

## **ROTATOR CUFF TENDON RUPTURE**

### **Anatomy:**

1. Rotator cuff consists of: Subscapularis anteriorly, Supraspinatus superiorly and Infraspinatus and Teres minor posteriorly.
- 2 Biceps tendon is present in the rotator interval [between supraspinatus and subscapularis] also contributes to cuff function.
3. Rotator cuff acts as force couple with the deltoid ie., rotator cuff fixes humeral head in the glenoid so that deltoid muscle can abduct the shoulder.

**Incidence** > 60 years      26% have full thickness  
   28% have partial tear of the rotator cuff.

### **Tendons involved**

Supraspinatus	95%
Infraspinatus	36%
Subscapularis	10%
Long head of biceps	35%

### **Pathology [Neer]**

Stage I	Edema (Overuse) of the cuff
Stage II	Fibrosis and tendinitis
Stage III	Cuff rupture

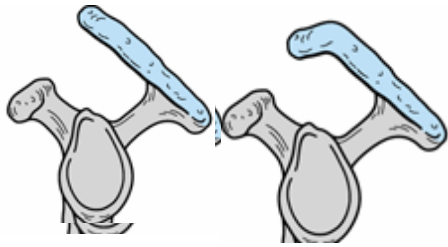
**Codman:** Rupture starts in the deep surface of the cuff and progress on to the bursal side of the cuff. This occurs a centimeter from its insertion of the cuff in the region of supraspinatus tendon.

### **Pathogenesis**

1. **Anatomical:** Cuff tendons pass under the coracoacromial arch and can get compressed between head of the humerus and acromion.

Repeated movement of the shoulder [abduction and forward flexion] the cuff gets compressed. This is the basis for the acromioplasty where in undersurface of the acromion is excised to provide increase room for rotator cuff.

**Bigliani** suggested three types of acromion.



**Bigliani 3 types of Acromion**

Type	Incidence	Incidence of rotator cuff tear
I - flat	8%	17%
II - curved	40%	0%
III – hooked	42%	60%

However this concept has been recently questioned.

**2. Biology:**

Mechanics: Eccentric loading  
 Concentric loading

These loading can subject Superior cuff to a compressive loading.

**3. Gradual:** It has also been suggested that as the muscle fatigues in overuse, (i) the function of the rotator cuff to centralize the humeral head in the glenoid and (ii) proprioceptive feedback from the tendon mechanoreceptors are both diminished, and the result can be upward subluxation under the coraco-acromial arch, possibly resulting in impingement.

**Classification cuff tear**

I Partial: Bursal side tears  
 Joint side tear  
 Inter tendinous tear

II Complete: Small <1 centimeter  
 Medium 1-3 centimeter  
 Large 3-5 centimeter  
 Massive >5 centimeters

Massive tear is seen 20% of the tear and about one third are irreparable

### **Pathogenesis of tendinosis**

Pathologic processes intrinsic and extrinsic to the tendons have been proposed as the underlying cause of rotator cuff disease, but the precise etiology is not known. Tear formation is, in part, attributable to the accumulation of subrupture tendon fatigue damage. The progression of damage accumulation leading to fiber rupture and eventual tendon tearing seen with higher loading illustrates the progression from tendinopathy to full thickness tearing.[ J Shoulder Elbow Surg (2012) 21, 158-163]

### **Clinical**

Cuff tear occurs in 50-60 years in sedentary lives without history of injury or heavy use.

Cuff lesion is usually bilateral

50% patients with cuff defects had no recollection of shoulder trauma

Could be symptomatic or asymptomatic

When painful:

    Pain with overhead activity

    Pain at night (on sleeping on the affected side).

### **Signs**

Wasting of Supraspinatus and Infraspinatus.

