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STUDY OF FINDINGS AT SONOGRAPHY OF SUDANESE PATIENTS WITH SHOULDER PAIN.

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ABSTRACT

Objective: The aims were to study the prevalence of sonographic findings in Sudanese patients with shoulder pain, as well as to correlate the findings with age and occupation. **Materials and Methods:** The study sample comprised 40 consecutively enrolled subjects who had shoulder pain. Ultrasound of shoulder was performed by a musculoskeletal sonologist according to a defined protocol that included imaging of the rotator cuff: tendon of the long head of the biceps brachii muscle(LHB),subacromial-subdeltoid bursa, supra and infra spinatous as well as the teres minor. The shoulders were imaged, and the pathologic findings were recorded. **Results:** 29(72.5%) right and 11 (27.5%) left shoulders were imaged. The most common affected ages were between 43-52 years constituting14 (35%) of the total sample. Shoulder abnormalities were found in 100% of subjects complained of shoulder pain. The occurrence was found to be as 5(12.5%) cases of calcified tendinosis, 1(2.5%) degenerative changes,1(2.5%) (LHB) dislocation, 30 (75%) have no tendinopathy seen and 3 (7.5%) with shoulder impingement syndrome (SIS). Bursa thickening with fluid was seen in 18(45%) of the cases. No tears were detected neither in teres minor nor in (LHB). A significant relationship is found between the patient's age, occupation and the ultrasound findings at $p \leq 0.003$ and 0.019 respectively. **Conclusion:** With the presence of pain, we suggest that ultrasound findings should be interpreted closely with clinical findings, occupation and age to determine the cause.

KEYWORDS: Shoulder joint, ultrasonography, pain.

INTRODUCTION

Shoulder pain is accountable for 16 percent of all musculoskeletal complaints,[1] with a yearly increased incidence of new episodes seen in the primary care setting.[2] Clinical decision rules have been developed to determine if a patient has a rotator cuff tear.[3] The initial imaging; imaging is the plain radiographs which are indicated for all chronic shoulder pain. It used to assess osteoarthritis of the acromioclavicular and glenohumeral joints, calcific tendinitis, migration of the humeral head, cystic changes of the humeral head and sclerosis of the inferior acromion which can indicate chronic rotator cuff disease.[4] Further imaging of chronic shoulder pain including: MRI, arthrography, computed tomography (CT), and ultrasonography. The preferred method for diagnosing rotator cuff disorders is MRI, which can assess rotator cuff tendinopathy, partial tears, and complete tears.[5] MRI arthrography has become the preferred test for the imaging of suspected labral pathology that may be found in chronic shoulder instability.[6] The CT scan is the preferred imaging study for bony disorders of the shoulder, including arthritis with significant erosion; instability with significant bone loss of the humeral head or the glenoid; tumors; and occult fractures. CT arthrography may play a role for patients with suspected rotator cuff tears who cannot undergo an MRI.

Now a day ultrasonography is emerging as a cost-effective alternative to MRI, with advantages over MRI that include better patient tolerance, dynamic assessment and improved resolution in the face of previous surgery.[5] Ultrasonography is operator-dependent and, therefore, has not yet gained widespread acceptance however ultrasonography of the shoulder is accepted as the investigation of choice for rotator cuff abnormality in many centers around the world.[7,8,9] It is also one of the most commonly performed studies among all diagnostic musculoskeletal ultrasound examinations.

The objectives of this study were to describe the frequent findings at shoulder ultrasound and highlight the spectrum of shoulder abnormalities that may be encountered at sonographic examinations for Sudanese coming with shoulder pain in our ultrasound departments in Sudan. Therefore this current study will highlight the diagnostic criteria of the shoulder pain causes in Sudanese as an awareness of the range of shoulder

abnormalities which is essential to gain a point of view on the clinical importance of findings in diagnosis and patient care.

