle can appear hypo-echoic and mimic a tear.
2. USG of shoulder is technically difficult to master, making it user dependent. However in experienced hand USG is a sensitive and specific test to detect AC.
3. Location of the osteophytes can affect the detectability on USG for example an acromial spur can be easily detected by USG where as spur in inferior aspect of articular margin of glenoid can be difficult to detect.

Since in AC was there are only soft tissue changes, X-ray comes out almost normal except mild osteoporosis which may occur late in the disease, due to disuse of the arm.

USG along with X-ray can identify osteoarthritic changes which include narrowing of joint space, osteophytes and intra-articular loose bodies though sub-chondral sclerosis is an exclusive X-ray finding.

USG findings has to be confirmed by other modalities like CT scan and or MRI making USG an informative first hand diagnostic modality in early planning of treatment.

Role of USG in Excluding Other Pathologies Which Mimic Ac Clinically

Table 2 Demonstrates the following

<table>
<thead>
<tr>
<th>PATHOLOGIES</th>
<th>NO. OF PATIENTS</th>
<th>X - RAY</th>
<th>USG FINDINGS</th>
<th>MR/CT scan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rotator cuff tear</td>
<td>4</td>
<td>N</td>
<td>Demonstrated the tear.</td>
<td>Demonstrated on MR</td>
</tr>
<tr>
<td>Glenohumeral joint effusion</td>
<td>1 Patient with Rotator cuff tear had effusion</td>
<td>N</td>
<td>USG demonstrated the effusion.</td>
<td>Demonstrated on MR</td>
</tr>
<tr>
<td>Rotator Cuff Tendinopathy</td>
<td>1</td>
<td>N</td>
<td>Fluid in subscapularis, supraspinatus and biceps tendon. Loss of fibrillary pattern of biceps tendon. USG demonstrated Anterior Glenoid labral tear with the torn labrum.</td>
<td>Hyperintensity on T2 wtd Sequences.</td>
</tr>
<tr>
<td>Anterior glenoid Labral Tear</td>
<td>1</td>
<td>Inconclusive/</td>
<td>Demonstrated the hypoechoic cleft in the triangular Posterior Labrum.</td>
<td>Demonstrated on MR</td>
</tr>
<tr>
<td>Posterior glenoid Labral Tear</td>
<td>1</td>
<td>N</td>
<td>Demonstrated.</td>
<td>Demonstrated on MR</td>
</tr>
<tr>
<td>Fluid Collection in Infraspinatus</td>
<td>The same patient with Posterior Labral tear. 2</td>
<td>N</td>
<td>Fluid in infraspinatus.</td>
<td>Demonstrated on MR</td>
</tr>
<tr>
<td>Fracture</td>
<td>(Including 1 with Posterior Labral Tear )</td>
<td>Occult</td>
<td>Cortical irregularity Demonstrated.</td>
<td>Demonstrated on CT</td>
</tr>
<tr>
<td>Impingement Syndrome</td>
<td>2</td>
<td>N</td>
<td>Diagnose Impingement in arm abduction in real time USG.</td>
<td>MR revealed hooked Acromion with fluid in SubAcromial/Sub-deltoid Bursa and subscapularis tendinopathy.</td>
</tr>
<tr>
<td>Dislocated biceps tendon from biceps groove</td>
<td>1</td>
<td>N</td>
<td>In another 1 demonstrated collection in SubAcromial/Sub-deltoid Bursa and subscapularis tendinopathy. Medial dislocation of Biceps tendon head on active shoulder medial rotation with elbow flexion. Shallow biceps groove Associated subscapularis tear.</td>
<td>MR revealed shallow biceps groove and also associated subscapularis tear</td>
</tr>
<tr>
<td>Calcific tendinosis</td>
<td>1 (associated with Osteoarthritis)</td>
<td>Soft tissue calcification with osteoarthritic changes</td>
<td>Infra spinatus calcification with degenerative changes</td>
<td>Hypointense signal Infraspinatus with Degenerative changes in Shoulder joint.</td>
</tr>
</tbody>
</table>
demonstrating biceps tendon head dislocation during active shoulder medial rotation with elbow flexion as well shallow biceps groove. The demonstration of dislocation during active movement being demonstrable only on usg and hence confirmatory.

Though MRI is certainly diagnostic in evaluating the acromion and subcoracoid space the role of usg should not be understated in trying to rule out antero-superior impingement wherein there is conflict between the supraspinatus tendon and the coracoacromial arch during the elevation of the arm and shoulder abduction or the anteromedial impingement wherein the superior part of the subscapularis tendon, the long head of the biceps tendon impinges with the tip of the coracoid during maximal internal rotation and flexion of the arm.

Neer and Welsh(ref 10) criteria as stated below promptly serves to differentiate impingement versus adhesive capsulitis by these features which are then confirmed by MR:

Stage 1 - corresponds to edema and hemorrhage in the bursa.
Stage 2 - to widening and fibrosis of the bursa with tendinosis.
Stage 3 - to tendon rupture.

The three stage of increasing tendon damage in Impingement syndrome namely

Stage I - Impingement leads to sub-acromial bursitis and absent or minimal tendon changes.
Stage II - Progressive thickening and irregular appearance of the supraspinatus tendon and the subacromial/subdeltoid bursa is as a result of the degenerative process.
Stage III - Progression of tendon damage to partial and freely thickness tears.(Stephano Bianchi and Carlo Martinoli 2007)(ref 11) are well evaluated by usg and absence of such tendon damage per say is noted in adhesive capsulitis.

CONCLUSION

This prospective study was carried out in department of Radiodiagnosis at a tertiary care hospital in Kolkata from April to September 2018.

Total of 50 patients (25 male and 25 female) with clinical diagnosis of AC were evaluated by USG using 7.5 to 12 MH linear array transducer with colour power doppler facility and 3.5 to 5 MH convex transducer for anterior labrum and glenoid rim and employing proper patient positioning optimum techniques and using standardized diagnostics criteria. In all cases proper history taking, clinical examination and supportive investigation were performed.

Follow up study was divided according to clinical problems and its magnitude, consent of the patient and clinical course and treatment plan. Few cases were planned for other imaging modalities like CT scan and MR Imaging.

Cases were planned for conservative management and evaluation of the course of the disease clinically and sonographically to establish a final diagnosis.

Dynamic sonography was highly sensitive 100% and specific 100% for AC but most importantly USG excluded other pathologies like occult fracture of humeral head, supraspinatus tendon tear, long head of biceps tear, impingement syndrome which simulated Adhesive Capsulitis.

Colour doppler revealed hyper-vascularity around the affected shoulder joint in infective and inflammatory conditions. It can be thus concluded that usg is an efficient tool in screening for Adhesive Capsulitis.

- AC generally occurs in premenopausal women. It is predisposed by condition like Diabetes mellitus, previous history of trauma surgery, associated history of neuropathies.
- Color Doppler is very useful in detecting increased vascularity in the muscles of the rotator cuff which is seen in patients of Adhesive Capsulitis.
- USG is a highly and specific tool for diagnosing fluid distention of the biceps tendon sheath, thickening of coraco-humeral ligament and diminished excursion of supraspinatus muscles which occur in Adhesive Capsulitis.
- Though High resolution ultrasound is a very efficient modality in detecting shoulder joint lesion it has some limitation like operator dependencies, experience of the operator, long learning and it also needs cooperation of the patients.
- Thus high resolution Ultrasonography and Doppler can be regarded as the primary modalities of screening for most of the shoulder pathologies including Adhesive Capsulitis.

References