Role of ultrasonography in diagnosis of rotator cuff disease

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Abstract

Back ground: The shoulder joint is an elegant and complex piece of machinery. The rotator cuff tendons are keys to the healthy function of the shoulder and rotator-cuff tear is an especially painful injury and can happen at any age.

Objectives; to evaluate the role of ultrasonography in the diagnosis of rotator cuff tear.

Patients and method; From March 2013 to September 2015 forty eight patients were enrolled in a prospective comparative study and divided into full thickness, partial thickness tear or intact tendons according to clinical and ultrasonographic criteria and these results were assessed by surgery and results compared.

Results: Sensitivity of clinical diagnosis was 95.3%., specifity 20% and predictive value 33.3% and sensitivity of ultrasonography was 100%, Specifity 37.5% and Predictive value of 100 %.

Conclusions; Ultrasonography is well tolerated and cost-effective and useful test in diagnosis and detection of rotator cuff tear.

Key words; rotator cuff tear, full thickness tear, partial thickness tear, intact tendon.

Introduction**:**

The prevalence of shoulder problems in patients presenting to a primary care facility in the United Kingdom, is estimated to be 2.4%, Thirty to seventy percent of such shoulder pain is due to disorders of the rotator cuff [1-3] .This shows how much of a financial burden they present to the healthcare system. In the 1960 s clinicians called the shoulder the "forgotten joint" at that time only plain films were available for its evaluation, in the sub acromial joint, the sub acromial sub deltoid bursa (SASDB) acts as joint cavity, The supraspinatus (SS), infraspinatus (I S), Terris minor (Tm) and subscapularis(ssc) constitute the rotator cuff (RC) which insert on greater and lesser tuberosity of the humerus [4-11], Shoulder joint motion depends on the congruity of the humeral head, the glenoid, the RC and the deltoid, its version or humeral retroversion projects the axis of the humeral head joint surface 25° to 40°from the coronal plane, whereas the glenoid surface is retroverted 4° to 12° with respect to the scapula, when rotator cuff tear (RCT) occurs the unopposed upward force of the deltoid causes impingement on the acromion. This system is so finely tuned that in a normal shoulder the center of rotation of the humeral head is near its geometric center (6+ 2mm) [416]

Diseases of the RC include inflammatory, degenerative as well as partial and total ruptures which can be in different shapes, the s.s.is involved in more than 90% of cases. ((It passes in three pathological stages: edema and hemorrhage, fibrosis and tendinitis, and bone spurs and tendon rupture, it affects Coracoacromial arch, SASDB, shoulder and end stage leads to arthropathy [5-21]

RCT is uncommon before the age of 40, pain may be nocturnal, and many tests may be positive painful arc, SS atrophy, Job's test, Impingement test, Neer Hawkins impingement sign, drop arm sign Shoulder shrug and abduction paradox in in full thickness tear (FTT) and partial thickness tear(PTT) according to Louis Solomon, David J. Warwick and Selvadurai Nayagam*:* Crass et Aland Middleton et al in 1984 were the first to describe ultrasonographic evaluation for rotator cuff tears. Ultrasonography (U/S) is safe, quick, low coast, allows evaluation of both shoulders at once, Specific tendons can be studied in details, pathology can be demonstrated before FTT and changes in the biceps tendon and deltoid can be identified. Depending on the suggestion of E. Craig; for FTT may be focal echogenicity, large defect, complete non visualization, marked thinning of the RC or thickening and for PTT Small defect or abnormal echogenicity [(4-26].

Patients and method: When assessing a patient with shoulder impingement, it is important to ascertain the integrity of the rotator cuff and the extent of the tear. This information allows the surgeons to plan a strategy for further management of the patient.

A prospective comparative study conducted at Al- Yermouk teaching hospital from March 2013 to September 2015 in which 48 patients were included who were suspected to have RCT (18 - 62) years, mean±sd (47.708±12.757)}after exclusion of 62 patients who improved by conservative treatment.

Full history and examination were done and the patients were divided into two groups according to the clinical criteria of Louis Solomon, David J. Warwick and Selvadurai Nayagam, then all patients were sent for ultrasonography of the shoulder.

U/S was done by combined examination. It was real time study. Two planes at least were done and decision depended on the criteria of E. Craig.