2- MATERIAL AND METHODS

2.1 Area, Duration and study sample

The study was carried out during the period from June 2014 up to August 2016 at Bashaer Hospital – Southern Khartoum. Patient consent was obtained. All scans were performed according to a routine shoulder protocol using Mindray DP-20 ultrasound machine with a high-frequency (7-12 MHz) linear-array transducer. The patient sample consisted of 40 patients (24 females and 16 males) with shoulder pain complaints for at least 3 months period were undergone an evaluation of the rotator cuff tendons using ultrasound. Ages between 23-32 years were 2(5%),33-42 were 4(10%), 43-52 were 14(35%) ,53-52 were 11(27.5%) and ages >62 years were 9(22.52%).The occupation of the participants were recorded. 18 were house wife,2 were farmers,5 were employees,6 were free business , 2 were teachers,4 were drivers, 1 student and 2 were other jobs. The affected side were common in the right shoulder constituting 29(72.5%) while in the left shoulder was affected in 11 (27.5%) of the cases.

2.2 Ultrasound Technique used

The examination of shoulder started with the long head of the biceps tendon (LHBT) with the patient sitting, facing the examiner, the elbow joint flexed at 90° and the arm was supinated on the patient´s thigh. The probe was placed axially (transverse) at the anterior aspect of the shoulder searching for the bicipital groove, the LHBT appears as an ovular hyperechoic structure within the groove, surrounded by a small amount of fluid in the sheath. Both transverse and longitudinal views were obtained, starting from the proximal aspect of the bicipital groove and extending distally to the musculotendinous junction.

For the evaluation of the Subscapuler tendon the elbow joint flexed at 90°. The arm was rotated externally. Long-axis scan was performed; the probe was placed axially, (transverse) approximately at the level of the coracoid process. The SubScapuler tendon appears as a convex, well-defined fibrillar echo structure. the probe was swept up and down until its full width visualization was achieved.Modified Crass (Middleton position) was applied to evaluate the Supraspinatus tendon (SupraS) with the arm posteriorly extended, flexed elbow, pointing directly posteriorly, and the palm of the hand placed on the ipsilateral iliac wing.

The (SupraS) tendon was examined in long-axis and short-axis views. The greater tuberosity and the humeral head were the important bone landmarks during the SupraS tendon examination. In long-axis view, the SupraS tendon is visualized as convex beak-shaped hyperechoic structure over the smooth hypoechoic band of the articular cartilage and the hyperechoic humeral cortex, ending into the great tuberosity. In short-axis view, the SupraS tendon has a convex shape, composed of homogeneous texture of medium-level echoes.

The subacromial-subdeltoid bursa appears as a hypoechoic linear line between two hyperchoic linear planes. The forearm was placed across the chest and the palm is placed on the opposite shoulder to evaluate the Infraspinatus and teres minor tendons. The infraspinatus and teres minor muscles appear as an individual structure filling the infraspinous fossa deep to the deltoid. After scanning these muscles, the transducer sweeped toward the greater tuberosity on sagittal planes.

2.3 Statistical Analyses

The frequency and percentages were calculated for each variable in the sample. A Pearson Correlation Coefficient was calculated .Significance for the tests was noted at P ≤.001.All of the statistical analyses were performed using Statistical Package for Social Sciences software package (SPSS for Windows, Version 16 Chicago, IL, USA).

3. RESULTS

Table 1: Ultrasound Findings in 40 Sudanese patients.

Ultrasound Findings n=40	Frequency	Percentages (%)
Shoulder Impingement Syndrome (SIS)	3	7.5
Calcify Tendinosis	5	12.5
Degenerative Changes	1	2.5
LHB Dislocation	1	2.5
No Tendinopathy Seen	30	75.0
Total	40	100.0 (%)

Table 2: Causes of different shoulder pain (Ultrasound Findings) cross tabulated with the patients occupation and p –value.