May have rupture of long head of biceps: deformity of the biceps muscle

Range of movement: Forward flexion, Abduction, External and internal rotation may be limited

Tests: Neer's impingement sign is positive

    Hawkin's sign may be positive

    Muscle weakness: Lag tests

        Supraspinatus: Jobe's test

        Infraspinatus: Resisted external rotation

        Subscapularis: Belly press test or Lid off test

        Biceps: Speed or Yargassons's test

## **Shrugging of the shoulder on abduction**

Movement by scapular rotation. Reversal of rhythm

## **Scapular Dyskinesia**

Abnormal movement of the shoulder blade (scapula) is known as scapula dyskinesia. This occurs in a variety of shoulder problems. Type 3 - supero-medial border prominence is seen in cuff pathology.

**X ray :** AP and scapular outlet view [lateral with rays directed 10° inferior]

1. Greater tuberosity: Sclerosis or cystic changes
2. Acromio-Clavicular joint:  
Osteoarthritis  
Osteophytes or Spur [The heel type was most common and detected in (56%) in the cuff tear group].
3. Acromio-humeral distance  
Normal 7–15 mm
4. Bigliani's 3 types



## **ULTRASOUND**

Sensitivity 91%  
Specificity 98%  
Accuracy: 95%.

It is an operator dependent procedure

### **Advantages**

- Noninvasive
- Cheaper
- No radiation.

## **MRI**

MRI is a very accurate in demonstrating rotator cuff tear. Gold standard

### **Advantages**

1. Defines partial or complete tear
2. Chronicity of the tear

3. Detects any intra-articular pathology: Labral tear
4. Detects arthritis of Glenohumeral and acromioclavicular joint
5. Any Labral cysts

Complete tear



**B. Chronicity of the tear [CORR (2010) 468:1498–1505]**

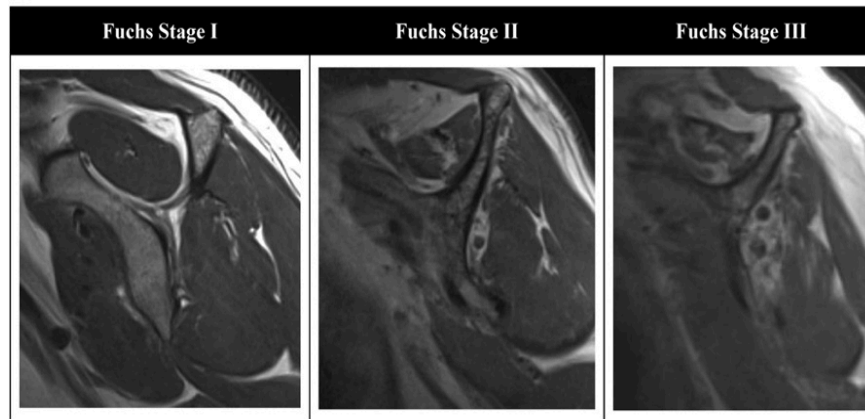
**Table 4.** Delay between the symptoms onset and the imaging studies for the different fatty infiltration stages (variation observed according to the onset.)

Supraspinatus fatty infiltration	Delay onset – imaging studies (months)		
	Total	Traumatic onset	Progressive onset
Minimal	23.6 ± 36.8	19.4 ± 37.3	29.5 ± 37.5
Moderate	45.7 ± 61.8	34.8 ± 55.7	54.1 ± 66.7
Severe	70.3 ± 74.2	57.7 ± 66.7	83.9 ± 80.2

Fatty degeneration. J Shoulder Elbow Surg (2012) 21, 175

**A**

Goutallier Stage (CT)	Degree of Fatty Change	Fuchs Stage (MRI)
0	Normal muscle (no fatty deposits)	I
I	Some fatty streaks present	
II	More muscle than fat	II
III	Equal muscle and fat	III
IV	More fat than muscle	

**B****Treatment****Asymptomatic Tear**

Leave it alone

Exercises

**Symptomatic Tear**

1. Gentle stretches five times a day.

Rockwood 6 stretching exercise, each for 1 minute for 3 months

1. Stretching External Rotation
2. Stretching in overhead
3. Forward leaning
4. Cross body reach
5. Stretching Internal Rotation
6. Stretching External Rotation by rotation of body