Then the 48 patients were subjected to surgery

for resistant to conservative treatment, operation done under general anaesthesia, deltoid splitting approach was used and carful assessment of the tendon was done and diagnoses was done as FTT or PTT accordingly then managed accordingly.

All the patients included in the study were interviewed and examined according to a questionnaire, the purpose and procedures of study were explained to all of the patients who accepted to participate in this study. Then the results were discussed accordingly.

Results: The taken number of patients was 48 patients, age range18-62 mean ±SD (47.708±12.757) (table 1), 26 males and 22 females, male/female ratio 1/1.1; table (2) shows distribution of study sample according to the basic variables.

Among the (48) patients and according to the criteria of clinical examination; (20) patients (41.7%) mean ±SD (53±7.629) were having FTT and (27) patients (56.25%) mean ±SD (43.7851±14.533) were having PTT (table 3).

The results of U/S were as follow: The number of patients who were diagnosed as having FTT was (18) patients 37.5% , mean±sd (50.666±9.774)(fig 1), 23 with PTT(fig 2) 47.9% mean±sd (43.5±15.247) and 7 found to have intact tendon 14.58 mean±sd (51±11.03) (table4).

The results of surgery: During surgery we found that (19) patients were having FTT 39.58% mean±sd (50.841±9.839), (26) were having PTT 54.1% mean±sd (44.538±14.645), and 3 patients were having intact tendon 6.25% mean±sd (54.666±3.785).

Sensitivity of clinical diagnosis was 95.3%., Specifity of clinical diagnosis was 20%, positive predictive value of clinical diagnosis was 33.3%., Sensitivity of U/s was 100%., Specifity was 37.5% and positive Predictive value of U/S was 100 %.(table:5).

Table 1: age distribution of RCT

age	FTT	ptt	Total
10-19	0	1	1
20-29	0	2	2
30-39	1	5	6
40-49	8	7	15
50-59	7	8	15
60-62	4	5	9
total	20	28	48
X2 =4.71 (calculated) df=8 X2 =15.51 (tabulated) statistically significant at p > 0.05			

Table (2) distribution of study sample according to age, sex and size

Type of tear	Mean age	gender				side			
		Male		Female		Dominant		Non dominant	
		No.	%	No.	%	No.	%	No.	%
FTT	46.2	12	25	7	14.58	13	27	6	12.5
PTT	42.4	12	25	14	29.1	19	39.58	7	14.58
Intact	47.1	2	4.1	1	2	1	2	2	4.1
Chi-square =1.48 P-value >0.05, Chi-square =1.98 P-value >0.05									

Table (3) the distribution of the study sample according to clinical findings compared to surgery

Type of the lesion according to surgery	Clinical findings					
	FTT		PTT		Intact tendon	
	No	%				
FTT no.19	17	89.4%	2	10.5%	0	0
PTT no.26	3	11.5%	23	88.4%	0	0
Intact tendon no.3	0	0	2	66.6%	1	33.3%
TOTAL 48	20	41.7	27	56.25%	0	0
Chi-square =23.94 P-value<0.000001						

Table (4) the distribution of the study sample according to U/S findings compared to surgery

Type of lesion according to surgery	Ultrasonographic finding					
	FTT		PTT		Intact tendon	
	No.	%	No.	%		
FTT no.19	16	84.2%	3	15.78	0	0
PTT no. 26	2	7.6%	20	76.9%	4	15.38%
Intact tendon no. 3	0	0	0	0	3	100%
Total no.48	18	37.5	23	47.9	7	14.58
Chi-square =26.9 P-value <0.00001						

Table 5; Comparison of clinical and U/S diagnosis regarding sensitivity, specicifity and predictive value

diagnosis	sensitivity	specicifity	predictive value
Clinical	95.3%.	20%	33.3%.
U/S	100%	37.5%.	100%
Chi-square = 22.8 p-value < 0.00002			