Ultrasound Findings n=40	Occupation							
	House wife	Farmer	Employee	Free business	Teacher	Driver	Student	Others
Shoulder Impingement Syndrome	3 (100.0%)	-	-	-	-	-	-	-
Calcify Tendinosis	4 (80.0 %)	-	1 (20.0%)	-	-	-	-	-
Degenerative Changes	1 (100.0%)	-	-					
LHB Dislocation	-	-	-	-	-	-	1 (100.0%)	-
No Tendinopathy Seen	10 (33.3%)	2 (6.7%)	4 (13.3%)	6 (20.0%)	2 (6.7%)	4 (13.3%)	-	2 (6.6%)
Total	18 (45.0%)	2 (5.0%)	5 (12.5%)	6 (15.0%)	2 (5.0%)	4 (10.0%)	1 (2.5%)	2 (5.0%)
P-value = 0.019								

Table 3: Causes of different shoulder pain cross tabulated with the patients age.

	Age/Years				
	23-32	**33-42**	**43-52**	**53-62**	**>62**
Shoulder Impingement Syndrome	-	-	-	3 (100.0%)	-
Calcify Tendinosis	-	-	1 20.0%	3 (60.0%)	1 (20.0%)
Degenerative Changes	-	-	-	-	1 (100.0%)
LHB Dislocation	1 (100.0%)	-	-	-	-
No Tendinopathy Seen	1 (3.3%)	4 (13.3%)	13 (43.3%)	5 (16.7%)	7 (23.3%)
Total	2 (5.0%)	4 (10.0%)	14 (35.0%)	11 (27.5%)	9 (22.5%)
	P-value = 0.003				

Table 4: Prevalence of shoulder pain causes diagnosed by ultrasonography for the rotator cuff tendons and long head of biceps (n=40)

	US Findings		
	No tears	Partial Thickness tear	Full Thickness Tear
Subscapularis tendon			
Shoulder impingement syndrome (SIS)	3(100.0%)	-	-
Calcify tendinosis	5(100.0%)	-	-
Degenerative changes	1(100.0%)	-	-
LHB Dislocation	1(100.0%)	-	-
No tendinopathy seen	29(96.7%)	1(3.3%)	-
Total	39(97.5%)	1(2.5%)	-
Supra Spinatous Tendon			
Shoulder impingement syndrome	1(33.3%)	2(66.7%)	-
Calcify tendinosis	4(80.0%)	-	1(20.0%)
Degenerative changes	1(100.0%)	-	-

LHB Dislocation	1(100.0%)	-	-
No tendinopathy seen	12(40.0%)	13(43.3%)	5(16.7%)
Total	19(47.5%)	15(37.5%)	6(15.0%)
Infraspinatous Tendon			
Shoulder impingement syndrome	13(3.3%)	26(6.7%)	
Calcify tendinosis	5(100.0%)	-	
Degenerative changes	1(100.0%)	-	
LHB Dislocation	1(100.0%)	-	
No tendinopathy seen	29(96.7%)	1(3.3%)	
Total	37(92.5%)	3(7.5%)	
Teres minor			
Shoulder impingement syndrome	3(100.0%)	-	-
Calcify tendinosis	5(100.0%)	-	-
Degenerative changes	1(100.0%)	-	-
LHB Dislocation	1(100.0%)	-	-
No tendinopathy seen	30(100.0%)	-	-
Total	40(100.0%)	-	-
LHB			
Shoulder impingement syndrome	3(100.0%)	-	-
Calcify tendinosis	5(100.0%)	-	-
Degenerative changes	1(100.0%)	-	-
LHB Dislocation	1(100.0%)	-	-
No tendinopathy seen	30(100.0%)	-	-
Total	40(100.0%)	-	-

Values in parenthesis are number of cases.

