Tendon Infections & Ruptures

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Rotator Cuff Disorders

- True “syndrome” – i.e. signs & symptoms with than one cause.
- Classic impingement syndrome described by Neer.
  - Stage 1: reversible edema & hemorrhage
  - Stage 2: fibrosis & tendinitis
  - Stage 3: bone spurs & tendon ruptures
Rotator Cuff Disorders

Clinical presentation includes:
- Pain & tenderness from rotator cuff.
- Subacromial abrasion/crepitus.
- Positive “impingement signs.”
- Relief with subacromial local anesthetic injection.
- Confirmatory imaging (arthrogram, U/S, MRI).
Functional Anatomy

- Rotator cuff tendons form complex woven pattern.
- Deepest layer has looser arrangement than dense oblique weave of layer above.
- Most rotator cuff tears begin on articular surface.
Functional Anatomy

- Rotator cuff muscles have abundant and redundant blood supply.
- Tendons possess “critical zone” of hypovascularity.
Functional Anatomy

- As tendon fibers fail, load increases on remaining fibers.
- Vascular anatomy can also be distorted, leading to local ischemia.
Are acromial bone spurs a primary cause of rotator cuff tendinitis?

• Acromial morphology may be congenital or acquired.
• In a cadaver study, Bigliani found 17% Type I, 43% Type II, & 40% Type III.
• 80% of patients with positive arthrograms had Type III acromion.
Functional Anatomy

- Spurs are not the same as a Type III acromion.
- Spurs are osteophytes on the anterior 1/3 of the acromion at the CA ligament insertions.
Pathogenesis of Cuff Damage
Static Causes

- Type III acromion.
- Lateral downsloping of acromion.
- Os acromiale.
- Ossification of origin of C-A ligament.
- Hypertrophy of C-A ligament.
Pathogenesis of Cuff Damage
Dynamic Causes

External impingement: abnormal motion of head/cuff relative to scapula/C-A ligament.
- Cuff weakness.
- Tight posterior capsule.
- Type II SLAP lesion.
- U/E weight-bearing.
- Scapular dysfunction.
- Poor conditioning &/or technique.
Pathogenesis of Cuff Damage
Dynamic Causes

- Internal impingement: abnormal motion of head/cuff with inner cuff contacting superior labrum.
- Cuff weakness.
- Shoulder instability.
- Scapular dysfunction.
- Poor conditioning &/or technique.
Natural History

- Cadaver studies demonstrate a 7-26% incidence of RCT’s.
- Studies with higher average age generally have more RCT’s.

Chard Arthritis Rheum, 1991

- 21% of 644 subjects > 70-year-old had shoulder symptoms but only 40% had sought medical attention.
Natural History

Peterson G, Acta Chir Scan 1942

- 71 healthy, asymptomatic shoulders (age 15-85 year-old)
- 13/27 shoulders age 55-85 had partial or full RCT’s on arthrogram.
- Most in 70-75 year-old.


- 60-70 year-old → 50% partial or full RCT’s
- 80+ → 80% partial or full RCT’s
Natural History

Sher et al JBJS-A, 1995

- MRI study of asymptomatic shoulders.
- 19-39 year-old → 4% partial, 0% full RCT’s.
- 40-60 year-old → 24% partial, 4% full.
- >60 year-old → 26% partial, 28% full.
Diagnosis of Cuff Disorders
Pain and tenderness

Differentiate from:
- adhesive capsulitis
- scapulothoracic crepitus
- cervical radiculopathy
- suprascapular neuropathy
- G-H and AC arthritis
Diagnosis of Cuff Disorders

Instability
- Apprehension confused with impingement.
- Can lead to internal impingement.
- Can be caused by cuff rupture (loss of subscapularis or massive RCT).

Muscle Atrophy
- Large chronic tears.
- Suprascapular neuropathy.
Diagnosis of Cuff Disorders
Subacromial abrasion/crepitis
Diagnosis of Cuff Disorders

Impingement signs
MacDonald, Clark et al, JSES 9(4):299-301, 2000
- Neer sign sensitivity of 75% for bursitis, 85% for RCT.
- Hawkins sign sensitivity of 85% for bursitis, 88% for RCT
- Specificity was 40-50%.
Diagnosis of Cuff Disorders

Subacromial Pain Ablation Test
Mair, Koler et al JSES 13(2):150-3, 2004

- Outcome of scope SAD compared to preoperative pain ablation test result.
- Pts with positive test $\rightarrow$ 88% satisfactory post-op.
- Pts with negative test $\rightarrow$ 60% satisfactory post-op.
Diagnosis of Cuff Disorders

Arthrography
- Invasive.
- Accurate for full-thickness RCT’s though not for assessment of size.
- Articular-side partial RCT can be shown.
- Not useful for tendinitis or assessment of muscle atrophy.
Diagnosis of Cuff Disorders

Ultrasonography
- Cost-effective.
- Non-invasive.
- Dynamic images.
- Operator-dependent.
- Not useful for tendinitis or muscle atrophy.
Diagnosis of Cuff Disorders

MRI
- Non-invasive.
- Expensive.
- Accurate for full-thickness tears.
- Has potential for Dx of tendinitis & partial tears but reliability is variable.
- Demonstrates muscle atrophy, fibrosis, and fatty infiltration.
Diagnosis of Cuff Disorders
MRI
Conservative Treatment

• Activity modification
• Moist heat
• NSAID’s
• Home exercise program
Conservative Treatment

- