Sudan University of Science &Technology

College of Graduate Studies

Study the Impact of Physical Efforts on the Shoulder Tendons for the People with Different Jobs Using Ultrasounography

دراسة اثر المجهود الجسدي على اربطة الكتف لدي الاشخاص ذوي المهن المختلفه باستخدام التصوير بالموجات فوق الصوتيه

A thesis Submitted for Partial Fulfillment of the Requirements of MS.c Degree in Medical Diagnostic Ultrasound

By:

Alaa Abdallah Siralkatim Mohammed

Supervisor:

Dr. Caroline Edward Ayad

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الايه

بسم الله الرحمن الرحيم

قال تعالي :

(وَعَلَّمَ آدَمَ الْأَسْمَاءَ كُلَّهَا ثُمَّ عَرَضَهُمْ عَلَى الْمَلَائِكَةِ فَقَالَ أَنبِئُونِي بِأَسْمَاءِ هَٰؤُلَاءِ إِن كُنتُمْ صَادِقِينَ * قَالُوا سُبْحَانَكَ لَا عِلْمَ لَنَا إِلَّا مَا عَلَّمْتَنَا ۖ إِنَّكَ أَنتَ الْعَلِيمُ الْحَكِيم *)

صدق الله العظيم

سورة البقره الايه 32-31

Dedication

I dedicate this work to my Dad who has always been a constant source of support; positive energy andencouragement he encouraged me during my whole live and still my inspiration

To my Mam for her unconditioned love and support

To my sisters and brothers

I also dedicate this thesis to my beloved husband; who has encouraged me all the way and whose encouragement has made sure that I give it all it takes to finish and to my sweet heart Jud.

. My love for you all can never be quantified.

Finally I would like to thanks every one participate in this work .

Acknowledgment

Gratefully I would like to thanks ALLAH who help me to finish this work successfully

I would like to send my greatest thanks and respect to Dr.Caroline Edward Ayad for here kindly supervising this study ,and the thanks are extended to Mohmmed Nafiea sonograhper at Kosti hospital for his co-operation

Finally I would like to thanks anyone who gave me any type of support

Abstract

This was cross section study carried out in ultrasound department of Sudan university of science and technology (SUST) and kosti hospital , during the period from September 2018 to November 2018.MSKUS is consider as cost effective diadnostic modality to screen rotator cuff tears. Increase the thickness of rotator cuff tendons may indicate pathology ,there for the cut of point normal thickness should be known the question to be answer :can ultrasound be able to identify the normal thickness of shoulder tendons. The aim of this thesis was to study the impact of physical effort on shoulder tendons for people with different jobs using ultrasonography. The data was collected from 50 subjects 33 male, 17 female with known age ,job, dominant hand also the thickness of RT SST , RT LHB and RT SCT and LT SST, LT LHB and LT SCT the data were analyzed using SPSS program .The results showed that there was no statistical correlation between SST ,LHB and SCT and age but there was increase in thickness of LHB and SST by 0.007mm and increase in thickness of SCT by 0.006 mm .also there in no significant correlation between LHB ,SCT , SST and dominant and non dominant hand p values was (0.53 ,0.51 and 0.91 respectively) also no significant correlation with gender p values was (0.20 ,0.56, 0.55 respectively) , also was no significant correlation with job p values >0.05 .

This study defind the normal thickness values of supraspinatois, long head of biceps and subscapularis tendons.

ملخص البحث

هذه دراسة مقطعية اجريت بقسم الموجات فوق الصوتيه بجامعة السودان للعلوم والتكنولوجيا و مستشفى كوستي في الفترة الزمنيه من سبتمبر 2018 حتى نوفمبر 2018.

يعتبر التصوير بالموجات فوق الصوتية وسيلة تشخيصية فعالة لتشخيص اصابات اربطة الكتف. زياده سمك اربطة الكتف عن الحد الطبيعي قد يدل علي وجود بعض الامراض بالكتف لهذا السبب يجب معرفة الحد الطبيعي لسمك اربطة الكتف ,السؤال الذي يجب الاجابة عليه بواسطة هذه الدراسة هو هل يمكن للموجات الصوتية المقدرة علي تحديد السمك الطبيعي لاربطة الكتف .الهدف الاساسي من هذه الدراسة هو دراسة اثر المجهود الجسدي علي اربطة الكتف لدي الاشخاص ذوي المهن المختلفة باستخدم التصوير بالموجات فوق الصوتية .جمعت البيانات من 50 شخص ,33 انثى و17 ذكر بمعرفة العمر والوظيفة والطرف المهيمن وايضا بمعرفة سمك وتر الكتف فوق الشوكي الأيمن والوتر الطويل لدي العضله ذات الرأسين الأيمن والوتر تحت الكتفي الأيمن و سمك وتر الكتف فوق الشوكي الأيسر والوتر الطويل لدي العضله ذات الرأسين الأيسر والوتر تحت الكتفي الأيسر. تم تحليل البيانات بواسطه برنامج تحليل احصائي .

اثبتت النتائج عدم وجود علاقة احصائية بين سمك وتر الكتف فوق الشوكي والوتر الطويل لدي العضله ذات الرأسين والوتر تحت الكتفي وبين عمر الاشخاص ولكن هنالك زياده في سمك وتر الكتف فوق الشوك والوتر الطويل لدي العضله ذات الرأسين بمعدل 0.007 ملم وزياده في سمك الوتر تحت الكتفي بمعدل 0.006 ملم .ولا توجد علاقة احصائية بين سمك وتر الكتف فوق الشوكي والوتر الطويل لدي العضله ذات الرأسين والوتر تحت الكتفي وبين الطرف المهيمن حيث القيم المحتمله (0.53, 0.51, 0.91) بالتتالي .و ولا توجد علاقة احصائية بين سمك وتر الكتف فوق الشوكي والوتر الطويل لدي العضله ذات الرأسين والوتر تحت الكتفي وبين او النوع حيث القيم المحتمله (0.20, 0.56, 0.55) بالتتالي. ولا توجد علاقة احصائية بين سمك وتر الكتف فوق الشوكي والوتر الطويل لدي العضله ذات الرأسين والوتر تحت الكتفي وبين الوظيفة حيث القيم المحتمله > 0.05.

سلطت هذه الدراسة الضوء علي قيم السمك الطبيعي لوتر الكتف فوق الشوكي والوتر الطويل لدي العضله ذات الرأسين والوتر تحت الكتفي

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List of Abbreviations

Abbreviations	Meaning
BPD	Bi partial Diameter
CRL	Crown Rump Length
MSKUS	Musculoskeletal ultrasound
RC	Rotator cuff
SST	Supraspinatous tendon
SCT	Subscapularis tendon
LHB	Long head of bicebs
MRI	Magnetic resenos imaging
CT	Computed tomography
SA SD	Subacromialsubdeltoid
RUSI	Rehabilitative Ultrasound Imaging
MRA	Magnetic Resonance Arthrography
SA-SD	subacromial-subdeltoid
BMI	Body mass index
TM	Teres minor
Rt	Right
Lt	Left

Chapter one

Introduction

1-1 Introduction :

Musculoskeletal ultrasound MSKUS is imaging technique which adds a different and complimentary dimension of imaging evaluation to the traditional modalities of plain radiography, computerized tomography (CT), and magnetic resonance imaging (MRI). Recognized advantages of the modality the relatively low cost of the procedure compared with advanced imaging technique. Other advantages of the modality include an ability to image patients with a contraindication to MRI (e.g., patients with some types of pacemakers) and that ultrasound experiences much less artifact when imaging patients with surgical hardware. It is also allows dynamic evaluation of patients, which can improve radiologic interpretation of the clinical relevance of findings seen in a static image.(Nazarian, 2008).

MSKUS is considered as cost-effective diagnostic modality to screen rotator cuff tears. From systematic reviews of all studies, pooled sensitivities and specificities are 0.95 & 0.96 respectively and Sensitivity figures of 0.98 are obvious when using transducer of 10 MHz or greater(Ottenheijm, Jansen et al. 2010) In another study, the sensitivity and specificity ranges were given as follow: 92.4% to 96% and 93% to 94.4% respectively for diagnosis of full thickness tears through MSKUS whereas from 66.7% to 84% and from 89% to 93.5% respectively for partial thickness tear from same imaging tool(De Jesus, 2009).

Rotator cuff injuries are the most common causes of painful shoulder in the elderly, accounting for up to 70% of cases and supraspinatus tendon is the most commonly involved tendon among all rotator cuff (RC) injuries. Severe supraspinatus tendon injury may affect the patient's quality of life. However, supraspinatus tendon injury can be relatively asymptomatic in some cases and may require imaging examination for diagnosis(keener ,2012)Rotator cuff (RC) disorders can be diagnosed through various imaging tools like MSKUS which is also known as Rehabilitative Ultrasound Imaging (RUSI), Magnetic Resonance Imaging (MRI) and Magnetic Resonance Arthrography (MRA)(Roy, 2015).

The rotator interval contains several important anatomical structures that contribute to the stability and normal function of the shoulder joint including the biceps tendon, coracohumeral ligament, superior glenohumeral ligament, rotator interval capsule, anterior fibers of the supraspinatus tendon, and superior fibers of the subscapularis tendon. Rotator interval pathology is associated with biceps instability, glenohumeral instability, and adhesive capsulitis, all of which can be challenging to clinically diagnose and treat.(Beltran, 2014)

Despite significant study into the anatomy and biomechanics of the shoulder, there is a limited amount of information regarding the thickness of the rotator cuff tendons near their insertions. Although some informative studies have been published describing the thickness of the more commonly torn supraspinatus, the other tendon insertions of the rotator cuff (infraspinatus, teres minor and subscapularis) have been largely overlooked. In addition, many of the studies that have measured rotator cuff thickness have been minimally descriptive in the precise locations where tendon measurement occurred. Detailed representation of the rotator cuff is essential in creating accurate models that can further establish links between the biomechanics of the shoulder and pathophysiology of rotator cuff tendon disease. As there is an increased frequency for rotator cuff pathology to develop along the articular margin, this remains an area of higher interest.

Therefore, the purpose of our study was to measure the insertion thickness of LHB, Subscapularis and supraspinatous.(Sessions,et al.2017)

1-2 Problem of the study:

Shoulder pain is the most common musculoskeketaldisorder.Rotator cuff injuries are the most common causes of painful shoulder in eldery .MSKUS is consider as cost effective diadnostic modality to screen rotator cuff tears.this study highlighted the normal thickness values of supraspinatous ,long head of biceps and subscapularisbecause increase thickness of rotator cuff tendons may indicate pathology,there for the cut of point normal thickness should be known the question to be answer :can ultrasound be able to identify the normal thickness of shoulder tendons.

1-3 Objectives of the study:

1-3-1General objective:

To study the impact of physical effort on the shoulder tendons in subjects with different jobs using ultrasoungraphy .

1-3-2 Specific objectives:

- To assess effect of physical effort on supraspinatous,long head of biceps and subscapularis tendon,s thickness.
- To compare the tendons thickness values to stander thickness values.
- To compare right shoulder tendons thickness values to left shoulder tendons thickness values.
- To compare between male and female shoulder tendons thickness.

- To compare Rt-handed shoulder tendon thickness to Lt-handed shoulder tendon thickness.

1-4 overview of the study:

This study consists of five chapters:

Chapter one consist of the introduction, problem of the study and objectives.

Chapter two includes Literature review (anatomy, physiology, pathology).

Chapter three deal with methodology where it is provide out line of material& method used to acquired the data and method of analysis.

Chapter four consist of the result presentation .

Finally Chapter five includesdiscussion, conclusion and recommendation.

