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Radiology

Sonographic Measurements of Normal Supraspinatus Tendon Width and Thickness in Sudan

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Abstract: The supraspinatus tendon is one of the four rotator cuff tendons; it lies on its superior aspect and arises from the supraspinous fossa of the scapula and scapular spine. The aim of the study was to measure the width and thickness of normal supraspinatus by ultrasound among Sudanese population. The study was conducted on a seventy-seven Sudanese population from both gender, 49 females and 28 males scanned by ultrasound machine with the participant sitting on a rotating stool and Place the participant's arm posteriorly, placing the palm side of the hand on the superior aspect of the iliac wing with the elbow flexed and directed posteriorly. There was a correlation between supraspinatus tendon thickness and volunteers body weight, height and age. The best correlation was between the supraspinatus tendon and volunteer's body weight followed by the supraspinatus tendon and volunteer's height and finally the correlation between the supraspinatus tendon and volunteer's age. The mean standard of supraspinatus tendon thickness was 4.8 ± 0.76mm, the mean standard of supraspinatus tendon width was 26.06 ± 3.11mm, and therefore we should take the supraspinatus tendon measurements in addition to the essential Rotator Cuff measurements.
Keywords: Supraspinatus, tendon, thickness and Ultrasound.

INTRODUCTION

Musculoskeletal ultrasound has expanded opportunities in the field of diagnostic ultrasound. The modality is readily available, economical, and portable. Its real time capability helps render clinical correlation of the site of pain and aids in comparison with the contra lateral side.

Movement of tendons and joints can be directly visualized with dynamic ultrasound scanning. Unlike other applications musculoskeletal ultrasound is usually not affected by body habitus, motion artifacts, or intervening structures such as bowel gasses. Structures such as tendons are better visualized with ultrasound than MRI. Tendons appear as signal void on MRI but show a characteristic internal architecture on ultrasound [1]. Imaging of the muscular system is not limited to the muscles themselves, but also includes the tendons, nerves, ligaments, and bursa [2].

Shoulder ultrasound has been the most prominent application of musculoskeletal imaging, as it has been used to evaluate the rotator cuff since the mid 80s.during the early days, lower frequency transducers of 7.5 MHz were used. Combined with limited experience, this was probably the reason for the low reported sensitivity of around 70% advances in transducer technology with frequencies reaching 13 to 15 MHz have improved the near- field resoluation considerably and given shoulder and musculoskeletal ultrasound a much needed boost[1].

The supraspinatus arises from the supraspinous fossa of the scapula and scapular spine. The tendon passes underneath the acromion and above the glenohumeral joint over the superior aspect of the shoulder joint to inserts on the superior aspect of the greater tuberosity; its footprint or attachment averages 2.25 cm (approximately 23 mm in width) measured anterior to posterior, of which the 13 mm inserts onto the superior facet and the posterior 10 mm inserts onto the anterior aspect of the middle facet and 6 mm in thickness (figure 1), which covers the superior facet and the anterior portion of the middle facet of the greater tuberosity posterior to the scapula and inferior to the scapular spine, and the normal tendon shows a smooth, convex superior surface. It is separated from the acromion, coracoacromial ligament and deltoid

muscle by the subacromial - subdeltoid bursa. Anatomic studies indicate that the supraspinatus consists of two distinct portions: ventral and dorsal [3-6].

OBJECTIVES

The aim of this study was to measure the thickness and width of normal supraspinatus tendon by ultrasound among Sudanese population.

MATERIALS AND METHODS

This is a cross sectional study dealing with normal Sudanese volunteers, during the period between June 2016 and June 2018. A seventy-seven of normal volunteers were selected randomly by the technique of simple random sample. The primary data was collected from data collection sheets by using different types of ultrasound machine i.e- Snoace x4, Mindary DP 1100 Plus, and Toshiba, Xario200 with electronic 7.5MHZ lineararray probe, ultrasonic gel, height meter, and measuringinstrument[1].

The examination was performed with the participant sitting on a rotating stool and Place the participant's arm posteriorly, placing the palm side of the hand on the superior aspect of the iliac wing (toward the gluteal muscles) with the elbow flexed and directed posteriorlyin the so-called 'arm lock' position[7].

RESULTS AND DISCUSSION

The study was done on normal volunteers, 49 females and 28 males. The mean age was 24.2, the maximum limit of volunteer's height was 186 cm and the minimum limit was 131 cm, and the maximum limit of volunteers weight was 94 kg and the minimum limit was 40 kg. In The study the supraspinatus thickness ranged from 3-6.8mm and the mean was found to be 4.83 ± 0.76 mm, the supraspinatus width ranged from 20 - 34.4mm and the mean was 26.06 ± 3.11mm (Table 1).

The study clarified that the mean supraspinatus thickness and width more in males than females, for males were 5.07 ± 0.78mm, 28.29 ± 2.97mm and 4.69± 0.70mm, 24.78 ± 2.40mm for females respectively (Table 2). Also the mean supraspinatus thickness and width more in right side than left, which found to be 4.94± 0.75mm, 26.1± 3.09mm for right side and 4.7± 0.74mm and 26.01± 3.16mm respectively (Table3). Also these results are in line with study done by ShanmugamKarthikeyan, Santosh B. Rai, Helen Parsons, Steve Drew, Christopher D. Smith and Damian R. Griffin and found that the mean thickness of the supraspinatus tendon was 4.9 mm in women and 5.6 mm in men. Also these results are in line with study done by E Uchendu MBBS, OO AyoolaMBChB, FMCR, VA Adetiloye MBBS, FWACS, FMCR, RT Ikem BM BCh, FMCP, FACE, IC Ikem BM BCh, FMCS Orthop, FWACS, FICS and found that the mean thickness was greater in males than females, which found to be 5.30 ± 0.72mm and 5.18 ± 1.05mmrespectively[8,9].