Aim: Initial goal is to achieve normal movements by stretching exercises

Strengthening exercises follows this

First build up Cuff tendons and the build up later deltoid and scapular muscles

2. Course of NSAID's is beneficial

3. Role of Steroid: 2 or 3 injection 40 mg of kenacort [steroid] is effective

Some surgeons questioned it's effectiveness

4. If non-operative treatment fails then Open or Arthroscopic acromioplasty with or without cuff repair should be considered.

### **Natural History of non-operative treated tear [Am J Sports Med 39, 2011]**

At a follow-up of 2-3 Years, 50% of the tears increased in size, 40% had not changed, and 10% decreased in size. For 25% of initially intact shoulders, a new full-thickness rotator cuff tear was diagnosed.

Maman: 33 symptomatic full thickness rotator cuff tears in patients treated non-operatively. Using MRI scans performed at least 6 months apart, they found that 52% had an increase in tear size (.2 mm), 36% had no change, and 12% had decreased in size in a median follow-up period of 18 months (range, 7-58 months).

### **Contemporary Concept of surgical treatment**

#### **1. Symptomatic or not**

An asymptomatic rotator cuff tear may convert symptomatic one with time

Rotator cuff tears do progress in size with time. Untreated partial rupture may become complete [40%, J Bone Joint Surg Am. 2010;92:2623-33]

Treat all tears surgically? No

Pain development in shoulders with an asymptomatic rotator cuff tear is associated with an increase in tear size. Larger tears are more likely to develop pain in the short term than are smaller tears. Further research is warranted to investigate the role of prophylactic treatment of asymptomatic shoulders to avoid the development of pain and loss of shoulder. Presently literature is not clear

#### **2. Age**

<50 years always operate

>60 years: try non-operative first if fails then consider surgery. As aging population are more active, many disabled elderly patient may benefit with a surgical treatment.

### 3. Timing

Some surgeon suggest early repair as with delay fatty degeneration in the cuff muscles occur with delay in surgery. However, recent report does not support this.

### 4. The integrity of the tendon after surgical repair

Ultrasound at 2 years after surgery revealed that the integrity of the repair of a large tear was present only in 50% . Integrity of surgical repaired small tear was present in over 90%.

### Traditional treatment [Neer]

Gold standard is open surgery

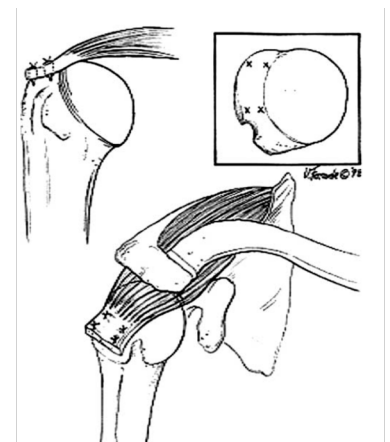
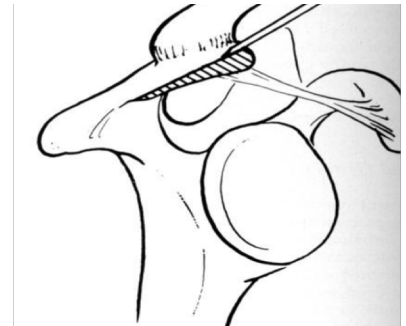
Some centers this is carried out arthroscopically

Skin: Sabre incision or lateral incision

Acromioplasty: antero-inferior part of the acromion

Cuff repair: Allan Mason stitch with tunnels in the greater tuberosity

+/- Excision of later end of clavicle. . .



