Shoulder Tendon Injuries

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Disclosures

- I have no relevant disclosures

Overview

- What are shoulder tendon injuries in the athlete?
- Rotator cuff injuries
- Biceps tendon injuries
- Pectoralis injuries
- Summary

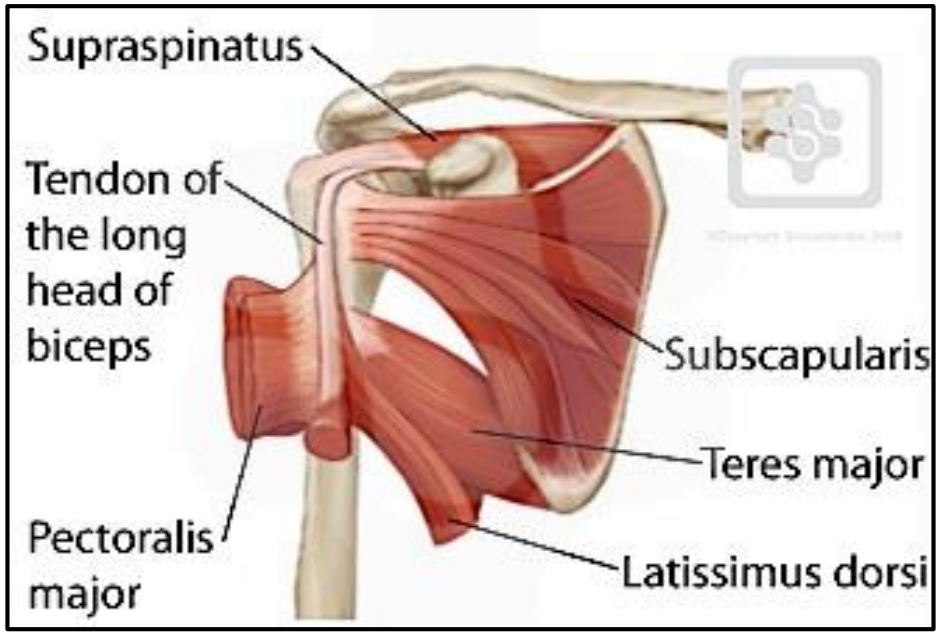
What are shoulder tendon injuries?

Anatomy

- Shoulder consists of:
  - Humerus
  - Scapula
  - Clavicle
- Shoulder joint includes:
  - Capsule (keeps humeral head in glenoid socket)
  - Labrum (deepens socket and stabilizes joint)
  - Muscles, tendons (reinforce joint stabilty)

Anatomy

- Tendons connect muscles to bone
- Shoulder tendons include:
  - Rotator cuff tendons (SITS)
  - Biceps tendon
  - Pectoralis major tendon



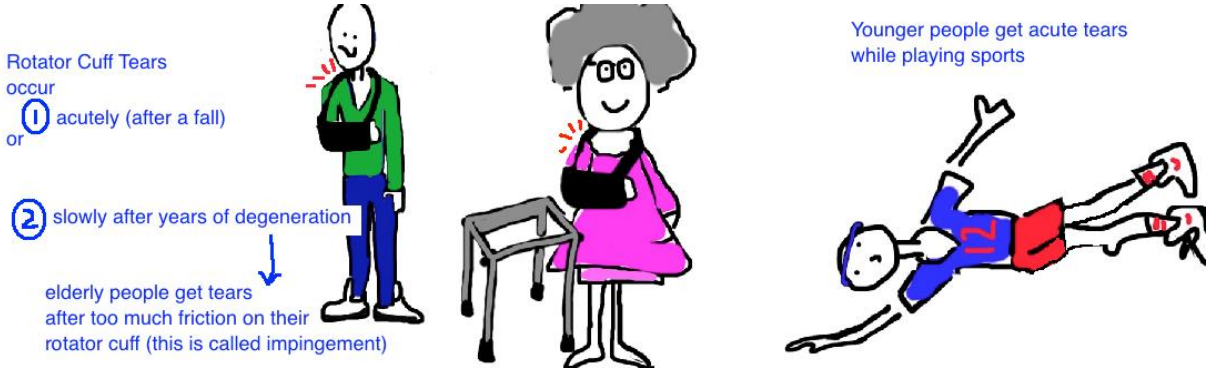
Tendon injuries

- Tendinitis
- Partial tear
- Complete tear
- Muscle sprain

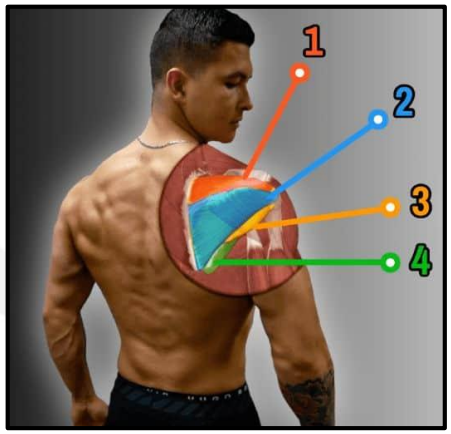
Rotator cuff injuries

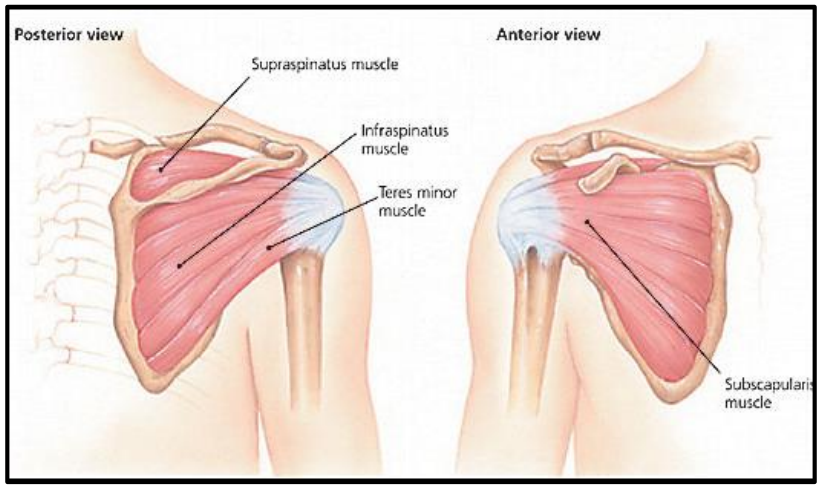
Anatomy

- Rotator cuff injuries:
  - Traumatic in younger patients
  - Degenerative in older patients



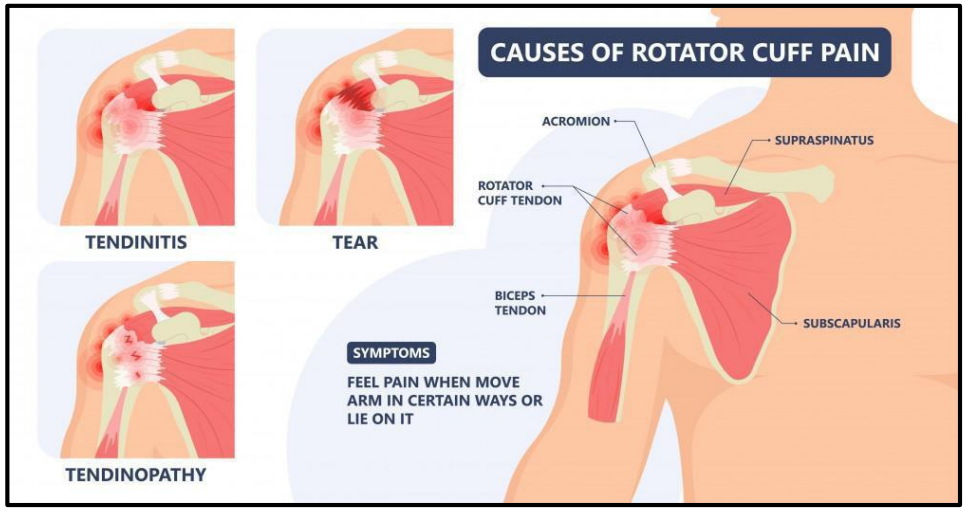
- Rotator cuff includes:
  - Supraspinatus
  - Infraspinatus
  - Teres minor
  - Subscapularis





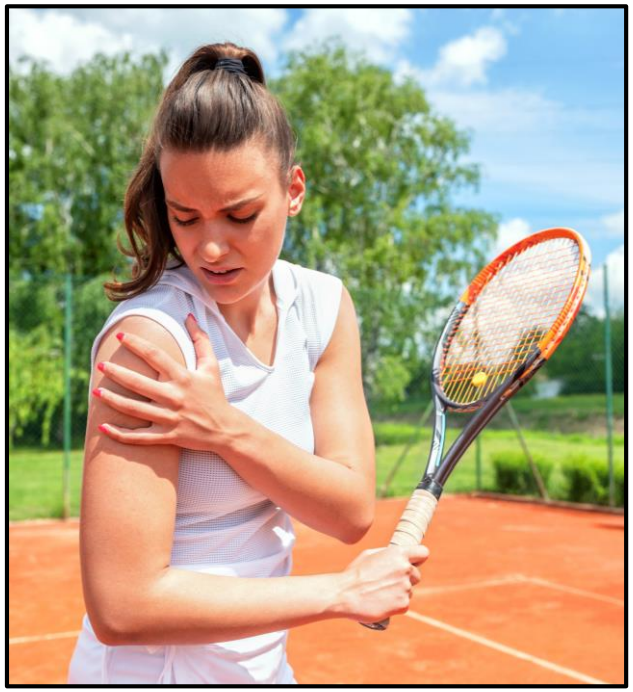
Injury

- Rotator cuff tears typically occur slowly overtime, after motions are consistently repeated and there is repetitive stress on the shoulder
- Bursal side is more vascular than the articular side, which is hypovascular and is more often injured
- Can also occur traumatically with a fall or dislocation
- The primary function of the rotator cuff is to provide dynamic stability and maintain a stable fulcrum for glenohumeral motion
- The goal of treatment in rotator cuff tears is to restore this equilibrium in all planes.



Epidemiology

- Prevalence
  - age >60: 28% have full-thickness tear
  - age >70: 65% have full-thickness tear
- Risk factors
  - age
  - smoking
  - hypercholesterolemia
  - family history
- Common among athletes, especially in sports that require throwing, repetitive lifting or overhead activities, such as:
  - Baseball
  - Tennis
  - Rowing
  - Weightlifting
  - Basketball

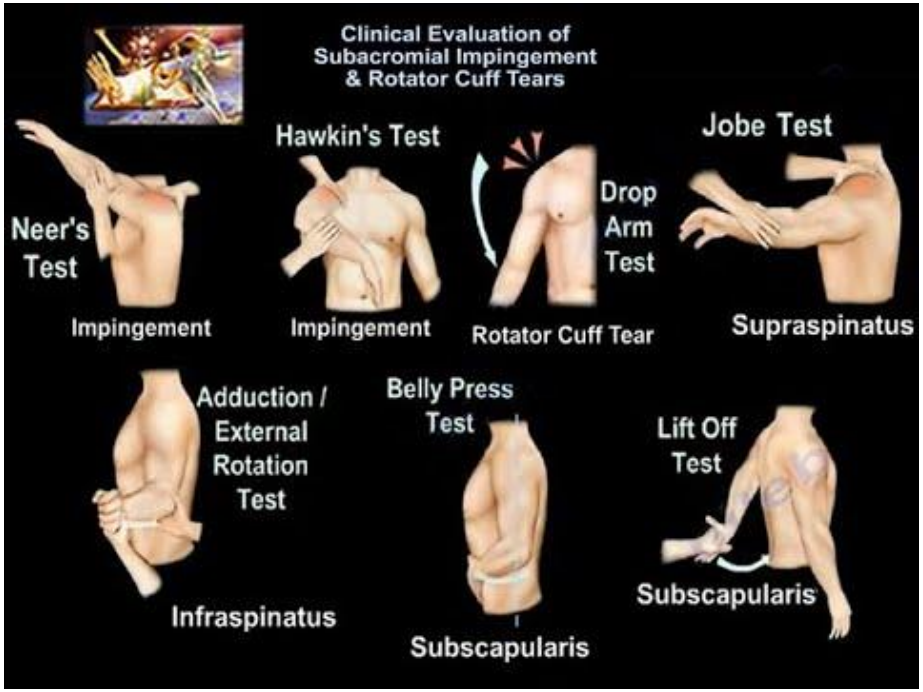


History

- Pain:
  - Typically insidious onset of pain exacerbated by overhead activities
  - Located in deltoid region
  - Can have acute pain and weakness with an traumatic tear
- Weakness:
  - Loss of active ROM with greater or intact passive ROM

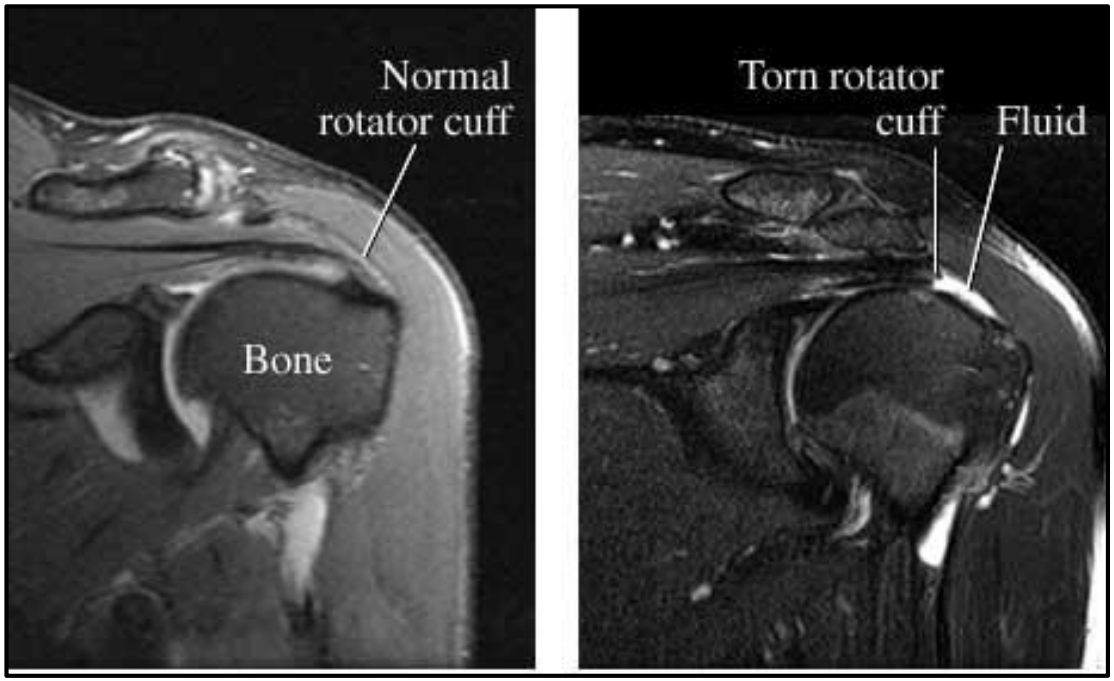
Exam

- Swelling
- Tenderness at lateral shoulder
- Active ROM limited, worse than PROM
- Provocative tests



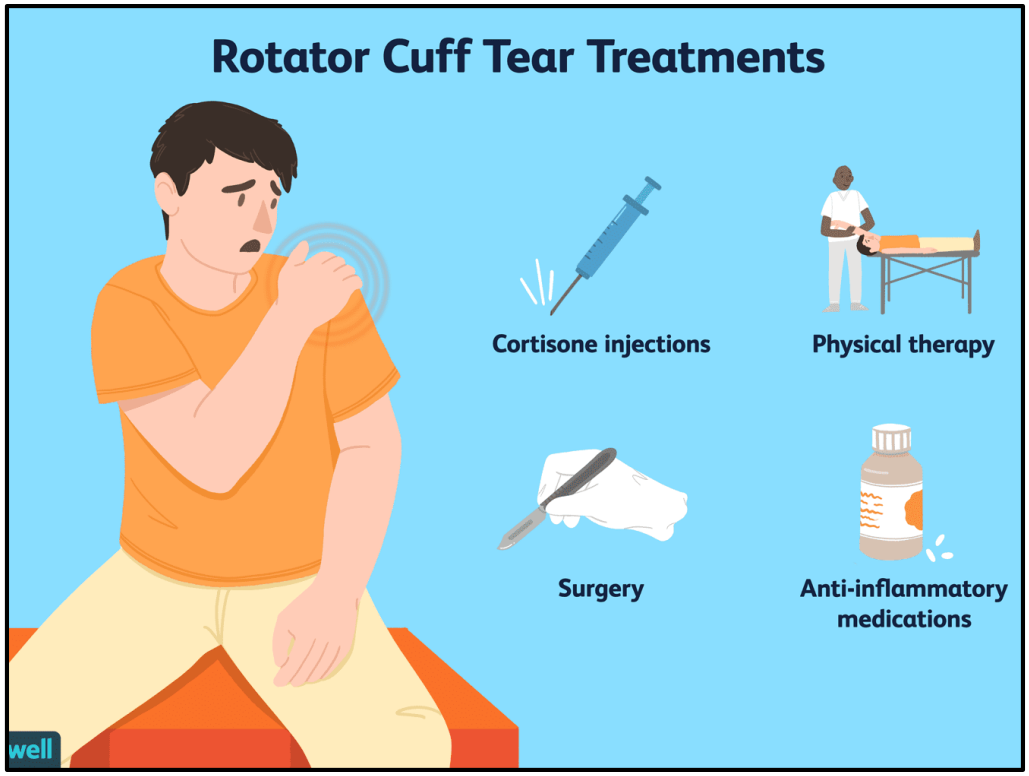
Imaging

- X-rays
  - Rule out fx/dislocation
- MRI
  - Diagnostic standard for rotator cuff pathology
- Possibly MRA, ultrasound



