

## Ultrasonographic findings in patients with shoulder pain

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### Abstract

**Background:** Shoulder pain is a common musculoskeletal condition and high frequency ultrasonography is an accurate non-invasive imaging technique for evaluating patients with painful shoulder. This study was designed to determine the ultrasonographic findings in patients with shoulder pain and to compare the clinical diagnosis established by physical examination to high frequency ultrasonographic findings.

**Methods:** Thirty patients with shoulder pain were included in the study between the period from December 2017 to April 2018 in BIRDEM General Hospital, Dhaka, Bangladesh. All had a physical examination performed by a physician. Ultrasonographic examination was carried out within three days of the physical examination by two sinologists, who had no knowledge of the clinical findings.

**Results:** Total patients were 30 with mean age  $52.20 \pm 7.52$  years and male female ratio 2:3. On examination out of these thirty patients, impingement syndrome was positive in 93.3% (Neer) and 76.7% (Hawkin), supraspinatus tendinitis in 83.3% (Jobe's), biceps tendinitis in 30.0% (Yergason's test) and 33.3% (Speed's maneuver), subscapularis tendinitis in 3.3% (Gerbers lift off test) patients. Sonographic alteration was found in a total of 28 (93.33%) patients. Forty five pathologies were detected; 46.67% patients had single pathology, 40% had two and 6.67% had three pathologies. The structure most frequently involved was the supraspinatus tendon (35.50%). The long head of biceps tendon (17.78%) and the acromioclavicular joint (26.67%) were also frequently involved. Infrapinatus tendinopathy, subscapularis tendinopathy and subacromial bursitis were present in small percentage. Significant difference was found between clinical examination and ultrasound findings.

**Conclusion:** Ultrasonography may be a useful tool to improve diagnosis in painful shoulder.

**Key words:** Painful shoulder, sonography.

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### Introduction

Shoulder pain is one of the most recurrent complaints among people with musculoskeletal disorders.<sup>1</sup> It is

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estimated that approximately 50% of population in the United States experience at least one of shoulder pain every year.<sup>2</sup> There are many causes of a painful shoulder, but periarticular soft tissue lesions involving tendons and bursae are common and are often associated with chronic impingement of the rotator cuff on the anterolateral margin of the acromion. Although a number of clinical tests used for the diagnosis of painful shoulder are considered accurate in determining the location of the periarticular lesions<sup>3</sup>, these entities may be difficult to differentiate by physical examination alone.<sup>4,5</sup> Traditional clinical examination maneuvers are of limited diagnostic value and x-ray have a low yield when assessing soft tissue, ultrasonography (US) due to established reliability, efficiency and easy access has been identified as the best tool to assess shoulder pain.<sup>6,7</sup> Aim of the present study were to determine the prevalence of ultrasonographic findings in patients with shoulder pain and to compare the clinical diagnosis established by a physical examination with high frequency ultrasonographic findings in patients with painful shoulder.

## Methods

This cross-sectional study was done between the period from December 2017 to April 2018 in BIRDEM General Hospital, Dhaka, Bangladesh. A total of 30 patients. Inclusion criteria were shoulder pain lasting for at least 4 weeks prior to the study and positive one of the following physical examinations; two clinical tests (Neer's, Hawkin's) were used to detect shoulder impingement syndrome<sup>8,9</sup>, Jobe's test for supraspinatus<sup>10</sup>, Patte's test for infraspinatus and teres minor<sup>11</sup>, Gerbers lift off test for subscapularis<sup>12</sup>, Speed's and Yergason's maneuver for the long head of the biceps brachii.<sup>13,14</sup> Patients with radicular pain, presence of pathologies such as frozen shoulder, tumour, infection, inflammatory arthritis were excluded. Ultrasonographic examination was carried out within three days of the physical examination by two sonologists without knowledge of the physical examination findings.

### Physical examination

Neer's maneuver<sup>8</sup>: Performed with the elbow in extension and forearm prone. Prevention of scapular rotation is made with one hand. A passive elevation of the upper limb is done, which may cause the impact of the supraspinatus region insertion with the bottom edge of the acromion.

Hawkin's maneuver<sup>9</sup>: The examiner maintains the shoulder in flexion of 90°. With the other hand, holds the wrist of the examined and does a rapid internal rotation, causing supraspinatus tendon impact against the anteroinferior edge of the acromion and against the coracoacromial ligament.

Jobe's test<sup>10</sup>: Position the arm abducted to 90° flexed to 30° in the frontal plane and internally rotated, with the thumbs pointed to the floor. The elbows should remain extended. Next the examiner lowers the upper limb against the patient resistance. The test is considered positive when there is pain weakness secondary to a rupture.

Patte's test<sup>11</sup>: The arm is positioned at 90° of abduction and elbow at 90° flexion. Request the patient to resist the force of internal rotation by the examiner's hand placed on the hand dorsum of the patient. The decreased resistance may indicate infraspinatus tendon rupture.

Gerbers lift off test<sup>12</sup>: Place the shoulder to be examined in extension and internal rotation with the hand on the back. Then ask the patient to open the distance between hand and back. The inability to perform the maneuver indicates rupture of the subscapular tendon

Speed's test<sup>13,14</sup>: The test is performed with the patient flexing the arm anteriorly against resistance, with the elbow extended and the forearm in supine. The test is positive when the pain is located in the bicipital groove.

Yergason's maneuver<sup>13,14</sup>: Place the patient with the arm near the trunk, with the elbow flexed at 90° and the shoulder in neutral position. Request the patient to perform supination against resistance. The test is positive if pain is present on bicipital groove.

Ultrasonography examination: All patients were examined with commercially available real time equipment (Philips affinity 50 G, USA) using a 12.5 MHz linear array transducer.

Data analysis: Data were analyzed with the statistical package for social science (SPSS version 20, Chicago, IL, USA). Prevalence was expressed in percentage. Comparison were made using paired sample t test. Probability value  $P < 0.05$  was considered as significant.

## Results

During the period total 30 patients were studied. Mean age of the patients was  $52.20 \pm 7.52$  years. Proportion of female was 60%. Table I shows the physical examination findings and the clinical diagnosis of the patients.

**Table I** Physical examination findings and clinical diagnosis of patients with shoulder pain (n=30)

Maneuvar	Physical examination findings	Clinical diagnosis
Neer's	28 (93.3%)	Impingement syndrome
Hawkin's	23 (76.7%)	Impingement syndrome
Jobe's	25 (83.3%)	Supraspinatus lesion
Patte's	0 (0.00%)	Infraspinatus tendinopathy
Gerbers lift off test	1 (3.3%)	Subscapularis tendinopathy
Yergason's test	9 (30.0%)	Biceps tenosynovitis (Long head)
Speed's maneuver	10 (33.3%)	Biceps tenosynovitis (Long head)

Sonographic alteration were found in a total of 28 (93.33%) patients, 14 (46.67%) had only one pathology, 12 (40%) had two pathologies and 2 (6.67%) had more than two pathologies.

A total of 45 pathologies were detected. Table II shows the sonographic alterations of various structures of the shoulder girdle. Supraspinatus tendon assessment revealed 6 cases of tendinosis (13.3%), 8 findings of at least a single calcification (17.78%) and 2 cases of tear (4.44%). Twelve (26.67%) patients had acromioclavicular (AC) joint osteoarthritis (OA). Bicipital synovitis and tendinosis were detected in 8 cases (17.78%). Infrapinatus tendinopathy, subscapularis

tendinopathy and subcaromial bursitis were present in small percentage shown in Table II.

Table III shows positive clinical maneuvers for supraspinatus, infrapinatus, subscapularis, long head of the biceps tendon and their ultrasound abnormalities. This study showed that the clinical testing for the supraspinatus tendon (Neer’s, Hawkin’s, and Jobe’s) and infrapinatus had statistically significant difference ( $p < 0.05$ ), when compared with ultrasonography. There were no statistically significant difference between semiological and ultrasound tests for subscapular and the long head of the biceps tendon.

**Table II** Ultrasonographic findings of various structures in patient with painful shoulder (n=28)

Structure	Number	Percentage
Supraspinatus tendinosis	6	13.30
Supraspinatus calcification	8	17.78
Supraspinatus tear	2	4.44
Infrapinatus tendinopathy	5	11.11
Subscapularis tendinopathy	2	4.44
Biceps tenosynovitis (Long head)	8	17.78
Subacromial bursitis	2	4.44
OA AC joint	12	26.67

(Multiple responses present)

**Table III** Proportion of shoulder with positive semiology maneuvers and their altered ultrasonography (n=30)

Maneuvar	Clinical findings		Ultrasonography findings		p value
	Positive	Normal	Altered	Normal	
Neer’s	28(93.3%)	2(6.7%)	15(50.0%)	15(50.0%)	0.000
Hawkin’s	23(76.7%)	7(23.3%)	14(46.7%)	16(53.3%)	0.017
Jobe’s	25(83.3%)	5(16.7%)	15(50.0%)	15(50.0%)	0.002
Patte’s	0(0.00%)	30(100.0%)	5(16.7%)	25(83.3%)	0.023
Gerbers liftoff test	1(3.3%)	29(96.7%)	2(6.7%)	28(93.3%)	0.326
Yergason’s test	9(30.0%)	21(70.0%)	8(26.7%)	22(73.3%)	0.801
Speed’s maneuver	10(33.3%)	20(66.7%)	8(26.7%)	22(73.3%)	0.601

(P after paired sample t test)

## Discussion

Painful shoulder is a very common musculoskeletal condition. In most patients, it results from different anatomic structures involving rotator cuff, the biceps tendon and subacromial-subdeltoid bursa.<sup>15</sup> The differential diagnosis includes several entities of similar clinical picture. Tendinitis and tears of the rotator cuff, biceps tendinitis and subacromion-subdeltoid bursitis are the most common lesions found.<sup>15</sup> It has been established that tendon degeneration occurs as part of the aging process.<sup>16</sup> Progressive tendon failure then leads to rotator cuff rupture.<sup>17</sup> The cause of these lesions is thought to be tendon degeneration, repetitive trauma or both.<sup>18</sup> The impingement concept is a unification of this spectrum of disorders.<sup>16-19</sup>

The clinical diagnosis of periarticular shoulder conditions depend on a number of physical maneuvers. Clinically it may be difficult to differentiate the pain patterns of the rotator cuff lesions, biceps tendon pathology and subacromial-subdeltoid bursitis. Obviously, any position in which the rotator cuff is compressed by the acromial arch causing pain during examination is highly diagnostic of rotator cuff lesions such as tendinitis, partial thickness tear or full thickness tear. Moreover, many of these positions also compress or stretch the biceps tendon and the subacromial-subdeltoid bursa. Therefore the induced pain is not diagnostic of one rather than another disorder.

Our results showed that the clinical diagnosis of periarticular conditions in the painful shoulder is not very accurate compared with US diagnosis. Other authors have also reported the low accuracy of clinical assessment compared with intraoperative anatomical lesions in the diagnosis of periarticular shoulder conditions.<sup>3,20,21</sup> Many patients with chronic shoulder pain have impingement syndrome and several periarticular lesions, usually involving different tendons subacromial-subdeltoid bursa and acromioclavicular joint. In our 30 patients, 14 (46.67%) had only one pathology, 12 (40%) had two pathologies and 2 (6.67%) had more than two pathologies. Draghi et al<sup>22</sup> found that 65.5% had only one pathology, 30.4% had two pathologies and 4.1% presented three pathologies. Supraspinatus affection was present in 35.52% of all patients who described shoulder pain. This is consistent with most of the series described.<sup>23-25</sup> Calcific supraspinatus tendinosis was present in 8 (17.78%),

supraspinatus tendinosis in 6 (13.30%), supraspinatus tear in 2 (4.44%). Infraspinatus tendinosis, subscapularis tendinosis and subacromial bursitis was present in 5 (11.11%), 2 (4.44%) and 2 (4.44%) patients respectively. Osteophytes in the acromioclavicular joint was found in twelve patients which was frequent US finding in other studies.<sup>22,26</sup> Alteration in the long head of the biceps tendons were found in 8 (17.78%) patients and tenosynovitis was the most frequent manifestation.

The results showed that painful shoulder, clinical maneuvers and ultrasonography have statistically significant difference when compared to supraspinatus tendon. Our and other results are to be expected because most patients with chronic shoulder pain have impingement syndrome and several periarticular lesions, usually involving different tendons and subacromial-subdeltoid bursa. A possible explanation for the low accuracy of clinical tests is the lack of correlation between clinical findings and anatomical abnormalities in the shoulder.<sup>7</sup> A variable prevalence of shoulder periarticular lesions, especially rotator cuff injuries, has been reported in asymptomatic shoulder.<sup>7</sup>

Clinical examination is usually supplemented by plain radiography. However, the ability of this technique to show only non-specific indirect signs of chronic rotator cuff lesions limits its use for ruling out osteoarthritis, periarticular calcification and other bone causes of shoulder pain. Other diagnostic procedures such as computed tomography, arthrography and arthroscopy cannot be considered for routine examination. Currently, both magnetic resonance imaging (MRI) and high frequency US are used to evaluate soft tissue disorders of shoulder. The diagnostic value of MRI for shoulder pathologies has been widely reported.<sup>27</sup> However, it is expensive, time consuming and not widely available.

High resolution imaging afforded by the current generation of high frequency (greater than 7.5 MHz) linear transducers allows to effectively assess superficial tendon and muscle lesions and bursitis.<sup>28,29</sup> Several studies have shown an accuracy for US detection of rotator cuff lesions compared with surgical findings.<sup>30,31</sup>

This study has limitation also. Here population size is small. Longer duration of study with larger population is required.

US has important role to evaluate soft tissue disorders of shoulder. So US should be used wherever possible

to establish an accurate diagnosis of the painful shoulder and therefore improving the treatment of this common disorder.

**Conflict of interest:** Nothing to declare.

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