Chapter two

Literature review and previous study

2-1 Anatomical back ground:

The main function of the joints of the shoulder girdle is to move the arm and hand into almost any position in relation to the body. As a consequence the shoulder joint is highly mobile, where stability takes second place to mobility, as is evident from the shape of the osseous structures: a large humeral head lying on an almost flat scapular surface. Stability is provided mainly by ligaments, tendons and muscles; the bones and capsule are of secondary importance. The function of the shoulder girdle requires an optimal and integrated motion of several joints. In fact five 'joints' of importance to 'shoulder' function can be distinguished:The glenohumeral joint ,The acromioclavicular joint ,The sternoclavicular joint ,The subacromial joint or subacromial gliding mechanism the space between the coracoacromial roof and the humeral head, including both tubercles. This is the location of the deep portion of the subdeltoidbursa,Thescapulothoracic gliding mechanism this functional joint is formed by the anterior aspect of the scapula gliding on the posterior thoracic wall.(OmbregtLudwig,2013)

The shoulder girdle, or pectoral girdle as it is also known, is composed of two main components on either side the scapulae posteriorly and the clavicles anteriorly.(C.Harringgton,2010)

2-1-1 The scapula:

The scapula is a thin sheet of bone that functions mainly as a site of muscle attachment . Its medial border is parallel to the spine, the lateral and superior borders are oblique. It has a superior, a lateral and an inferior angle. The inferior angle corresponds to the interspinal level between the spinous processes of T7 and T8. The scapula contains four processes: the acromion, the coracoid, the spine and the articular process (the glenoid). The dorsum of the scapula is convex. It is divided by its spine into two fossae: the supraspinal and infraspinal fossa, containing the corresponding muscles. The scapular spine runs from the junction of the upper and middle third of the medial border, where it is rather flat, and corresponds to the level of the third thoracic spinous process. Laterally it becomes more prominent and meets the acromion at a right angle posteriorly. This angle is easily palpable and is one of the main bony landmarks at the shoulder. The acromion turns further anteriorly and covers part of the humeral head. The coracoid process is found at the anterior aspect of the scapula. The tip points outwards and is easily palpated inthe lateral part of the subclavian fossa. Further down, on theanterior aspect of the scapula, is a large concavity which contains the subscapularis muscle. At the lateral angle, just beyond the neck of the scapula, is the glenoid fossa. This has a rather shallow surface, which is directed anterolaterally and slightly cranially tilted. It is approximately one-quarter the size of the humeral head and this, plus its shallow concavity, makes the joint both very mobile and vulnerable to (sub)luxations.The ventral surface of the scapula is flat and covered withthe attachment of the subscapularis muscle, except for themedial border and inferior angle where the serratusanteriormuscle is inserted.(OmbregtLudwig,2013).

2-1-2 The Clavicle:

The clavicle joins the sternum to the acromion. At its medial end it has a forward convexity whereas its lateral end is rather more concave .The joint capsules of both the sternoclavicular and the acromioclavicular joints are reinforced by several ligaments. The clavicle has many muscular and ligamentous attachments. The insertion of the coracoclavicular ligament is of practical importance. It is found laterally on the inferior aspect of the clavicle, and just medial to it is the origin of the subclavius muscle. The clavicle gives support to the shoulder girdle by acting as a strut between scapula and sternum. Due to its S-shape, the outer end describes a much larger rotation during arm elevation than its inner end. Therefore, lesions of the acromioclavicular joint ligaments are more frequent than are lesions of the sternoclavicular joint ligaments.(OmbregtLudwig,2013).

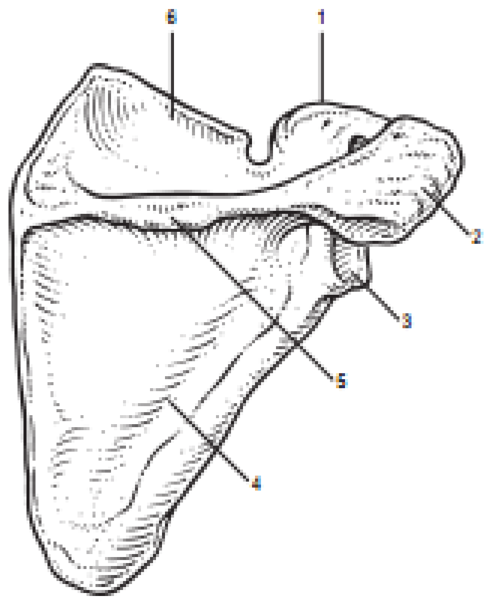

Figure 2-1: A Posterior view of the scapula: 1, coracoid process; 2, acromion; 3, glenoid; 4, infraspinal fossa; 5, scapular spine; 6, supraspinal fossa.(OmbregtLudwig,2013)

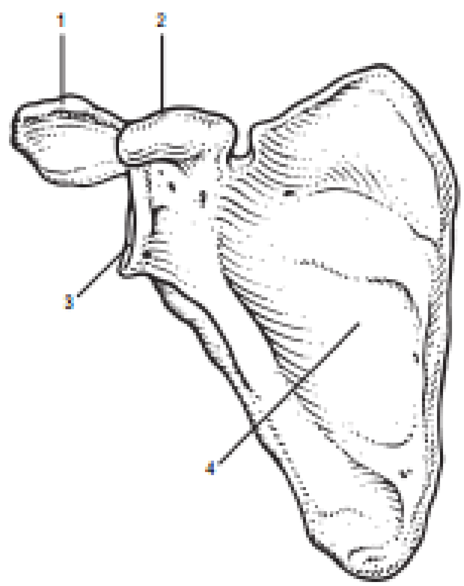

Figure 2-2: An Anterior view of the scapula: 1, acromion; 2, coracoids process; 3, glenoid fossa; 4, anterior surface.(OmbregtLudwig,2013)

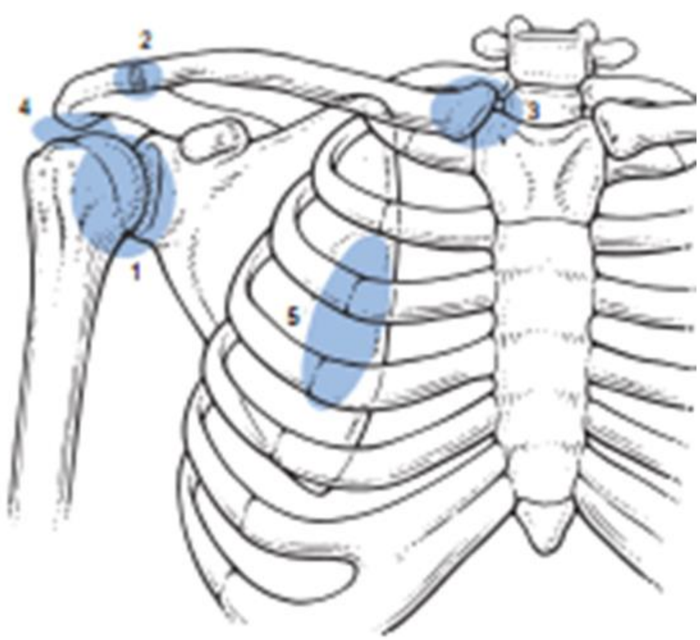

Figure 2-3: A view of all five joints of the shoulder girdle: 1, glenohumeral joint; 2, acromioclavicular joint; 3, sternoclavicular joint; 4, subacromial joint or subacromial gliding mechanism; 5, scapulothoracic gliding mechanism(OmbregtLudwig,2013)

2-1-3 The Rotator Cuff

The rotator cuff is considered the dynamic stabilizer of the shoulder joint. The rotator cuff comprises four muscles and their musculotendinous attachments;

• subscapularis

• supraspinatus

• infraspinatus

• teres minor

The subscapularis muscle originates on the scapula and inserts on the lesser tuberosity of the humerus. the muscle and tendonhorizontal orientation., this orientation requires a longitudinaltransducer position in order to image the tendon in a transverse plane and vise versa. (C.Harringgton,2010)

The supraspinatus and infraspinatus muscles both originate on the scapula and insert on the greater tuberosity. The teres minor muscle also originates on the scapula and inserts on the greater tuberosity. (C.Harringgton,2010)

The insertion site of the rotator cuff tendon at the greater tuberosity ,is often referred to as the footprint. The infraspinatous andteres minor fuse near their musculotendinous junctions, while thesupraspinatousand subscapularis tendons join as a sheath that surrounds the biceps tendon at the entrance of the bicipital groove. The supraspinatus is most commonly involved in a rotator cuff tear.during abduction of the arm, moving it outward and away from the trunk, the rotator cuff compresses the glenohumeral joint, an action known as concavity compression, in order to allow the large deltoid muscle to further elevate the arm. In other words, without the rotator cuff, the humeral head would ride up partially out of the glenoid fossa, lessening the efficiency of the deltoid muscle. The anterior and posterior directions of the glenoid fossa are more susceptible to shear force perturbations as the glenoid fossa is not as deep relative to the superior and inferior directions. The rotator cuff's contributions to concavity compression and stability vary according to their stiffness and the direction of the force they apply upon the joint. (OmbregtLudwig,2013)In addition to stabilizing the glenohumeral joint and controlling humeral head translation, the rotator cuff muscles also perform multiple functions, including abduction, internal rotation, and external rotation of the shoulder. The infraspinatus and subscapularis have significant roles in scapular plane shoulder abduction , generating forces that are two to three times greater than the force produced by the supraspinatus muscle.(Escamilla, 2009)However, the supraspinatus is more effective for general shoulder abduction because of its moment arm.The anterior portion of the supraspinatus tendon is submitted to significantly greater load and stress, and performs its mainfunctional role.(Soslowsky, L.J,1997).

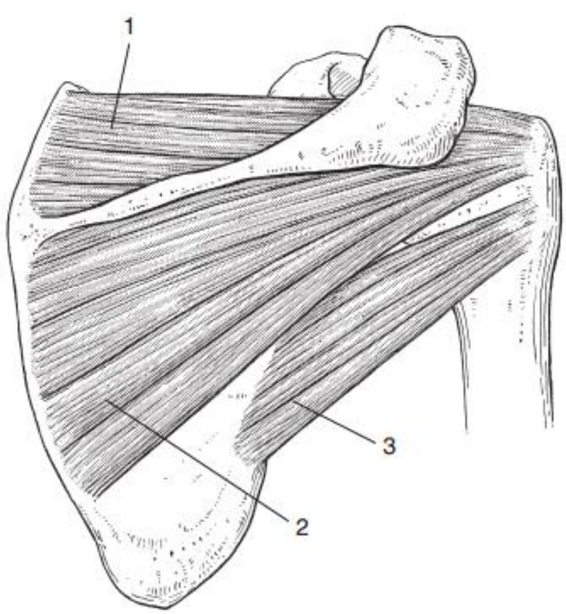

Figure 2-4: A Posterior view of the scapula: 1, supraspinatous muscle and tendon 2, infraspinatous muscle and tendon 3, teras minor (OmbregtLudwig,2013)

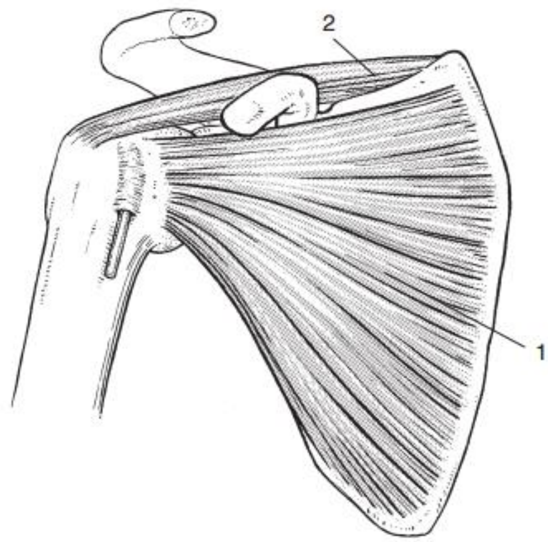

Figure 2-5: An anterior view of the scapula 1 subscapularis muscle and tendon ,2supraspinatous muscle and tendon(OmbregtLudwig,2013)

2-1-4 The Long Head Of Biceps (LHB):

It is originates at the most superior portion of the glenoid at the supraglenoid tubercle and glenoid labrum. From its origin, the tendon which averages approximately 9 cm. in length, courses obliquely across the top of the humeral head into the bicipital groove, where it measures a maximum of 4.7 mm. in depth. The LHB is intra-articular, but extrasynovial. Within the bicipital groove, the biceps tendon is restrained by the transverse humeral ligament, which traverses either

side of the groove formed by the greater and lesser tuberosities of the humerus, as well as the medial portion of the coracohumeral ligament.
The bicipital groove averages 4.3 mm in depth. Grooves which are less than 3 mm deep are considered shallow, with a higher risk of LHB dislocation or subluxation.