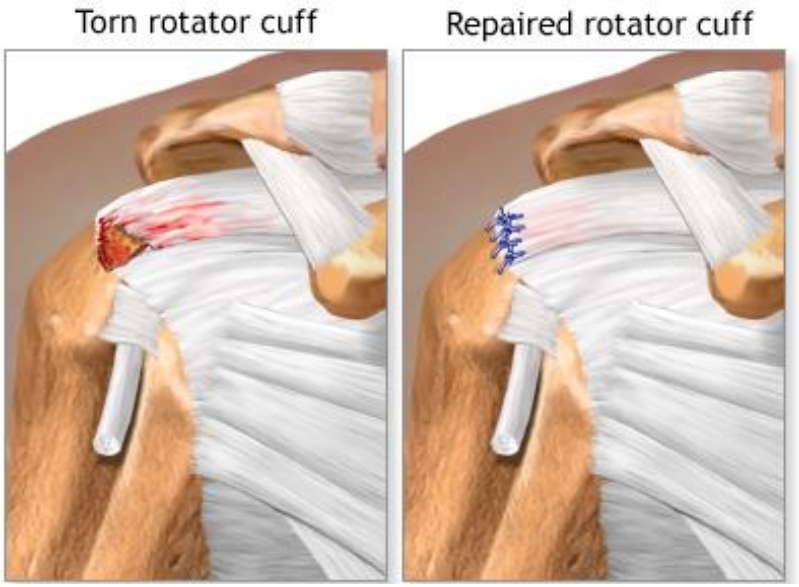
Treatment

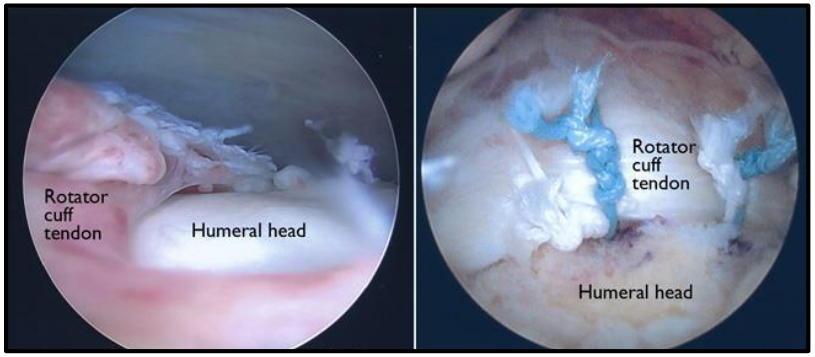
- Non-operative:
  - Physical Therapy
  - NSAIDs
  - Cortisone injections



Treatment

- Operative:
  - Subacromial decompression and RC debridement
  - Repair (arthroscopic, mini-open)
  - Tendon transfer
  - Superior capsular reconstruction
  - Reverse TSA





Evidence Based Management

AAOS Clinical Practice Guideline Summary

Management of Rotator Cuff Injuries

Stephen Weber, MD
Jaskarndip Chahal, MD, MSc, MBA

- Strong recommendations for:
  - Treatment of RC tears, non-op and op
  - Early post op mobilization for small-med tears
  - Older age, WC associated w higher failure rates poorer PROs after repair
- Moderate recommendations for:
  - Surgical mgmt shows improved PROs compared to PT alone
  - Single corticosteroid injections for pain and functional improvement
  - Adjunct procedures, +/- Acromioplasty, DCR
  - Diabetes, high BMI have higher retear rates
- Limited recommendations for:
  - Hyaluronic Acid, PRP

Factors Predicting Rotator Cuff Retears

An Analysis of 1000 Consecutive Rotator Cuff Repairs

Brian T.N. Le,* MD, Xiao L. Wu,* MBBS, Patrick H. Lam,* PhD, and George A.C. Murrell,*† MBBS, MD, DPhil
Investigation performed at the Orthopaedic Research Institute, St George Hospital Campus, University of New South Wales, Kogarah, Sydney, New South Wales, Australia

- Overall retear rate 6 months after surgery was 17%.
- Retears occurred in 27% of full-thickness tears and 5% of partial-thickness tears (P>.0001).
- Rotator cuff tear size (area and thickness) showed stronger associations with retears than tissue quality and concomitant shoulder injuries.

Evidence Based Management

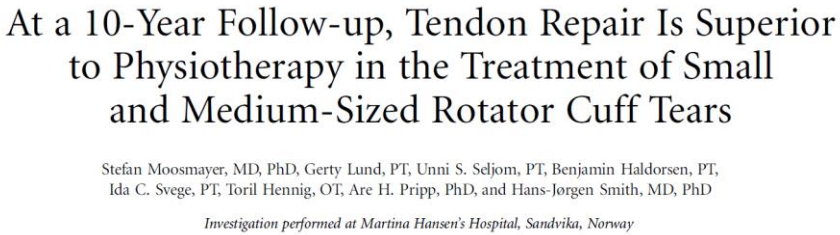
Diagnosis and Management of Partial Thickness Rotator Cuff Tears: A Comprehensive Review

Kevin D. Plancher, MD, MPH
Jaya Shanmugam, MD
Karen Briggs, MPH
Stephanie C. Petterson, MPT, PhD

ABSTRACT

Partial thickness rotator cuff tears (PRCTs) are a challenging diseas
entity. Optimal management of PRCTs continues to be controversi

- Nonsurgical treatment is typically first line management
- Surgical intervention should be considered when patients have failed 3 to 6 months of conservative management and in younger patients with acute, traumatic injury and is often directed by patient age, activity level, arm dominance, tear thickness, and location.



At a 10-Year Follow-up, Tendon Repair Is Superior to Physiotherapy in the Treatment of Small and Medium-Sized Rotator Cuff Tears

Stefan Moosmayer, MD, PhD, Gerty Lund, PT, Unni S. Seljom, PT, Benjamin Haldorsen, PT, Ida C. Svege, PT, Toril Hennig, OT, Are H. Pripp, PhD, and Hans-Jørgen Smith, MD, PhD

Investigation performed at Martina Hansen's Hospital, Sandvika, Norway

- Repair of small to medium RC tears show clinical improvement over time, supporting a primary surgical approach for this type of tear in younger and active patients.