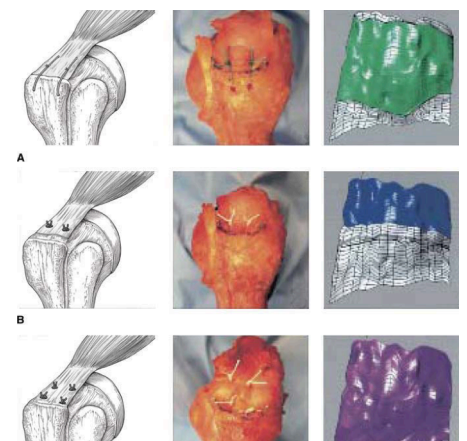
**Presently:** Arthroscopic or Mini open is more open surgery

Cuff repair with anchoring stitch

Double row technique.

Double-row rotator cuff repair techniques incorporate a medial and lateral row of suture anchors in the repair configuration.

Biomechanical studies of double-row repair have shown increased load to failure, improved contact areas and pressures, and decreased gap formation at the healing.





Clinical studies, however, have not yet demonstrated a substantial improvement.

A	Transosseous
B	Single Row
C	Double row

Recommendations [Am Acad Orthop Surg 2011;19:368-379]

1. In the absence of reliable evidence, it is the opinion of the work group that surgery not be performed for asymptomatic full-thickness rotator cuff tears.
2. Rotator cuff repair is an option for patients with chronic, symptomatic full-thickness tears. In this study larger treatment benefits in terms of outcome scores after one year were found for surgical treatment of rotator cuff tears compared to physiotherapy.
3. Inconclusive: for or against exercise programs (supervised or unsupervised) for patients with rotator cuff tears.

Inconclusive: for or against subacromial injections for patients with rotator cuff tears.

### **Outcome**

1. Zumstein [N 27] had undergone an open, transosseous repair; 3 years. All of these patients reported a good-to-excellent result despite a re tear rate of 37%. At 4 years 84% of the patients were satisfied and 93% had pain relief.

2. Survivorship of primary open cuff repairs [not requiring additional surgery]  
Open cuff repairs were performed in 254 patients; Survivorship of 94% at 5 years and 83% at 10 years. [Hawkins J Shoulder Elbow Surg (2011) 20, 591]

3. Mini Vs Open repair of the cuff: No difference in outcomes at 1 and 2 years postoperatively between the scope mini-open and open procedures. The quality of life of patients undergoing the arthroscopic acromioplasty with mini-open rotator cuff repair was improved to a clinically significant degree at 3 months compared with the open group. [*Am. J. Sports Med.* 2008; 36; 1043]

5. Analysis of between-group differences showed better results for the surgery group

on the Constant scale (difference 13.0 points), for pain-free abduction (difference 28.8°) and for reduction in pain. 92-B, No. 1, Jan 2010

6. Result of acute traumatic cuff rupture [Acta Orthopaedica 2011; 82 (2): 187]

1. No correlation between the structural or clinical outcome and the time to repair within 3 months was found.
2. The outcomes were similar irrespective of the number of tendons repaired.
3. The patients with a tendon defect at follow-up had a statistically significantly lower Constant- Murley score.

7. Operative and non-operative [J Bone Joint Surg Am. 2012;94:801-8]

In a consecutive series of patients who had been offered repair of an isolated, symptomatic supraspinatus tear, the refusal of operative treatment resulted in surprisingly high clinical patient satisfaction and no increase of the average size of the rotator cuff tear 3.5 years after the recommendation of operative repair.

## Reference

1. Optimise treatment for cuff. J Bone Joint Surg Am. 2012;94:163-7
2. Single Vs Double row technique JAAOS 2010, Vol 18, No 2: 83
3. Mini Vs Open. [Am. J. Sports Med. 2008; 36; 1043]
4. Surgery Vs non-op. VOL. 92-B, No. 1, JANUARY 2010
5. Maman: Non op Vs MRI J Bone Joint Surg Am. 91(8):1898
6. Operative Vs Non op. [J Bone Joint Surg Am. 2012;94:801-8]