Also of interest, the medial aspect of the bicipital groove, formed by the lesser tuberosity of the humerus, forms a lower sidewall of the groove than does the lateral, greater tuberosity, resulting in a higher incidence of medial subluxation of the LHB than lateral. the biceps tendon, along with the rotator cuff, serves to stabilize the head of the humerus within the shoulder joint. It also aids in the prevention of impingement. (C.Harringgton,2010)

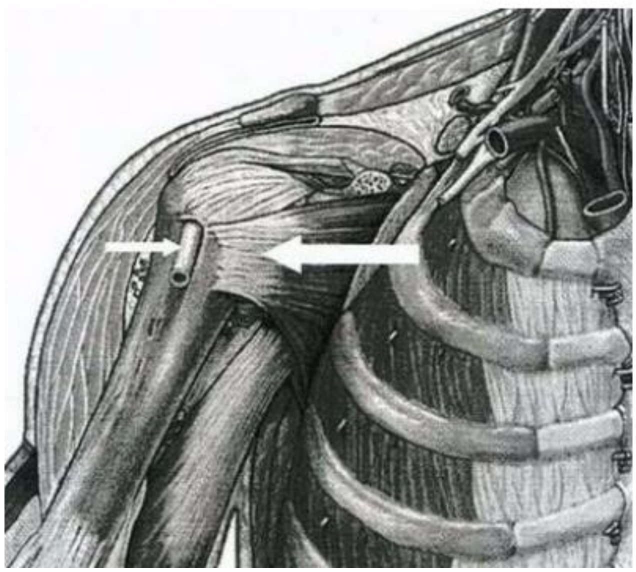

Figure 2-6: the long head of the biceps brachiitendon (small white arrow) at the same level, within the bicipital groove, just lateral to the insertion of the subscapularis tendon (large white arrow). (C.Harringgton,2010)

2-1-5 Ligament of shoulder joint:

- coracohumeral ligament - connects the coracoid process of the scapula to the greater tubercle of the humerus.
- glenohumeral ligament - connects the edge of the glenoid fossa to the lesser tubercle and anatomical neck of the humerus.

- transverse humeral ligament runs between the greater and lesser tubercles of the humerus, creating a canal through which the long head of the biceps tendon passes.
- glenoid labrum - attach along the margin of the glenoid cavity, forming a rim which serves to make the cavity deeper. (C.Harringgton,2010)

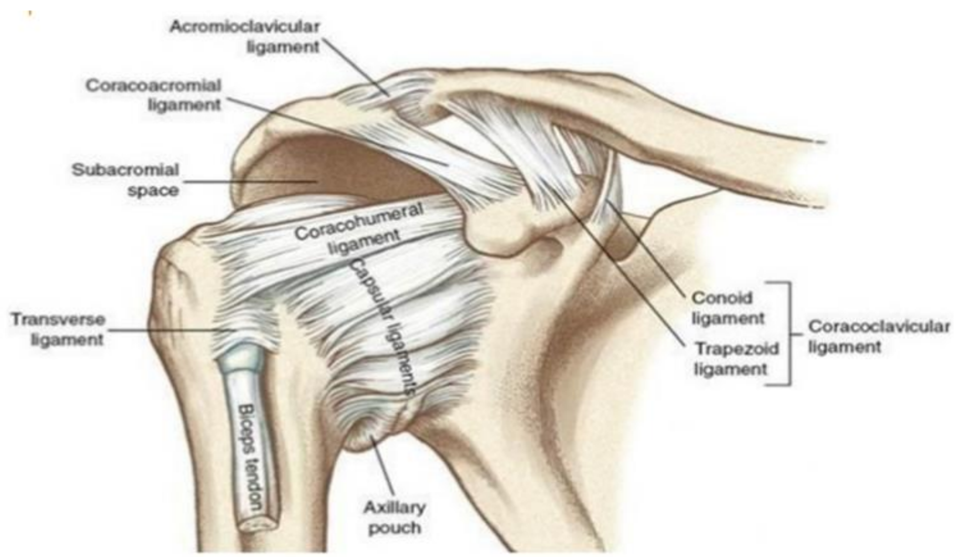

Figure 2-7:shoulder ligaments (Slideshare.net, 2018)

2-1-6 Bursae of shoulder:

Several bursae are associated with the shoulder joint. These include:
• the subscapular bursa - located between the joint capsule and the tendon of the subscapularis muscle

• the subdeltoid bursa - located between the joint capsule and the deep surface of the deltoid muscle

• thesubacromial bursa - located between the under surface of the acromion process of the scapula and the joint capsule.

• the subcoracoid bursa - located between the coracoid process of the scapula and the joint capsule Of the four bursae, the subscapular bursa is usually continuous with the synovial capsule surrounding the shoulder joint. The other bursae do not communicate with the joint cavity, but may communicate with each other . (C.Harringgton,2010)

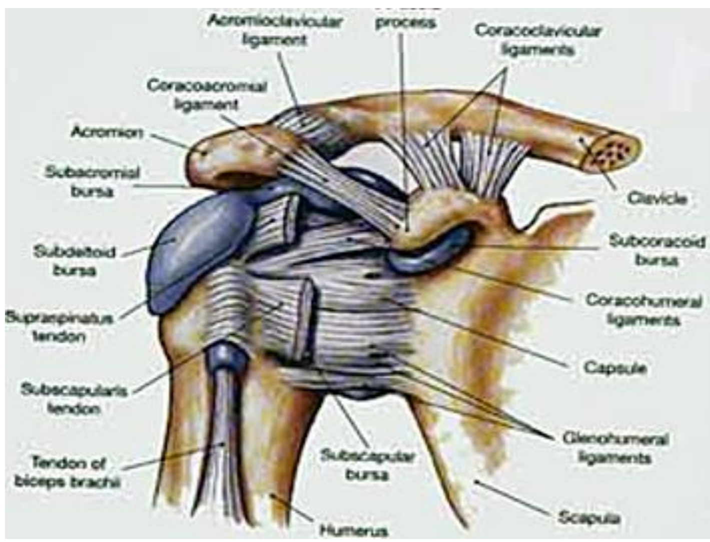

Figure 2-8:shoulder ligaments and bursae (Physiopedia. 2018)

2-2 SonographicAppearance :

*s*ubcutaneous Fat is relatively hypoechoic with thin septations of connective tissue The thickness of this layer depends on the body habitus of the subject .

M*uscle* when scanned longitudinally, appears as slabs of irregularly striated hypoechoic tissue contained within the thin hyperechoic lines of fascia. Viewed transversely, muscle striations or septa appear dotted and punctuate, or form short lines. Fascial lines separate muscle compartments.

Tendons have a characteristic pattern of fine parallel lines when viewed longitudinally . They are more echogenic and densely striated than muscle. Transversely, tendons appear to be round or flattened ovals with a punctuate interior.

Ligaments connect bones and appear similar to tendons but tend to be more compact and irregular. They are only a few millimeters in width and difficult to discern, especially in transverse view.Acep.org. (2018).

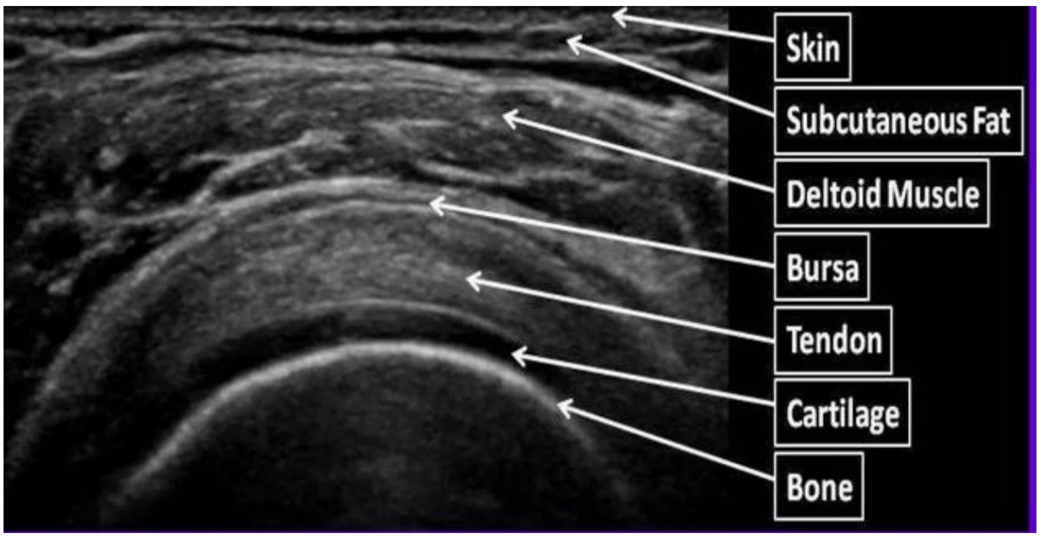

Figure 2-9 transverse view of shoulder tendon (Slideshare.net. 2018).

The biceps tendon groove can be recognized as a semicircular depression on the anterior aspect of the proximal humerus. The biceps tendon appears as an echogenic circle or ellipse within the biceps tendon groove.The bony protuberance medial to the groove is the lesser Tuberosity and the protuberance lateral To the Groove is The greater tuberosity. (Middleton, 1984).

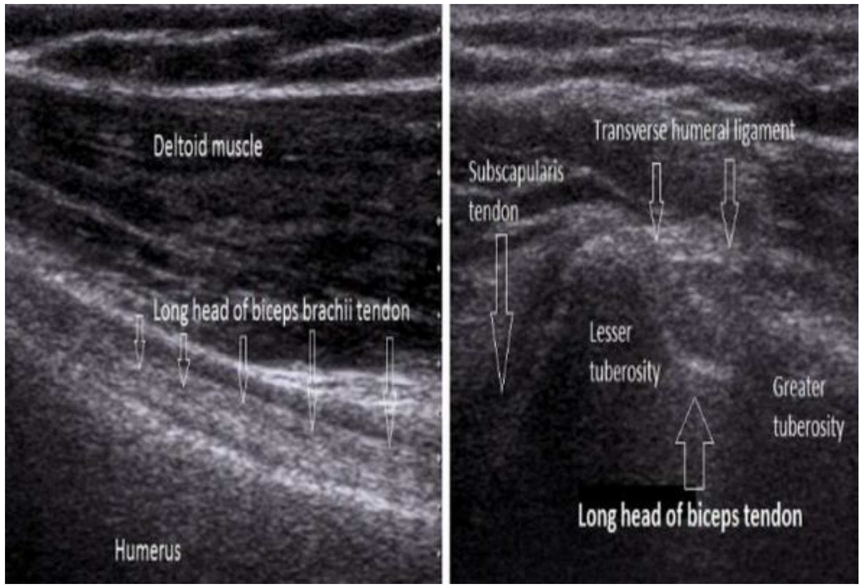

Figure 2-10longitudinal and transverse view of LHD(Slideshare.net. 2018).

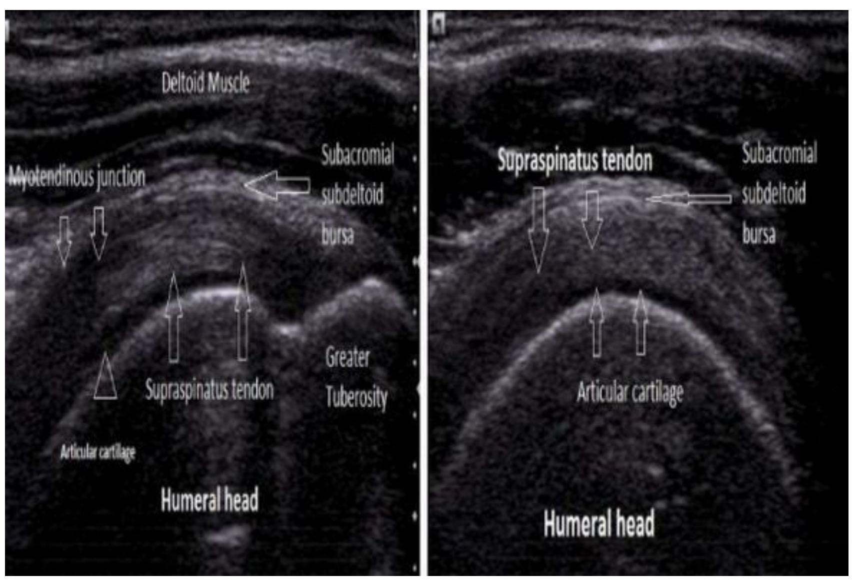

Figure 2-11 longitudinal and transverse view of SST(Slideshare.net. 2018).

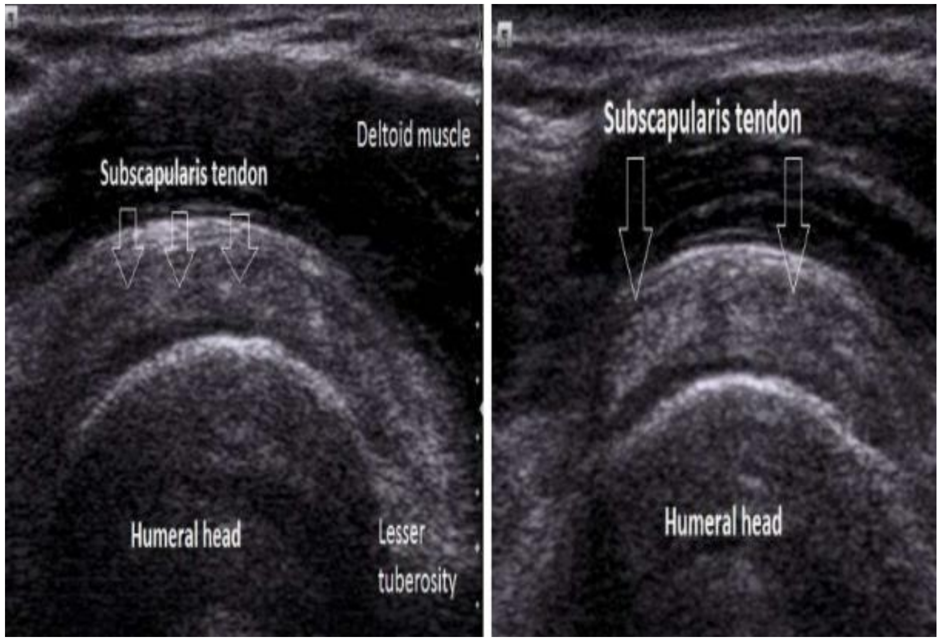

Figure 2-12longitudinal and transverse view of SST(Slideshare.net. 2018).

2-3 Pathological condition of shoulder:

2-3-1 Impingement syndrome :

Shoulder impingement is a clinical syndrome in which soft tissues become painfully entrapped in the area of the shoulder joint . Patients present with pain on elevating the arm or when lying on the affected side . Shoulder pain is the third most common musculoskeletal complaint in orthopedic practice , and impingement syndrome is one of the more common underlying diagnoses. On the pathophysiological level, it can have various functional, degenerative, and mechanical causes. The impingement hypothesis assumes a pathophysiological mechanism in which different structures of the shoulder joint come into mechanical conflict . The decision to treat conservatively or surgically is generally made on the basis of the duration and severity of pain, the degree of functional disturbance, and the extent of structural damage. The goal of treatment is to restore pain-free and powerful movement of the shoulder joint (Garving,2017)

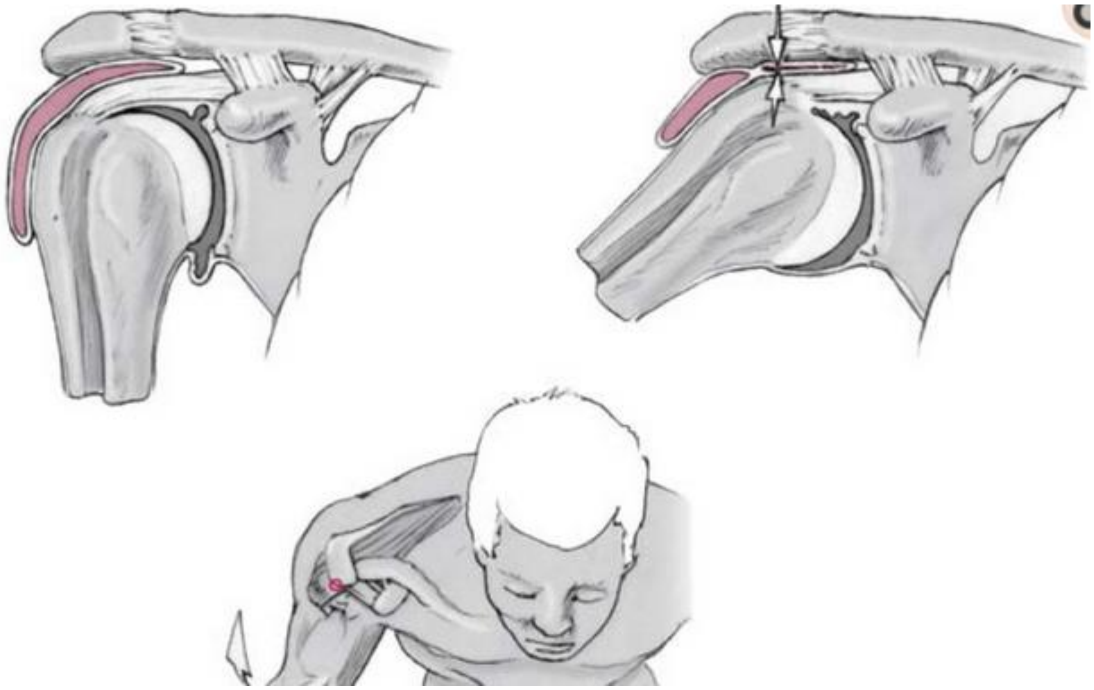

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Figure 2-13 impingement syndrome (Garving,2017)

2-3-2 Rotator cuff tears:

Rotator cuff tears Rotator cuff pathology is the most frequent (10%) cause of shoulder pain and disability (Wofford, 2005). Not only full-thickness rotator cuff tears but also partial-thickness rotator cuff tears are an important cause of schoulder pain and disability(Fukuda, Hamada et al. 1996). Its frequency depends on patient's age, with or without previous trauma and the practice of activities using the arm up (Wofford, 2005). Rotator cuff tears are common pathology, with a variable prevalence reported in the literature (Reilly, 2006). Several authors (Tempelhof, 1999) have shown the age-related prevalence of partial- or full-thickness rotator cuff tears due to degenerative changesrotator cuff tears are frequently asymptomatic. Tears demonstrated during radiological investigation of the shoulder may be asymptomatic. No statistical relationship could be found between the level of pain, impairment, and disability and the location and size of full-thickness tears of the rotator cuff as observed on MRI . Pain and disability are significantly linked to the presence of supraspinatus tendon lesions and the presence of bursitis, but these factors contribute little to the symptoms (Krief and Huguet ,2006).

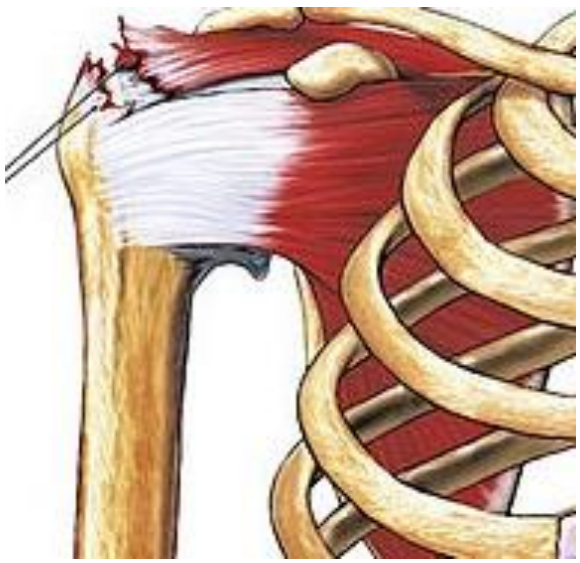


Figure 2-14 rotator cuff tear (*En.wikipedia.org. 2018)*

2-3-3 Dislocation (Subluxation) of the Biceps Tendon:

Normally, the biceps tendon is anchored within the bicipital groove by the transverse humeral ligament, arising from the subscapularis and supraspinatus tendons, providing a roof to the bicipital groove. Any interruption to this ligament, whether secondary to trauma or other disorder, provides an opportunity for the biceps tendon to leave its normal position. the medial side of the bicipital groove, formed by the lesser tuberosity of the humerus, with its relatively low, medial wall angle, provides an easier path for dislocation of the long head of the biceps tendon than does the lateral side. Therefore, dislocation or subluxation of the tendon is almost always over the lesser tuberosity, medially

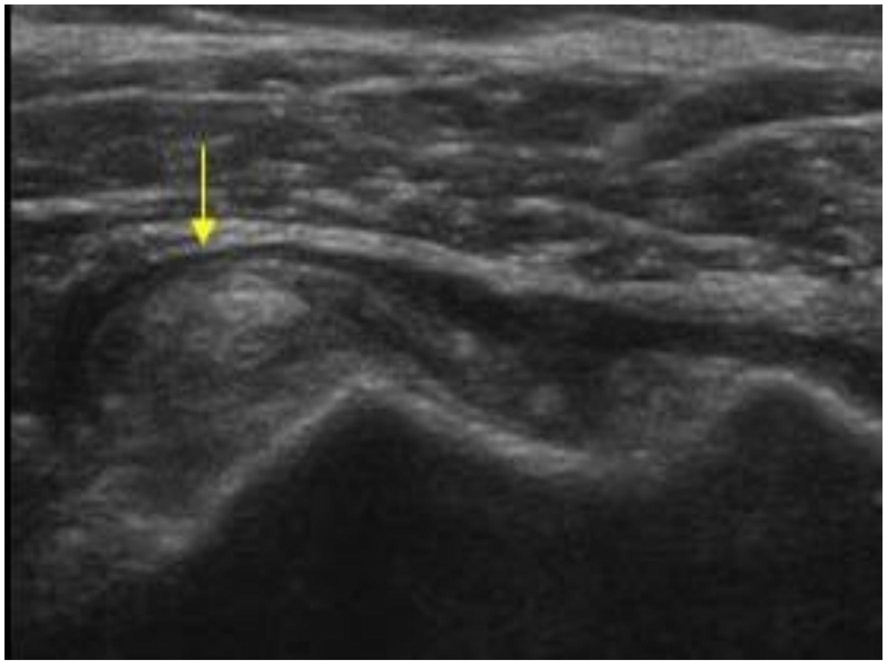


Figure 2-15 subluxation of LHB tendon(Acep.org, 2018)

2-3-4 SA- SD Bursal Effusion and/or Bursitis:

The largest and most commonly imaged bursa of the shoulder1 is the subacromial-subdeltoid (SA - SD) bursa, which acts as a buffer between the overlying acromion process, deltoid muscle and the rotator cuff. Normally seen as a pair of curvilinear echogenic lines hugging the surface of the rotator cuff, this potential space is typically echo free. When an effusion is present, the first location to become fluid filled is a teardrop shaped thickening of the bursa distal to the lateral edge of the greater tuberosity, near the insertion of the supraspinatus tendon. A similar teardrop shaped bursal thickening can also be found posteriorly, along the deltoid shelf. When fluid filled, this appearance is known as the teardrop sign for obvious reasons. Although bursal effusion may occur for many reasons, including trauma, arthritis, gout, or synovial disease, inflammation in the form of bursitis is quite common and the hypervascularity associated with the inflammation isoften evident with colour flow Doppler. Chronic inflammation can be suspected when irregular bursal thickening is evident.

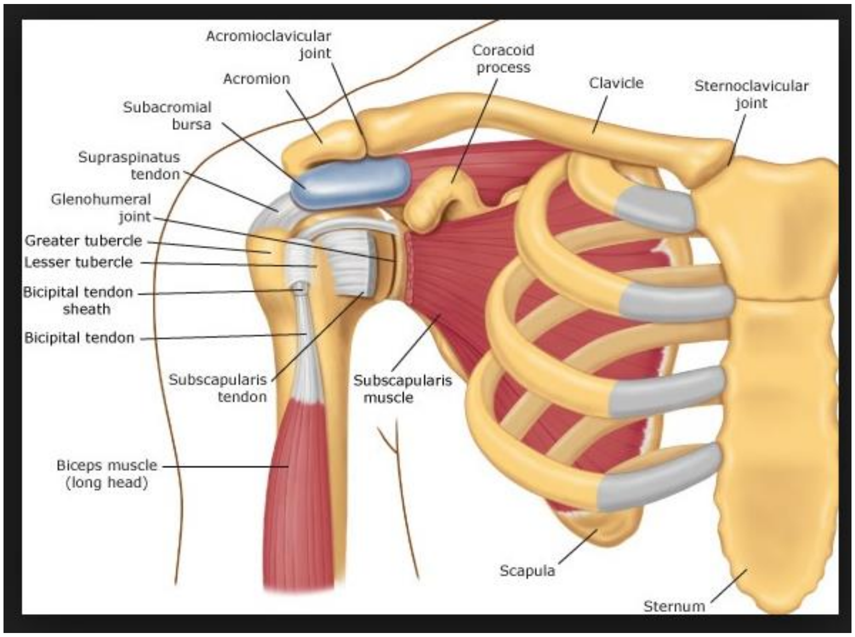


Figure 2-16 bursitis (Fitzgerald and Fitzgerald, 2018)

2-4 previous studies :

(Sessions, 2017) study the anatomy of 21 cadaveric shoulders (11 male and 10 female; average age at time of death: 78 years ± 14, range 59 – 101 years) was conducted. The cadavers were embalmed using a fluid concentrate that is 70% isopropyl alcohol, 13.25% phenol, 8% sorbitol, 7.5% formaldehyde USP-37, and 1.25% Barquat MB-50. Shoulders with direct rotator cuff pathology (partial or full thickness tears) or diseases with probable effects on rotator cuff insertions (tendinitis, bursitis, rheumatoid arthritis, or glenohumeral osteoarthritis) were excluded from the study. Disease pathology was identified using included medical history for each cadaver as well as visual inspection of the shoulder at the time of dissection. Two individuals completed rotator cuff dissection and measurements from two subject samples following the same protocol with direct oversight from the same supervisor.The skin and subcutaneous tissues were removed and the deltoid was released from its insertion at the deltoid tuberosity and reflected back to its origin. The acromion was cut and removed near its base to grant better access to the supraspinatus . The rotator cuff musculature (supraspinatus, infraspinatus, teres minor, and subscapularis) was dissected allowing visualization of the respective tendinousinsertions .The thickness of the four rotator cuff tendon insertions was measured with a caliper (Fowler Tools and Instruments, Vernier Model: Las Vegas, NV) by positioning the caliper as close to the insertion as anatomically possible without avulsing the tendon from its point of insertion. The muscle belly of each rotator cuff muscle was cut transversely and the distal half was retracted allowing the caliper to be positioned deep to the tendon without placing tension on the insertion. Each tendon was measured three times using within-subject measurements made by the same individual. Data was compiled and descriptive statistics .the study found that The mean thickness of the supraspinatus at the articular margin was 4.9 mm ± 2.1 (median: 4.2 mm, range: 2.9-12.7 mm) . The mean thickness of the infraspinatustendon at the articular margin was 4.9 mm ± 1.3 (median: 4.8 mm, range: 3.0-7.2 mm) . The teres minor tendon had a mean thickness of 3.2 mm ± 1.1 (median: 2.9 mm, range: 1.7-5.7 mm) at the articular margin . Finally, the mean thickness of the subscapularis tendon at the articular margin was 5.5 mm ± 1.3 (median: 5.5 mm, range: 3.5-9.3 mm) .

(Karthikeyan, 2014) evaluated 30 male and 30 female healthy volunteers (aged 18-40 years), with no shoulder problems, underwent ultrasound assessment of both shoulders by a musculoskeletal radiologist. The dimensions of the rotator cuff, deltoid, and biceps were measured in a standardized manner.A total of 120 shoulders were scanned. The mean maximum width of the supraspinatus footprint was 14.9 mm in men and 13.5 mm in women ($P < .001$). The mean thickness of the supraspinatus tendon was 4.9 mm in women and 5.6 mm in men. The mean thickness of the subscapularis was 4.4 in men and 3.8 mm in women and for the infraspinatuswas 4.9 mm in men and 4.4 mm in women. There was no correlation between height, weight, biceps, or deltoid thickness with any tendon measurements. Apart from supraspinatus tendon thickness, the difference between dominant and nondominant shoulders in the same sex was not significant for any other tendon dimensions.

(Cholewinski, 2008) study the rotator cuff thickness and distance between the infero-lateral edge of acromion and the AGT distance were measured ,the range of normalvalues was calculated as an interval between the 5th andthe 95th percentile. The differences in rotator cuff thickness and in AGT distance between both shoulders werecalculated . There was nostatistically significant difference in rotator cuff thicknessand AGT distance between the dominant and non-dominant limb.Further statistical analysis was performed in order to finda possible correlation between rotator cuff thickness andage, body mass, height and BMI of the subjects. However,we noted only a tendency for correlation between rotatorcuff thickness and body mass and BMI, which were notstatistically significant (Pvalue respectively 0.08 and 0.09).Similar analysis was performed for AGT distance and astatistically significant correlation was found between theAGT distance and the body height.

(Wang, 2005) study and compared the thickness of the biceps and supraspinatus tendons, the widths of the subacromial space in the frontal and scapular planes, and abnormal sonographic findings in the shoulders of injured, and uninjured elite college baseball athletes and healthy controls. This study recruited two groups of 42 and 12 athletes, with and without histories of shoulder injuries, respectively, as well as one control group of 16 college students who were matched for physical characteristics but not involved in sports. The results showed that the thickness of the biceps and supraspinatus tendons and the subacromial space widths at 0° and 90° shoulder abduction in the frontal plane were significantly greater in the athletes than in the controls (*P*-values <0.004). The occurrences of the acromioclavicular joint bulging, bicep tendon degeneration, infraspinatus tendon degeneration and infraspinatus cortical irregularity differ significantly between the injured athlete and the group of uninjured athletes and controls (*P*-values <0.05). However, only infraspinatus tendon degeneration corresponded to the injury histories. There was a high similarity of sonographic spectrum of abnormal findings among the groups. Longitudinal follow-ups are required to determine the clinical importance of the sonographic spectrums and the occurrences of abnormal finding in asymptomatic athletes' shoulders.

(Thompson,2013) Study the rotator cuff and their insertions in to the humerus in 20 fresh-frozen cadavers their findings demonstrated a consistent pattern at the insertion of the rotator cuff. The horseshoe-shaped insertion tapers away from the articular surface in a superior-to-inferior direction. Interdigitation of the muscle units may be noted, particularly between the supraspinatus and the infraspinatus. Average maximum insertional lengths and widths were as follows: subscapularis (SC): 40 x 20 mm; infraspinatus (IS): 29 x 19 mm; supraspinatus (SS): 23 x 16 mm; and teres minor (TM): 29 x 21 mm. The SC inserted on the lesser tuberosity adjacent to the biceps groove at the edge of the articular surface. It tapered away 18 mm at its inferior border. The SS inserted at the articular surface along its entire insertion from the bicipital groove to the top of the bare area. The IS wrapped the posterior border of the SS superiorly at the articular surface and tapered away inferiorly, framing the bare area. SEM microscopy showed the SS to be adherent to the edge of the articular surface medially. As it filled the sulcus, its lateral edge extended over the edge of the greater tuberosity.

Chapter three

Materials and methods

3.1 Material

3.1.1Study design:

Cross sectional study, was done to study the impact of pysical effort on the shoulder tendons for people with different jobs using ultrasoungraphy .

3.1.2 Study area and duration:

This study was conducted in sudan university of science and technology ultrasound department and in Kosti hospital ultrasound department .The study was carried out betweenAugust 2018 to novemper 2018

3.1.3Study population:

population of study ar were normal subject with known age ,job and domimante hand

3.1.4Sample/Sample size:

The study was include 50 subjects ,33male and 17 female escluding anyone suffaring from shoulder truma or shoulder pain .

3.1.5 Equipment used:

the study was performed on gray scale real time scanner Alipinon ,Mylab 40 with linear(7.2-12 MHz) transducers and acoustic gel .

3-2 Methods

3-2-1 Scaning Technique

The examination was performed with the participant sitting on a rotating stool and Placed the participant's arm in neutral position to scan the long head of biceps tendon in transverse plane ,then slided the probe medially in order to scan the subscapularis tendon in transverse plane by but the probe longitudinally and stretch the arm laterally to elongated the subscapularis tendon .finallyplaced 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' to scan supraspinatous tendon .measured the thickness of three tendon in articularmargin .

3-2-2 method of interpretation

Measure the tendons thickness in transverse view near the tendon insertion which should appear hyperechoic with fiberall pattern and avoid anstomasing artifact by perpendicular beam angle .thecurser was placed in the outer hyperechoic line to outer hyperechoic line ,measure the right shoulder tendons and left shoulder tendons .

3-3 analysis of data :

The data were analyzed using SPSS version 20.

Chapter four

Results

4-1 results:

The following tables and figures presented data obtained from 50 normal volunteers 33 males 17 females there age ranged between 15 to 53 years all with known occupation .

Table (4.1) frequency distribution of age

Age\years	Frequency	Percent
15-24	19	38.0
25-34	21	42.0
35-44	4	8.0
45-53	6	12.0
Total	50	100.0

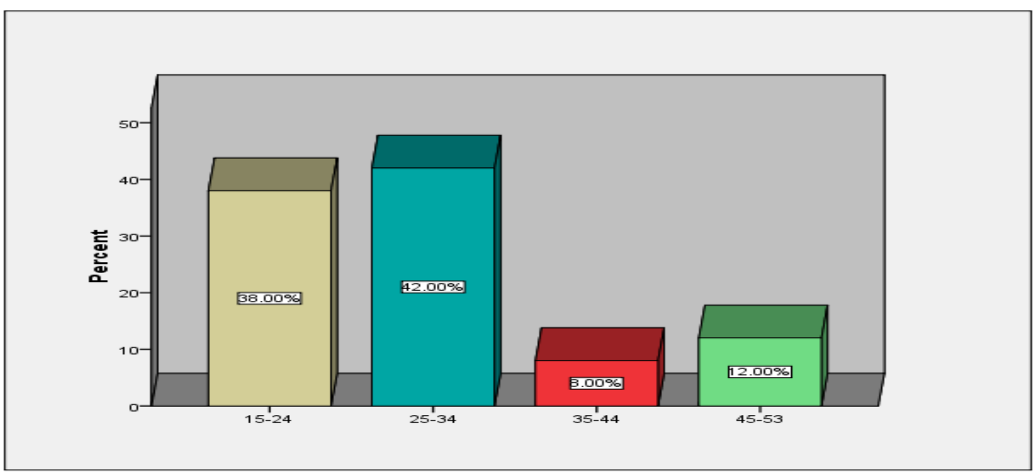


Figure (4.1) frequency distribution of ageTable (4.2) frequency distribution of gender

Table(4.2) frequency distribution of gender

Gender	Frequency	Percent
Female	17	34.0
Male	33	66.0
Total	50	100.0

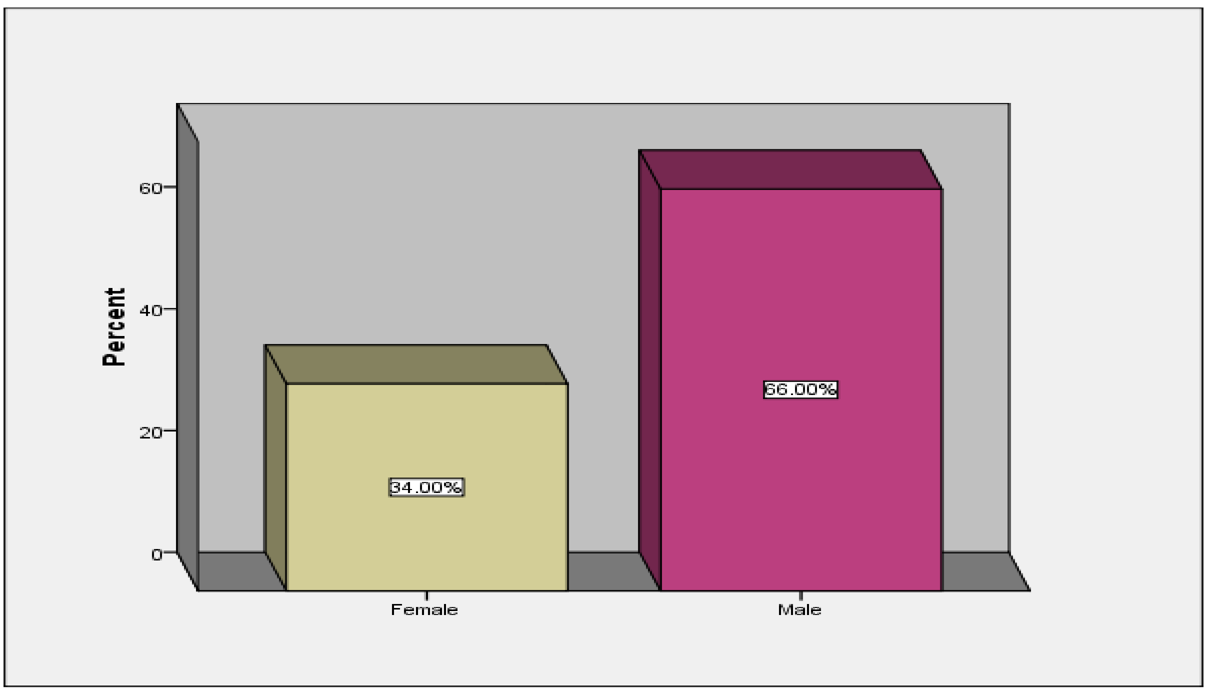


Figure (4.2) frequency distribution of gender

Table (4.3) frequency distribution of dominant hand

Using hand	Frequency	Percent
Left	4	8.0
Right	46	92.0
Total	50	100.0

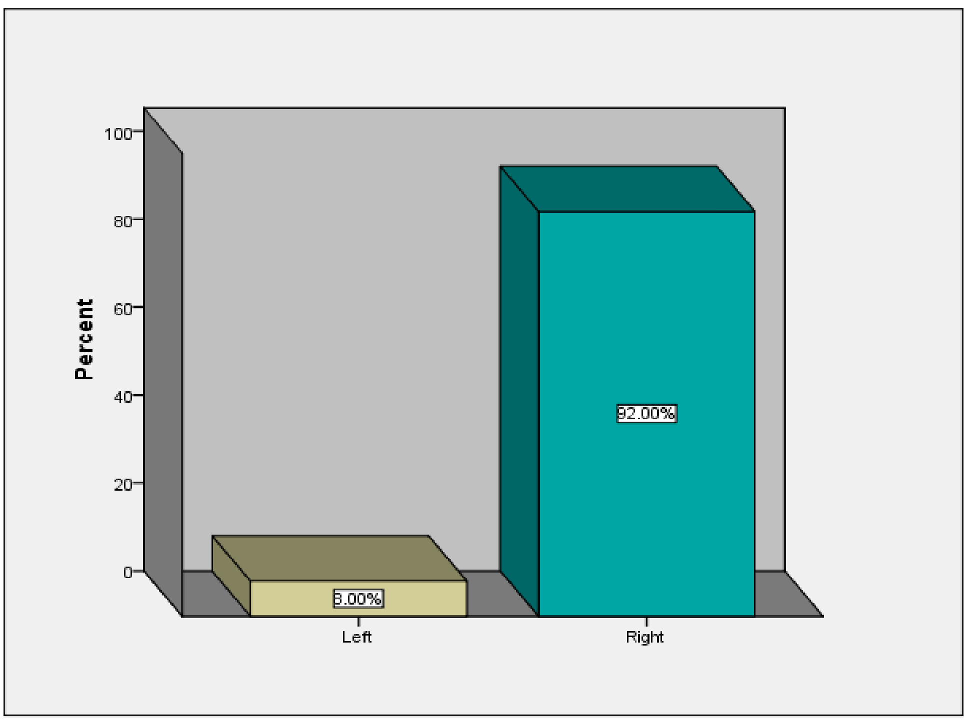
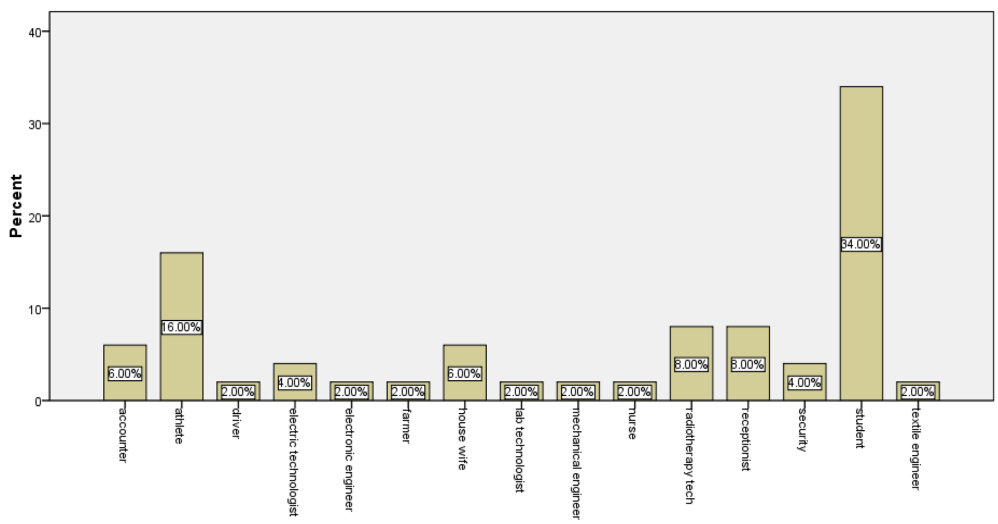


Figure (4.3) frequency distribution of dominant hand

Table (4.4) frequency distribution of occupation

Occupation	Frequency	Percent
Accouter	3	6.0
Athlete	8	16.0
Driver	1	2.0
Electric technologist	2	4.0
electronic engineer	1	2.0
Farmer	1	2.0
House wife	3	6.0
Lab technologist	1	2.0
Mechanical engineer	1	2.0
Nurse	1	2.0
Radiotherapy technologist	4	8.0
Receptionist	4	8.0
Security	2	4.0
Student	17	34.0
Textile engineer	1	2.0
Total	50	100.0



Figure(4.4)frequency distribution of occupation

Table (4.5) descriptive statistic (minimum, means, maximum) for age and shoulder tendon thickness Measurements\mm

Variables	N	Minimum	Maximum	Mean	Std. Deviation
Age	50	15	53	28.58	9.18
Rt LHB thickness	50	1.9	4.3	2.84	0.45
RtSupscapularis thickness	50	2.8	8.3	5.02	0.93
RtSupraspinatous thickness	50	3.8	7.5	5.01	0.75
Lt LHB thickness	50	1.7	3.3	2.61	0.40
Lt Supscapularis thickness	50	3.6	7.9	4.78	0.82
Lt Supraspinatous thickness	50	3.5	6.7	4.70	0.65
MeanLHB thickness	50	1.80	3.65	2.73	0.41
MeanSupscapularis thickness	50	3.65	8.10	4.90	0.83
MeanSupraspinatous thickness	50	3.75	6.75	4.86	0.67

Table (4.6) compare means gender and shoulder tendon thickness

a. **Compare means**

Variables	Gender	N	Mean	Std. Deviation	Std. Error Mean
Rt LHB	Male	33	2.92	0.39	0.07
	Female	17	2.71	0.55	0.13
Rt SUB	Male	33	5.05	1.05	0.18
	Female	17	4.96	0.66	0.16
Rt SUPRA	Male	33	5.08	0.83	0.14
	Female	17	4.89	0.56	0.14
Lt LHB	Male	33	2.66	0.33	0.06
	Female	17	2.50	0.51	0.12
Lt SUB	Male	33	4.84	0.91	0.16
	Female	17	4.68	0.62	0.15
Lt SUPRA	Male	33	4.71	0.72	0.13
	Female	17	4.68	0.52	0.13
MeanLHB	Male	33	2.79	0.33	0.06
	Female	17	2.61	0.52	0.13
MeanSUB	Male	33	4.94	0.93	0.16
	Female	17	4.82	0.60	0.14
MeanSUPRA	Male	33	4.89	0.75	0.13
	Female	17	4.79	0.51	0.12

b. Independent sample t-test for comparing mean in different gender

Variables	t-test for Equality of Means						
	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						Lower	Upper
R T LHB	1.32	24.54	0.20	0.20	0.15	-.110-	.5052
RT SUB	0.37	46.10	0.71	0.08	0.24	-.3991-	.5784
RT SUPRA	0.94	44.26	0.35	0.19	0.20	-.2131-	.5881
LT LHB	1.19	22.96	0.25	0.16	0.14	-.1206-	.4479
LT SUB	0.73	44.13	0.47	0.16	0.22	-.2800-	.5998
LT SUPRA	0.15	42.21	0.88	0.03	0.18	-.3327-	.3862
Mean LHB	1.30	22.99	0.21	0.18	0.14	-.1064-	.4673
Mean SUB	0.58	45.44	0.57	0.12	0.22	-.3121-	.5616
Mean SUPRA	0.60	44.06	0.55	0.11	0.18	-.2542-	.4685

Table (4.7) compare means age\yearsand shoulder tendon thickness

Age\ years		Rt LHB	Rt SUB	Rt SUPRA	Lt LHB	Lt SUB	Lt SUP RA	Mean LHB	Mea n SUB	Mean SUP RA
15-24	Mean	2.805	4.984	4.926	2.495	4.605	4.58	2.65	4.80	4.76
	Std. Deviation	.5223	.9697	.9326	.3808	.9484	0.79	0.43	0.94	0.83
	Minimum	2.0	3.7	3.8	1.9	3.6	3.50	2.00	3.70	3.80
	Maximum	4.3	8.3	7.5	3.3	7.9	6.70	3.60	8.10	6.80
25-34	Mean	2.862	5.124	5.052	2.638	4.838	4.71	2.75	4.98	4.88
	Std. Deviation	.4853	.8938	.7181	.4620	.7978	0.57	0.46	0.82	0.62
	Minimum	1.9	4.0	4.2	1.7	3.7	3.80	1.80	3.80	4.10
	Maximum	3.8	7.5	7.2	3.3	6.5	6.10	3.50	7.00	6.60
35-44	Mean	2.725	4.250	5.125	2.650	4.875	5.13	2.69	4.56	5.13
	Std. Deviation	.2500	.9950	.4349	.4041	.4924	0.65	0.32	0.26	0.53
	Minimum	2.4	2.8	4.5	2.1	4.5	4.20	2.20	4.20	4.40
	Maximum	3.0	4.9	5.5	3.0	5.6	5.70	3.00	4.80	5.40
45-53	Mean	2.967	5.267	5.067	2.833	5.083	4.77	2.90	5.18	4.92
	Std. Deviation	.1506	.8548	.3933	.1211	.6401	5.43	0.08	0.73	0.32
	Minimum	2.8	4.5	4.6	2.7	4.3	4.20	2.80	4.40	4.60
	Maximum	3.2	6.9	5.6	3.0	6.1	5.40	3.00	6.50	5.40
Total	Mean	2.842	5.018	5.012	2.608	4.782	4.70	2.73	4.90	4.86
	Std. Deviation	.4540	.9315	.7499	.4045	.8198	0.65	0.41	0.83	0.67
	Minimum	1.9	2.8	3.8	1.7	3.6	3.50	1.80	3.70	3.80
	Maximum	4.3	8.3	7.5	3.3	7.9	6.70	3.60	8.10	6.80
P >0.05										

Table (4.8) compare means dominant hand and shoulder tendon thicknes

A. Compare means

	using	N	Mean	Std. Deviation	Std. Error Mean
Rt LHB	Right	46	2.846	.4684	.0691
	Left	4	2.800	.2708	.1354
Rt SUB	Right	46	5.020	.9658	.1424
	Left	4	5.000	.4243	.2121
Rt SUPRA	Right	46	5.028	.7653	.1128
	Left	4	4.825	.5909	.2955
Lt LHB	Right	46	2.583	.3929	.0579
	Left	4	2.900	.4830	.2415
Lt SUB	Right	46	4.748	.8305	.1224
	Left	4	5.175	.6397	.3198
Lt SUPRA	Right	46	4.678	.6599	.0973
	Left	4	4.950	.5802	.2901
MeanLHB	Right	46	2.714	.4147	.0611
	Left	4	2.850	.3764	.1882
MeanSUB	Right	46	4.884	.8498	.1253
	Left	4	5.088	.5170	.2585
MeanSUPRA	Right	46	4.853	.6875	.1014
	Left	4	4.888	.5313	.2657

B. Independent sample t-test for comparing mean in different using hand

Variable	t-test for Equality of Means						
	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						Lower	Upper
R T LHB	.300	4.743	.777	.0457	.1520	-.3515-	.4428
RT SUB	.077	6.228	.941	.0196	.2555	-.6001-	.6392
RT SUPRA	.643	3.933	.556	.2033	.3163	-.6807-	1.0873
LT LHB	-1.278-	3.354	.283	-.3174-	.2484	-1.0626-	.4278
LT SUB	-1.247-	3.938	.281	-.4272-	.3425	-1.3839-	.5296
LT SUPRA	-.888-	3.710	.428	-.2717-	.3060	-1.1482-	.6047
Mean LHB	-.687-	3.664	.533	-.1359-	.1979	-.7057-	.4340
Mean SUB	-.709-	4.558	.513	-.2038-	.2873	-.9643-	.5567
Mean SUPRA	-.120-	3.932	.910	-.0342-	.2843	-.8291-	.7607

Table (4.9) compare means occupation and shoulder tendon thickness

Occupation		Rt LHB	Rt SUB	Rt SUPRA	Lt LHB	Lt SUB	Lt SUPRA	Mean LHB	Mean SUB	Mean SUPRA
Accouter	Mean	2.867	5.400	4.900	2.767	4.933	4.433	2.817	5.167	4.667
	Std. Deviation	.0577	1.3454	.7000	.2309	1.0214	.2082	.1443	1.1815	.4509
Athlete	Mean	3.125	5.475	5.175	2.675	5.288	5.038	2.900	5.381	5.106
	Std. Deviation	.5445	1.2326	.7723	.3059	1.2253	.8879	.3808	1.2159	.8152
Driver	Mean	2.800	4.500	4.900	2.700	4.300	4.200	2.750	4.400	4.550
electric technologist	Mean	3.100	5.500	5.100	3.100	5.550	4.900	3.100	5.525	5.000
	Std. Deviation	.1414	.0000	.8485	.2828	.2121	.7071	.0707	.1061	.7778
electronic engineer	Mean	2.700	2.800	5.500	2.600	5.600	5.400	2.650	4.200	5.450
Farmer	Mean	3.000	4.900	5.300	2.900	4.500	5.200	2.950	4.700	5.250
house wife	Mean	2.733	4.933	4.567	2.733	5.133	4.833	2.733	5.033	4.700
	Std. Deviation	.2887	.2517	.0577	.5508	.4509	.5508	.4193	.3215	.3041
Lab technologist	Mean	2.900	4.500	5.100	2.700	4.300	4.600	2.800	4.400	4.850
mechanical engineer	Mean	2.400	4.000	4.600	2.100	3.700	3.900	2.250	3.850	4.250
Nurse	Mean	2.500	3.700	4.100	2.200	3.700	3.500	2.350	3.700	3.800
radiotherapy tech	Mean	3.150	5.650	5.350	2.825	5.325	4.975	2.988	5.488	5.162
	Std. Deviation	.5000	1.0878	.7141	.2986	.7411	.4717	.3966	.8929	.5750
receptionist	Mean	2.650	4.825	4.800	2.400	4.675	4.475	2.525	4.750	4.638
	Std. Deviation	.6455	.6185	.2160	.6782	.4992	.2986	.6602	.5164	.2250
Security	Mean	2.800	4.500	4.500	2.650	4.300	4.300	2.725	4.400	4.400
	Std. Deviation	.0000	.4243	.1414	.0707	.4243	.4243	.0354	.4243	.2828
Student	Mean	2.724	5.029	5.059	2.506	4.512	4.647	2.615	4.771	4.853
	Std. Deviation	.4918	.7752	1.0106	.4408	.6470	.6983	.4585	.6847	.8345
textile engineer	Mean	2.700	4.300	5.500	2.300	4.100	4.900	2.500	4.200	5.200
Total	Mean	2.842	5.018	5.012	2.608	4.782	4.700	2.725	4.900	4.856
	Std. Deviation	.4540	.9315	.7499	.4045	.8198	.6528	.4099	.8262	.6719
$P > 0.05$										

Table (4.10) correlation between age and shoulder tendons thickness

		age	Rt LHB	Rt SUB	Rt SUPRA	Lt LHB	Lt SUB	Lt SUPRA
Age	Pearson Correlation	1	.077	.001	.066	.239	.159	.106
	Sig. (2-tailed)		.596	.996	.647	.095	.271	.465
	N	50	50	50	50	50	50	50

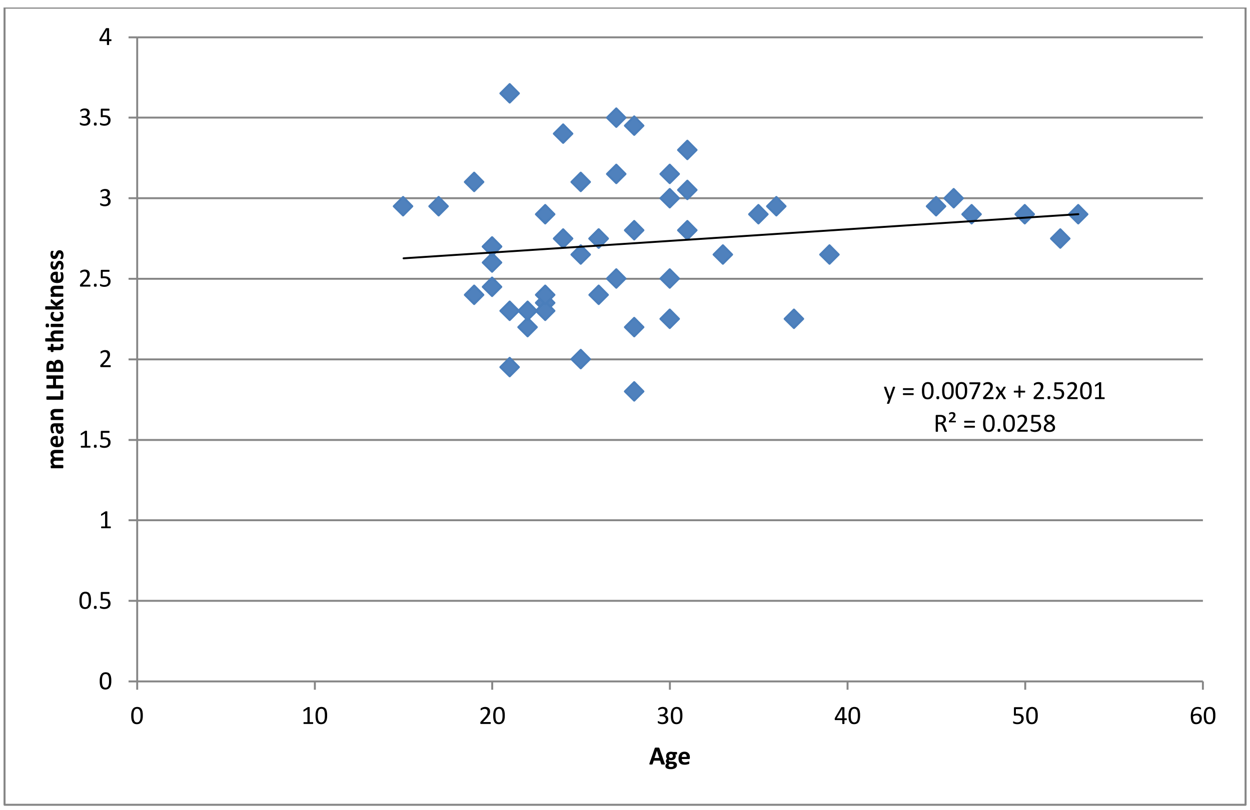


Figure (4.5) scatterplot shows relationship between age and LHB tendons thickness

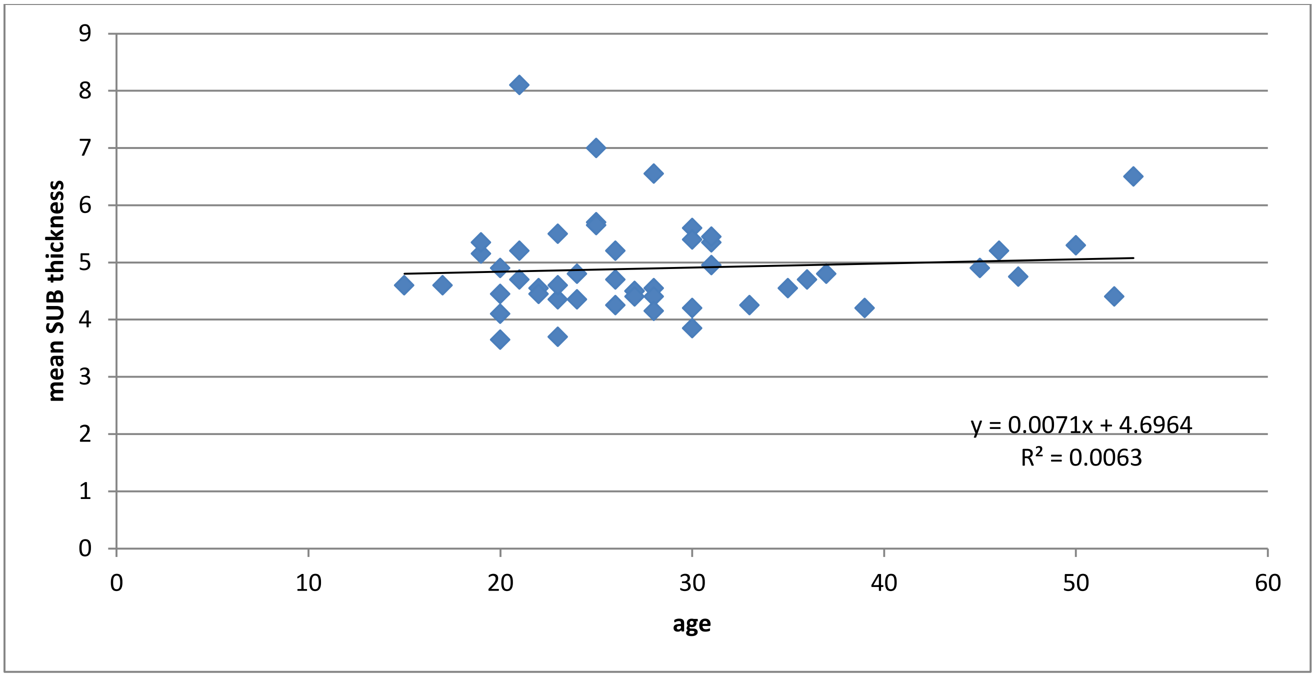


Figure (4.6) scatterplot shows relationship between age and Subscapularis tendons thickness