Evidence Based Management

Rotator cuff injuries in adolescent athletes

Jennifer M. Weiss[a], Alexandre Arkader[a], Lawrence M. Wells[b] and Theodore J. Ganley[b]

- Retrospective review showing surgical repair of high-grade partial-thickness and complete rotator cuff tears yielded excellent functional outcomes in adolescents at midterm follow-up.
- Overhead athletes may have difficulty playing the same position after surgery.

Risk Factors of Overuse Shoulder Injuries in Overhead Athletes: A Systematic Review

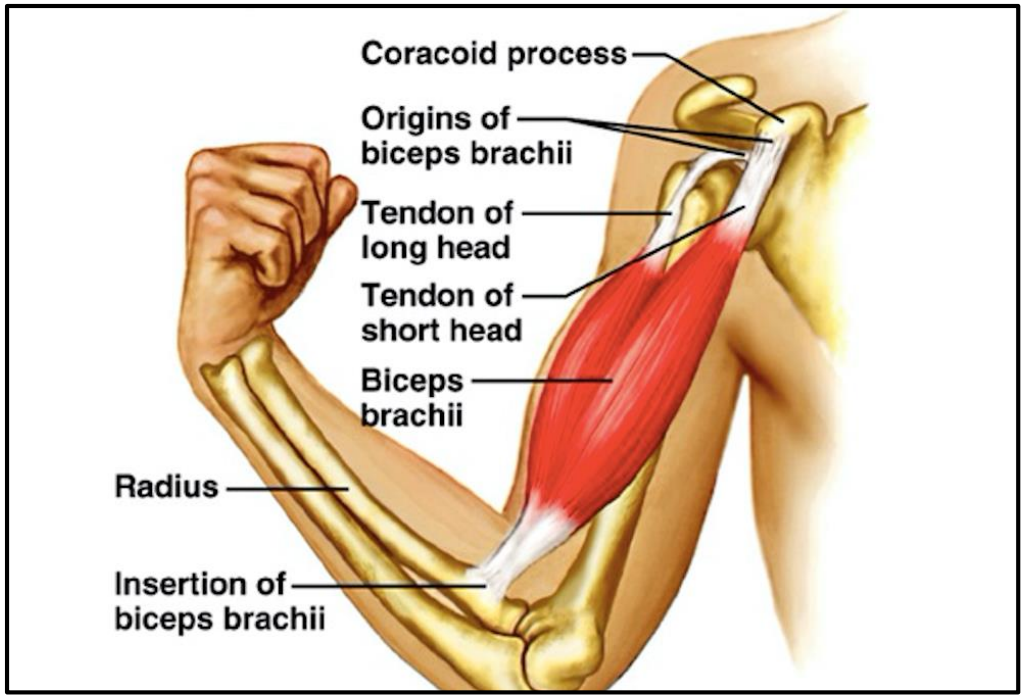
Camille Tooth, PT,*†‡ Amandine Gofflot, PT,‡ Cédric Schwartz, PhD,† Jean-Louis Croisier, PT, PhD,†‡ Charlotte Beaudart, PhD,§ Olivier Bruyère, PhD,§ and Bénédicte Forthomme, PT, PhD†‡

- Range of motion, rotator cuff muscle weakness, and training load are important modifiable factors associated with shoulder injuries.
- Intrinsic factors and scapular dysfunction may also have influence.

Biceps tendon injuries

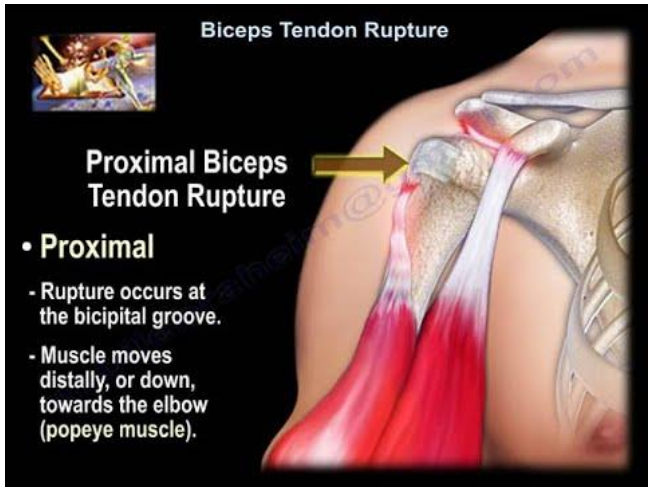
Anatomy

- **Bicep long head tendon**
  - originates off supraglenoid tubercle and superior labrum
  - stabilized within bicipital groove by transverse humeral ligament
  - Long head attaches to superior labrum
  - Short head attaches to coracoid

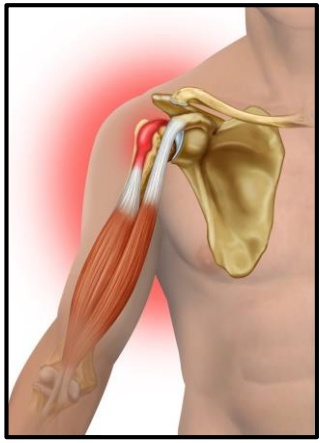


Injury

- Tendon rupture
  - Ruptures commonly occur when there is an unexpected force applied to the bicep muscle such as attempting to catch something or someone when they fall.
  - Most ruptures occur when the elbow is in a flexed position.
  - May hear a “pop”
  - Proximal biceps ruptures usually occur in setting of rotator cuff tears, particularly subscapularis



- Tendinitis
  - Often associated with other primary shoulder pathology
  - subacromial impingement
  - stenosis of bicipital groove
  - rotator cuff tears
  - especially subscapularis pathology



Epidemiology

- Associated with:
  - Anabolic steroid use
  - Biceps tendinoptathy
  - Rotator cuff tear (Subscapularis)
  - Involves mostly middle-aged men
  - Approximately 96% involve the long head, 3% the distal, and 1% the short head of the biceps