The study revealed that the mean supraspinatus thickness in age group 16-26 years was 4.83 ± .074mm, in 27-37 years was 4.66 ± 0.70mm and in 38-45 years was 5.30 ± 0.09mm, and the mean supraspinatus width was increased slightly and gradually as age increased it was 25.53 ± 3.10mm for 16-26 years, 26.71 ± 2.69mm for 27-37 years and 27.32 ± 7.5mm for 38-45 years respectively, These results are disagree with study done by Kyeongwon Kim *et al*. and revealed that the measurements of supraspinatus, subscapularis and deltoid thickness showed tendency of increase with the age (Table 4)[10].

The study found that there was a significant correlation between the supraspinatus thickness and volunteer's weight and Height, the P- value was 0.00 and 0.001 respectively, but there was no a significant correlation between the supraspinatus thickness and volunteer's age [the P- value was 0.190 and r= 0.160] also there was a significant correlation between the supraspinatus width and volunteer's age, weight and Height, the (P- value was 0.00) for all variables (Table 5).

Table -1: Shows the Minimum, Maximum and Mean of volunteer's age, weight, height and supraspinatus thickness and width

Variables	N	Minimum	Maximum	Mean	Std. Deviation
age	154	16	45	24.23	6.661
Weight	154	40.00	94.00	60.3636	11.81216
Height	154	131.00	186.00	165.142	9.38183
SS thickness	154	3.00	6.80	4.8370	.75641
SS width	154	20.00	34.40	26.0636	3.11786
Valid N (listwise)	154				

Table -2: Shows Mean and Stander Deviation of supraspinatus thickness and width in males and females

sex		SS thickness	SS width
Male	Mean	5.0786	28.2964
	Std. Deviation	.78479	2.97187
	Minimum	3.40	20.60
	Maximum	6.80	34.40
Female	Mean	4.6990	24.7878
	Std. Deviation	.70732	2.40884
	Minimum	3.00	20.00
	Maximum	6.50	30.60
Total	Mean	4.8370	26.0636
	Std. Deviation	.75641	3.11786
	Minimum	3.00	20.00
	Maximum	6.80	34.40
P value		0.002	0.000

Table-3:Shows Mean and Stander Deviation of supraspinatus thickness and width in right and left sides

side		SS thickness	SS Width
Right	Mean	4.9455	26.1169
	Std. Deviation	.75543	3.09279
	Minimum	3.30	20.60
	Maximum	6.80	33.30
Left	Mean	4.7286	26.0104
	Std. Deviation	.74655	3.16209
	Minimum	3.00	20.00
	Maximum	6.30	34.40
Total	Mean	4.8370	26.0636
	Std. Deviation	.75641	3.11786
	Minimum	3.00	20.00
	Maximum	6.80	34.40
P value		0.075	0.833

Table-4:Shows Mean and Stander Deviation of supraspinatus thickness and width in different age groups

Age		SS thickness	SS Width
16-26 years	Mean	4.8316	25.5351
	Std. Deviation	.74553	3.10603
	Minimum	3.20	20.00
	Maximum	6.80	34.40
27-37 years	Mean	4.6607	26.7107
	Std. Deviation	.70519	2.69476
	Minimum	3.00	21.60
	Maximum	6.00	31.00
38-45 years	Mean	5.3000	29.5750
	Std. Deviation	.84531	.93237
	Minimum	3.90	27.90
	Maximum	6.50	30.60
Total	Mean	4.8370	26.0636
	Std. Deviation	.75641	3.11786
	Minimum	3.00	20.00
	Maximum	6.80	34.40
P value		0.048	0.00

Table-5:Shows the correlation between the supraspinatus thickness and width and volunteer's age, weight and Height

		age	weight	height	SS thickness	SS Width
SS thickness	Pearson Correlation	.106	.299**	.265**	1	.363**
	Sig. (2-tailed)	.190	.000	.001		.000
	N	154	154	154	154	154
SS Width	Pearson Correlation	.381**	.420**	.556**	.363**	1
	Sig. (2-tailed)	.000	.000	.000	.000	
	N	154	154	154	154	154
**. Correlation is significant at the 0.01 level (2-tailed).						

Image-1: U/S Image of 27 years female shows the thickness and width of Supraspinatus tendon

CONCLUSION

From this study we found that there is correlation was between supraspinatus thickness and volunteer's weight followed by the supraspinatus thickness and volunteer's height and there was no correlation between the supraspinatus thickness and volunteer's age. Also there was a significant correlation between supraspinatus width and volunteer's age, weight and height. The mean age was 24.2, the maximum limit of volunteer's height was 186 cm, the minimum limit was 131cm, the maximum limit of volunteer's weight was 94kg, minimum was 40 kg, the maximum limit of supraspinatus thickness was 6.8mm and the minimum was 3mm, and the maximum limit of supraspinatus width was 34.4mm and the minimum was 20mm.. According to this study the mean standard for supraspinatus thickness was 4.8mm and for supraspinatus width was 26.06mm.

RECOMMENDATION

We should take the supraspinatus thickness and width measurement in addition to the essential Rotator Cuff measurements.

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