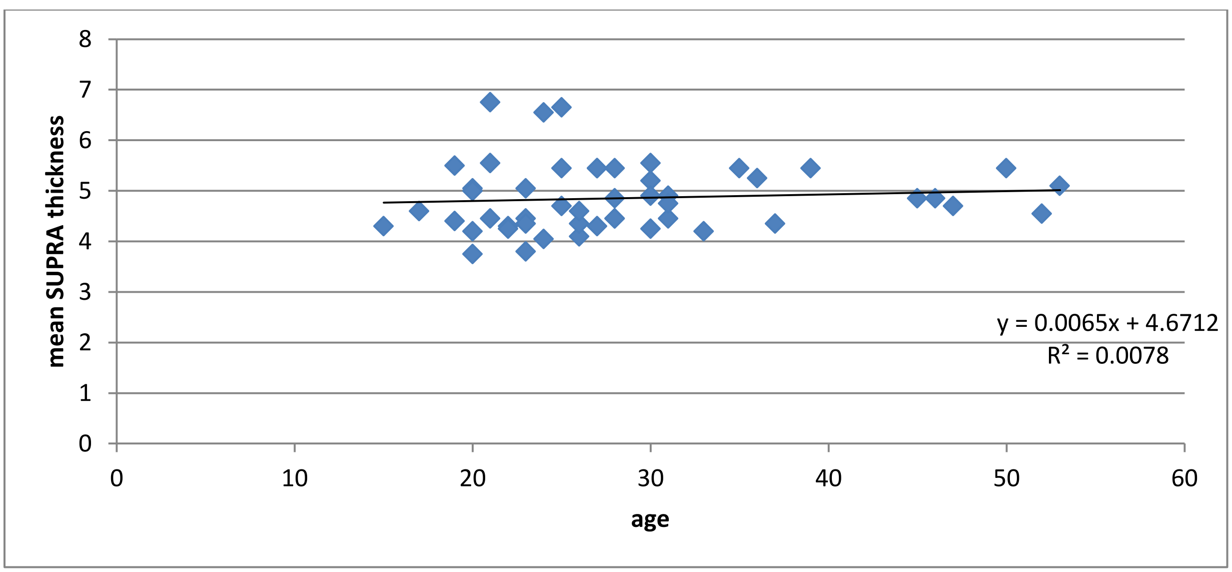


Figure (4.7) scatterplot shows relationship between age and Supraspinatous tendons thickness

Chapter five

Discussion, Conclusion and Recommendation

5-1 Discussion :

Table 4-1 frequency distribution of age shows the age class (15-24) years act 19 subjects with percentage of 38% ,age class of (25-34) years act 21 subjects with percentage of 42%,the age class (35-44)years act 4 with percentage of 8%,age class (45-53) years act 6 subjects with percentage of 12%.,the age class (25-34)years act 21 subject with percentage of 42% represent the highest frequency.

Table 4-2 frequency distribution of gender shows the females act 17 subjects with percentage of 34%,the males act 33subjecs with percentage of 66%.

Table 4-3 using hand distribution shows left-handed using act 4subjects with percentage of 8% ,right- handed using act 45 subjects with percentage of 92%.

Table 4-5 In This study the age of volunteers ranged from 15-53 years and the mean age was found to be 28.58+_9.17 .the thickness of Rt LHB, RtSubscapularis,andRtsupraspinatous tendon thickness rang from(1.9-4.3) (2.8-8.3) (3.8-7.5)mmrespectively and mean thickness was (2.84+_0.45) (5.01+_0.93) (5.01+_0.74)mm respectively .the thickness of Lt LHB, Lt Subscapularis,andLt supraspinatous tendon thickness rang from(1.7-3.3) (3.6-7.9) (3.8-7.5)mm respectively and mean thickness was (2.84+_0.45) (5.01+_0.93) (4.70+_0.65)mm.

The study found that the mean thickness of Rt LHB, Rtsubscapularis and Rt supraspinatus more in males than females, for males were(2.90+_0.38), 5.04+_0.65) and(5.07+_0.83) mm respectively for females were (2.71+_0.54),(4.95+_0.65)and (4.88+_0.56)mm respectively. Mean thickness of Lt LHB, It subscapularis and Lt supraspinatus more in males than females, for males were (2.66+_0.32),(4.83+_0.91) and (4.70+_0.71)mm respectively for females were (2.50+_0.51), 4.76+_0.61) and (4.68+_0.52)mm respectively as in Table 4-6.but there was no significant correlation between LHB,subscapularis and supraspinatous tendons thickness and gender (p values 0.20,0.56,o.55 respectively.)

The study foundthat the mean LHB, subscapularis and supraspinatus thickness in age group 15-24 years was 2.65 ± 0.43mm, 4.70 ± 0.93mm,and 4.70± 0.80mm, respectively . in age group 25-34 years was 2.75 ± 0.46mm, 4.98 ± 0.82mm,and 4.87± 0.62mm, respectively . in age group 35-44 years was 2.68 ± 0.30mm, 4.56 ± .0.26mm,and 5.20± 0.52mm, respectively . in age group 45-53 years was 2.90 ± 0.08mm, 5.17 ± 0.72mm,and 4.9± 0.31mm, respectively as in Table4-7.there was no significant correlation between LHB ,subscapularis and supraspinatous tendons thickness and volunteer's age ,the study agree with study done by (Marwa H. 2018) which revealed that there was no a significant correlation between the supraspinatus thickness and Volunteer age.sa in figure (4-5) (4-6) (4-7) the study found that for every year age there was increase in thickness of LHB and SST by 0.007 mm and increase in thickness of SCT by 0.006mm.

The study revealed that mean thicknes of LHB,subscapularis and supraspinatous in right- handed subjects was 2.71mm,4.88mm and 4.85mm respectively . the mean thickness of LHB,subscapularis and supraspinatous win in left- handed subjecs was 2.85mm,5.08mm and 4.88mm respectively as in 4-8 table .also there was no significant correlation between LHB,subsapularis and supraspinatous tendon thickness and using hand.(p values was 0.53, 0.51 and 0.91prespectively) .the study was agree with study done by (Cholewinski, 2008) and revealed that there was no statistically significant difference in rotator cuff thickness and dominant and non dominant limb.

The study clarified that there was no significant correlation between LHB ,subscapularis and supraspinatous tendons thickness and volunteer's occupation as in Table 4-9 .this result was agree with study done by (Girometti, 2006) which found that there was no significant different in shoulder tendon dimension on athletes volunteers and non athletes. And disagree with study done by (Wang, 2005) which revealed the thickness of LHB ,supraspinatous and subacromial space were significantly greater in athletes than in non athletes.

5-2 Conclusion:

The aim of this study was to study the impact of physical effort on shoulder tendons for people with different jobs this study has defined the thickness of the LHB, SCT and SST in healthy subjects . This is important for the documentation of normal ultrasound anatomy of LHB, SCT and SST and also demonstrates that there was no significant correlation between tendons thickness and gender ,age ,job and dominant hand .so we recommended to increase the sample size and variation.

5-3 Recommendation:

- Include all rotator cuff tendons .
- Measure RC width in addition to RC thickness.
- Measure the subjects Wight, height and body mass.
- Increase the sample size
- Increase the number of subject whom use the left hand for better compare.between subjects using left hand and subjects using right.
- Describes the precise location of measurement .

5-4 limitation:

- The sample size was small .
- The left-handed subjects size was small .

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Appendices

Appendix one:

Sudan University for Sciences and Technology

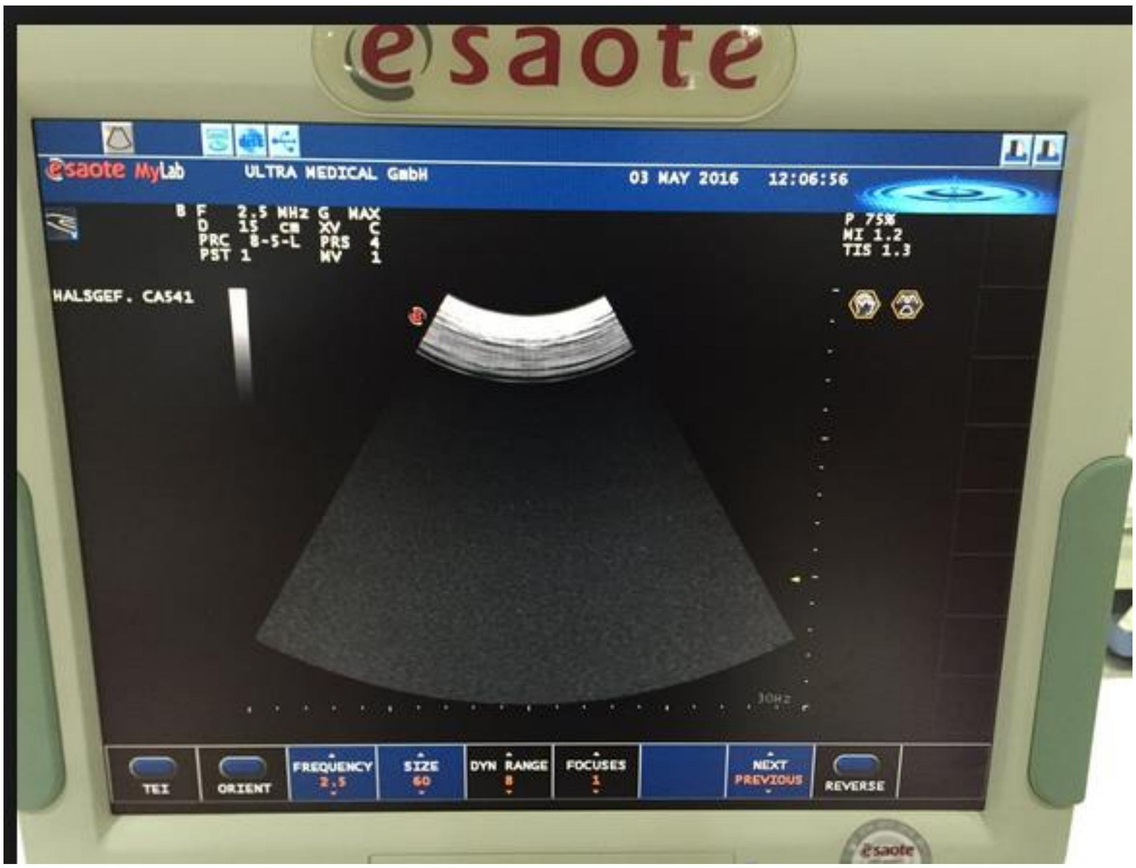
College of Graduate Studies

Study the Impact of Physical Efforts on the Shoulder Tendons for the People with Different Jobs Using Ultrasounography

Data Collection Sheet

age	gender	Dominate hand	job	Rt LHP	Rt SST	Rt SCT	Lt LHB	Lt SST	Lt SCT

Appendix two:



My labe

Alpinion ultrasound scanner