History

- Tendinitis
  - Anterior shoulder pain
  - May have pain radiating down the in the region of the biceps
  - Symptoms may be similar in nature and location to rotator cuff or subacromial impingement pain

- Traumatic injury (rupture)
  - Symptoms as above
  - Proximal tear or rupture associated with increased swelling, bruising, pain

Exam

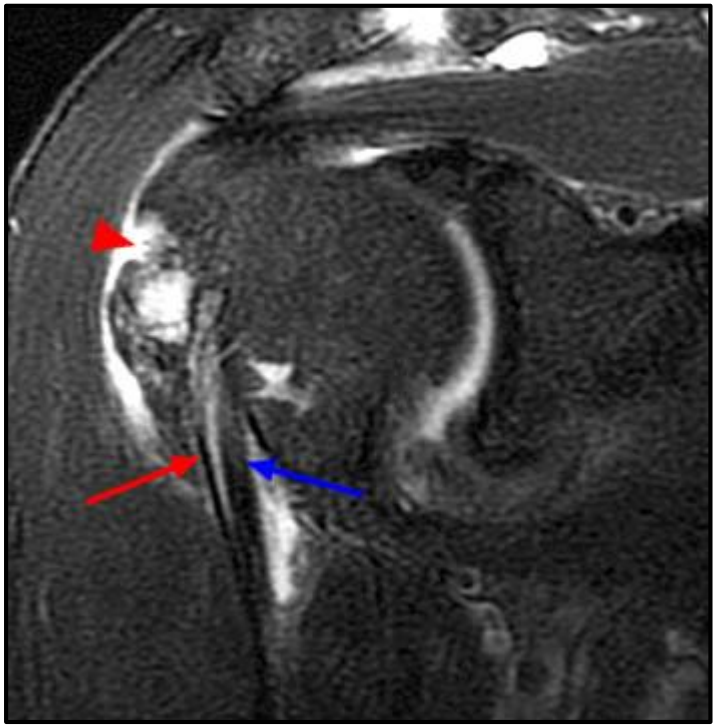
- Tenderness with palpation over biceps groove
  - worse with arm internally rotated 10 degrees
- Speed test
  - pain elicited in bicipital groove when patient attempts to forward elevate shoulder against examiner resistance while elbow extended and forearm supinated.
  - may also be positive in patients with SLAP lesions.

- Yergason's test
  - pain elicited in biceps groove when patient attempts to actively supinate against examiner resistance with elbow flexed to 90-degrees and forearm pronated

- “Popeye" deformity
  - indicates rupture

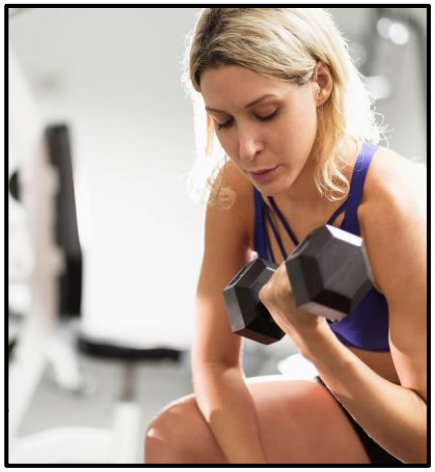
Imaging

- X-rays
  - Rule out fx/dislocation
- Ultrasound
  - can show thickened tendon within bicipital groove
- MRI
  - can show thickening and tenosynovitis of proximal biceps tendon
  - increased T2 signal around biceps tendon



Treatment – Non Operative

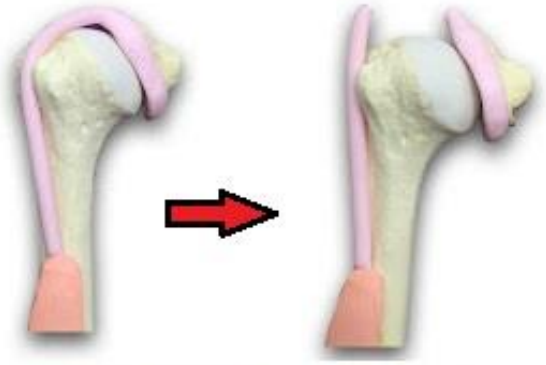
- Non-operative:
  - NSAIDS
  - PT
  - First line of treatment
- Steroid injections:
  - If refractory to above
  - Injecton technique - direct steroid injection in proximity, but not into tendon
- Tears/ruptures:
  - PT
  - Non-op tx in sedentary/older patients
  - Cosmetic deformity



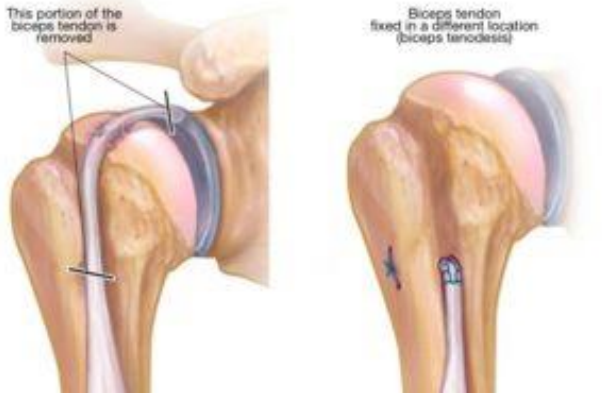
Treatment- Operative

Arthroscopic tenodesis vs. tenotomy

- indications
  - surgical release reserved for refractory cases for bicep pathology seen during arthroscopy
  - Young, active patients; athletes
- technique
  - repair vs. release/tenodesis
- post-op rehab: tenodesis
  - avoid active forearm supination with the elbow at 90° of flexion
- outcomes
  - tenotomy is associated with increased rate of cosmetic deformity ("Popeye deformity")
  - tenodesis may be associated with "groove pain"
- no difference in strength, functional outcomes, or range of motion between two techniques