Table 5: Prevalence of shoulder pain causes diagnosed by ultrasonography for the bursa diagnoses cross tabulated according to the ultrasound d(n=40)

	Fluids		Total
	Normal Bursa	Bursa Thickening (fluids seen)	
Shoulder impingement syndrome	-	3(100.0%)	3(100.0%)
Calcify tendinosis	3(60.0%)	2(40.0%)	5(100.0%)
Degenerative changes	1(100.0%)	-	1(100.0%)
LHB Dislocation	1(100.0%)	-	1(100.0%)
No tendinopathy seen	17(56.7%)	13(43.3%)	30(100.0%)
Total	22(55.0%)	18(45.0%)	40(100.0%)
	P-value = 0.250		

Values in parenthesis are number of cases.

4. DISCUSSION

Shoulder pain is very common complaints in the clinical practice and the shoulder is a joint site that particularly is assessed by ultrasound (US). The different structures and the complex anatomy make the use of US suitable for the evaluation of both normal and pathological findings at the joint.[10-14]

Our study results showed the variety of abnormal findings in the shoulder on ultrasound scans. Shoulder abnormalities were found in 100% of the studied subjects on either side. The occurrence was found to be as 5(12.5%) cases of calcified tendinosis, 1(2.5%) degenerative changes,1(2.5%) long head of biceps (LHB)dislocation, 30 (75%) have no tendinopathy seen and 3 (7.5%) with Shoulder impingement syndrome (SIS), this was presented in table(1). US findings showed that there are rotator cuff tears in 1(2.5%) of the Subscapularis tendons, 21 (52.5%) in Supraspinatos and 3 (7.5%) in Infraspinatous tendon. Bursa fluid was seen in 18(45%) of the cases with no tears detected in 40(100%) neither in teres minor nor in long head of biceps.

Similar studies; found that the most common shoulder disorders, assessed by US, was found to be abnormalities

of rotator cuff and long head of biceps tendon, lesions of glenohumeral and acromioclavicular joints.[10,15] In our study, the shoulder US common pathological findings were correlated with age and occupation and were presented in tables (2,3). The current study showed that there is significant relation between the shoulder pathology and occupation as well as increasing age.

The highest prevalence of occurrence of shoulder pathology that causing pain is the house wife and employees with or without tendenopathy, these pathological conditions were the Shoulder Impingement Syndrome 3(100.0%)and Calcify Tendinosis 4(80.0%) and 1(20%) for house wife and employees in respectively, the correlation is significant at $p \leq 0.019$.

Other similar studies showed that the prevalence of supraspinatus tendon calcification causing shoulder pain has been reported to be as high as 6.8%, mainly due to the supraspinatus tendon subacromial Impingement syndrome with shoulder pain causing inadequate motion.[10]

Our study showed that the Impingement Syndrome with shoulder pain was found in ages 43-52 years and 53-62years while the long head of biceps dislocation was found in young adults in ages between 23-32 years and the correlation is significant at $p \leq 0.003$.

On the other hand another studies showed that Ultrasound evaluation of supraspinatus tendon calcification with subacromial impingement syndrome has been reported to be excellent in adult patients, and supraspinatus tendon calcification with subacromial impingement syndrome diagnosed through ultrasonography has been reported in young athletes.[16-22] Supraspinatus tendon calcification has also been reported to cause shoulder pain in children.[23]

The importance of early diagnosis and the expectation of having shoulder abnormality with shoulder pain is important in all period of age within life because the presence of supraspinatus tendon calcification with subacromial impingement syndrome without treatment can progress to severe forms of subacromial and subdeltoid bursitis, rupture of the long head of the biceps tendon and rotator cuff tears.[19-21] Using ultrasonography to rapidly diagnose supraspinatus tendon calcification with subacromial impingement syndrome can accelerate improvement of patient outcomes.

Prevalence of shoulder pain causes diagnosed by ultrasonography for the rotator cuff tendons and long head of biceps for 40 patients were presented in table (4). The partial and full thickness tear happened more in the sub scapularuis and supra spinatous tendons.