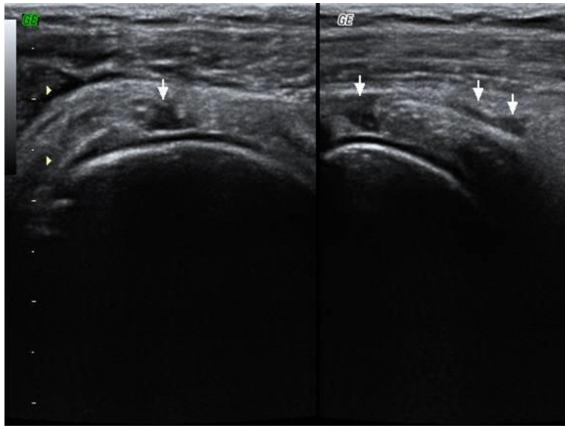

Fig 1 ultrasonography of FTT

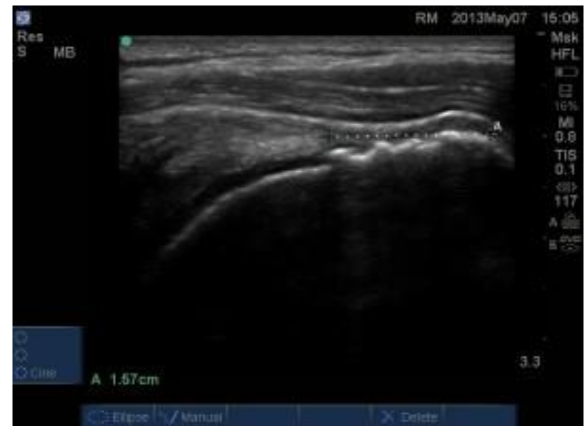

Fig 2 ultrasonography of PTT

Discussion;

The total number in our study was 48 patients, (20) of them were having FTT clinically and (28) were having PTT and this complies with the finding of Leman, et.al and K. Yamanaka and H. Fukuda and David &Eugene had higher percentage of FTT [6-29].

Age of patients was 18-62 mean±sd (47.708±12.757) years and this complies with what A. Graham Apley and Louis Salamon, and Craig A. Zeman. And Ghader and Imad M. Sarsam found [30-31].

The male\female ratio was (1/1.1) and this complies with the findings of Codman, Gartsman, Khan, and Morrison-Frogameni, but not with that of Craig A.Zemanor, Ghader and Imad M. Sarsam [7-34]

From the 19 patients found to have FTT by surgery 17; 89.4% were having FTT clinically, among the 26 patients found to have PTT by surgery 23; 88.4% were having PTT. This complies with the findings of K.Takais, and Koubunn Makino who reported 70-88% accuracy for u/s [35].

Sensitivity of clinical diagnosis was 95.3%, specifity was 20% and positive predictive value

was 33.3%.Dinnes et al recently reviewed 10 cohort studies on the clinical evaluation of the shoulder. Pooled data from four of these studies suggested that clinical examination as a whole has a sensitivity of 90% and a specificity of 54% in the detection of RCT. Litaker et al had found sensitivity and a positive predictive value of 76% and 79%, 88% and 70%, 64% and 78%, 97% and 67%, and 98% and 67%, (36-37).The difference in specifity to our results probably due to limited number we had taken.

From the 19 patients found to have FTT by surgery 16; 84.2% were having FTT by U/S, among the 26 patients found to have PTT 20; 76.9% were having PTT by U/S and 2; 7.6% were having FTT and 4; 15.38% were having intact tendons, and this complies with the findings of Craig S.Robert, Paavolainen, Brenneck,Taboury-F, Van Holsbeeck, but it doesn't comply with Msamore and 'Woodword finding (38-42). We think that the small number of patients appear to have intact RC by U/S may include those patients having severely restricted shoulder movement or their lesions obscured by the acromial process.

In our work U/S sensitivity was 100%, specifity of 37.5%., positive predictive value 100%, Van Holsbeeck et al reported a sensitivity and a specificity of 93% and 94%, respectively, for detection of RCT at U/S, Sensitivity of 100% and specificity of 94% have been reported with U/S in detecting retears. Ultrasonography had good sensitivity and specificity for the assessment of RCT (sensitivity 0.84, 0.96; specificity 0.89, 0.93) (43-45)

Conclusion: RCT affect different age groups, mainly those who are above the age of 40 years. Ultrasonography is well tolerated and cost-effective and useful test in diagnosis and early detection of RCT and this will help in the arranging the management of this disease. Its disadvantages include a long learning curve and reduced sensitivity in patients who are obese or who have severely restricted shoulder movement.

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