Biceps Tenotomy



Evidence Based Management

Review Article

Long Head of the Biceps Tendinopathy: Diagnosis and Management

Shane J. Nho, MD, MS
Eric J. Strauss, MD
Brett A. Lenart, MD
CDR Matthew T. Provencher, MD, MC, USN
Augustus D. Mazzocca, MD, MS
Nikhil N. Verma, MD
Anthony A. Romeo, MD

- Non op tx first line of treatment for LHB tendinopathy
- Surgical indications include:
  - Cosmetic deformity, fatigue discomfort from full thickness tear
  - Partial-thickness tear >25%
  - LHB subluxation w subscap tear
  - SLAP tear (relative)

A meta-analysis of level I evidence comparing tenotomy vs tenodesis in the management of long head of biceps pathology

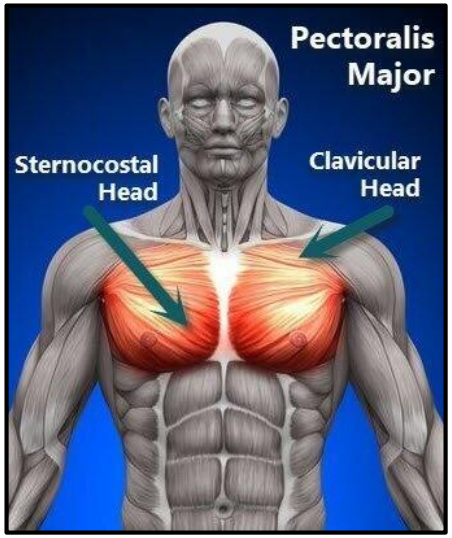
Xi Ming Zhu, MBBS, MSc[a,b], Timothy Leroux, MD, MEd, FRCSC[c], Eyal Ben-David, MBBS[a,b], Brittany Dennis, PhD, MBBS[b,d], Chetan Gohal, MD[e], Jacob M. Kirsch, MD[f], Moin Khan, MD, MSc, FRCSC[e,*]

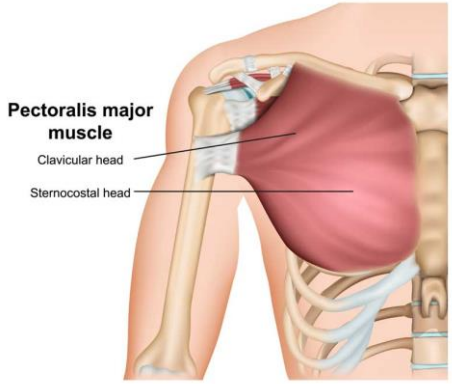
- Tenotomy and tenodesis of the long head of the biceps results in comparable postoperative clinical and functional outcomes.
- Tenodesis is superior to tenotomy in preventing Popeye deformity postoperatively

Pectoralis major injuries

Anatomy

- **Pectoralis major**
- Origin (two heads)
  - clavicular head - from medial clavicle and proximal sternum
  - sternocostal head - from distal sternum, costal cartilage ribs 1-6, external oblique aponeurosis
  - sternocostal portion is larger (>80% of muscle volume)
- Insertion
  - humeral shaft just lateral to the bicipital groove
- Action
  - shoulder adduction and internal rotation, to a lesser extent forward flexion (chiefly the clavicular head)





Injury

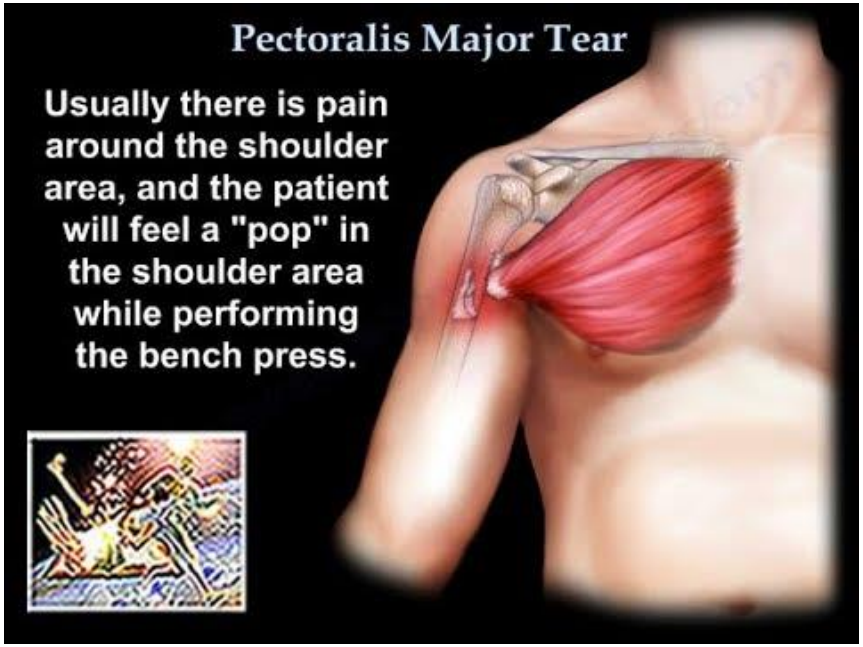
- A rare acute injury caused by avulsion of the pectoralis major tendon and usually seen in weightlifters.
- Occurs from excessive tension on a maximally eccentrically contracted muscle
  - occurs during the downward portion of a bench press, with the arm in the final 30 degrees of humeral extension while pushing against heavy resistance
- Tendon fails in a predictable sequence
  - inferior fibers of sternocostal head fail first,
  - then superior fibers of the sternocostal head
  - finally the clavicular head
- Treatment is usually surgical repair when presenting acutely

Epidemiology

- Incidence
  - rare injury (< 1 per 100,000 per year) that is increasing in incidence
  - 75% of all reported cases have occurred since 1990
- Demographics
  - almost exclusively seen in males (20-40 years of age)
  - often occurs in weightlifters
  - commonly during bench-pressing
- Location
  - most commonly occurs as a tendinous avulsion
  - sternocostal head of the pectoralis major tendon is the most common site of rupture
- Risk factors
  - anabolic steroid use

History

- Patient may report a sudden pop or tearing sensation with resisted adduction and internal rotation
- Pain and weakness of shoulder