Shoulder abnormalities were found in all of subjects. The most common were subacromial-subdeltoid bursal thickening with fluids in cases of calcify tendenosis and the impengment syndromes, table(5).

When evaluating the supraspinatus tendon; 19(47.5%) were found without tear, 15(37.5%)cases with partial tear and 6(15.0%) with full thickness tear. Subscapularis tendon evaluation showed 5 cases with calcify tendinosis with one case of partial tear .With regard to rotator cuff abnormalities, we found the rate of full thickness tears of the supraspinatus tendon in our study to be higher than the 9.8% reported by Gandikota et al[24] and 7.6% reported by Moosmayer et al.[25] and 6% reported by Schibany et al.[26] and lower than the 21.7% reported in a meta-analysis of cadaveric studies by Reilly et al.[27] Other authors, such as Sher et al.[28], found a higher rate of full-thickness tears, close to 15% similar to our findings, likely because they are of an older age. Previous studies have mentioned that 90% of the tears were found in subjects older than 60 years. We identify that the shoulder pathology is correlated significantly with age in keeping with the findings noted by Moosmayer et al.[25] This increase in prevalence of tears with increasing age is consistent with findings in other studies.[29,30,31]

The literature on the presence of partial-thickness rotator cuff tears is scant. Milgrom et al.[32] documented a 17.2% frequency of partial-thickness supraspinatus tears less than our findings that was found to be 15(37.5%) with or without bursal thickness involvement ,on the other hand; another study found partial-thickness supraspinatus tears in 24% of the subjects, which was also possibly lower.[24] We did not find any reports of comprehensive evaluations of rotator cuff pathology correlated with occupation with which to compare our data.

26(6.7%) of our subjects had full-thickness tears of the infraspinatus tendon, this was more than the study that have mentioned that only2 cases have full thickness tear.[24]

No subject had a full-thickness tear of the subscapularis tendon this was consistent with Gandikota et al study.[24] No subject had a partial or full-thickness tear of the teres minor tendon on the other hand another finding in the rotator cuff was four cases (8%) of teres minor atrophy. Friend et al.[33] found teres minor atrophy in 3% of cases and hypothesized that this finding may be due to variations in teres minor innervation.

With regard to the long head of the biceps brachii tendon, no subject had a partial or full-thickness tear identified in this study. We did not find documentation of this type of tear in the literature. We found subacromial-subdeltoid bursal thickening subjects with impengment syndrome and calcify tendons with no tendenopathy seen in 13(43.3%) of the cases and the thickened areas contained bursal fluid. These results suggest that finding of subacromial-subdeltoid bursal abnormality is an indicator of symptomatic subacromial

impingement, this was not consistent with the findings done by Gandikota et al[24] and a study by Oschman et al.[29] that showed that 4% of subjects who had no symptoms, had the changes of subacromial subdeltoid bursitis. Among the cases of impingement syndrome in our study, we found that 3 (100%) were associated with subacromial-subdeltoid bursal effusion, another study also found three cases (6%) of impingement, all of which were asymptomatic have bursal effusion.

We acknowledge several possible limitations of this study. The sample was not large enough, and the children population was not included figuring ages below 20 years. There was no surgical confirmation or clinical follow-up were applied.

5. CONCLUSION

shoulder abnormalities were found in 100% of subjects complained of shoulder pain .The most common affected ages were between 43-52 years constituting14(35%) of the total sample. The most common abnormalities were subacromial- subdeltoid bursal thickening, Shoulder Impingement Syndrome, Calcify Tendinosis, Degenerative Changes, LHB Dislocation. A significant relationship is found between the patient's age, occupation and the ultrasound findings at $p \leq 0.003$ and 0.019 respectively.

With the presence of pain, we suggest that ultrasound findings should be interpreted closely with clinical findings, occupation and age to determine the cause.

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