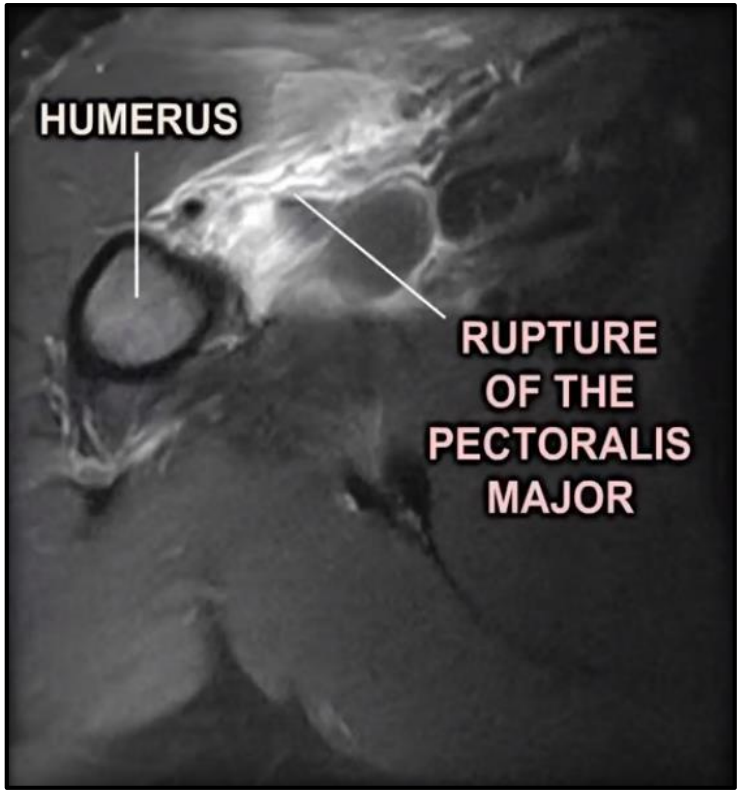
Exam

- Inspection & palpation
  - swelling and ecchymosis of anterolateral chest wall and/or proximal medial brachium
  - "dropped nipple" sign - ipsilateral nipple will appear lower than the unaffected side due to medial retraction of muscle belly
  - palpable defect and loss of anterior axillary contour, accentuated by resisted adduction

- Motion & strength
  - weakness most pronounced in adduction and internal rotation
  - to a lesser extent forward flexion

Imaging

- X-rays
  - Rule out fx/dislocation
- MRI
  - can differentiate between complete and partial tears
  - requires dedicated sequence (standard shoulder MRI will not capture adequately)
  - useful in identifying the location and extent of the rupture (partial versus complete)
  - may show avulsion of the pectoralis major tendon from the humerus
  - integrity of clavicular head may mask partial rupture of sternocostal head

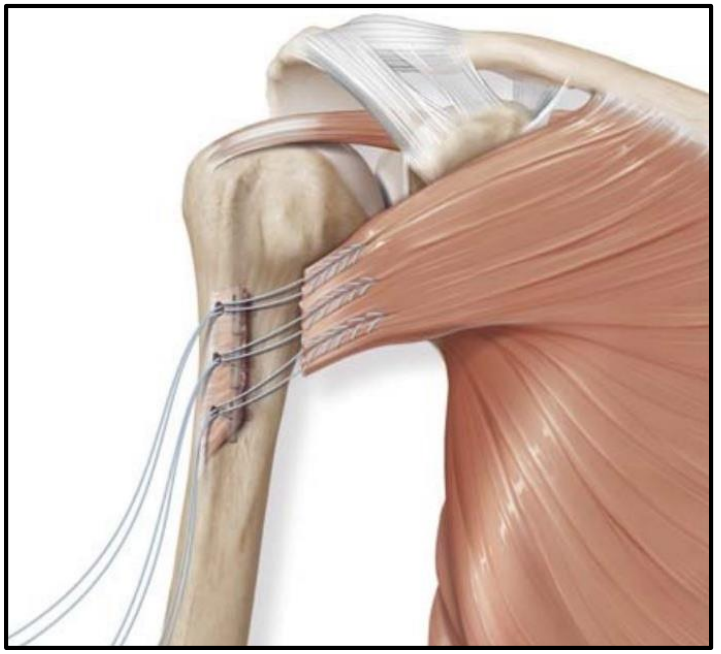


Treatment – Non operative

- **Initial sling immobilization, rest, ice, NSAIDs, physical therapy**
- Sling in adduction and internal rotation, begin passive range of motion immediately as tolerated
- Active assisted and active motion over the first 6 weeks
- Transition to strengthening and unrestricted activity at 2-3 months

Treatment – Operative

- **Open primary repair**
  - transosseous suture repair
  - cortical button fixation
  - suture anchor repair
  - direct repair may be indicated for tears at the muscle belly or myotendinous junction
- **Reconstruction**
  - graft options: Achilles allograft (most common), Gracilis weave (allograft versus autograft)



Evidence Based Management

M. Wurm · A. B. Imhoff · S. Siebenlist
Abteilung und Poliklinik für Sportorthopädie, Klinikum Rechts der Isar, Technische Universität München, Munich, Germany

Surgical repair of acute pectoralis major muscle ruptures

- Recent metanalysis which included both acute and chronic PM tendon repairs confirmed superiority of surgical treatment versus nonsurgical treatment in functional score

Pectoralis Major Rupture: Evaluation and Management

Marcin Kowalczuk, MD, FRCSC
Amr Elmaraghy, MD, FRCSC

ABSTRACT

- Nonsurgical treatment is a viable option especially in patients with partial tears, multiple comorbidities or poor compliance with postoperative rehabilitation

Summary

Take Away Points

- Shoulder injuries can involve many different tendons around the joint; location is key to diagnosis
- Tendon injuries may occur traumatically on the field, but often occur from training or overuse
- First-line treatment for all tendon injuries is with rest, ice, NSAIDs, sling immobilization
- For all shoulder tendon injuries, athlete should f/u with an orthopaedist ASAP to obtain further imaging and confirm diagnosis

Thank You!

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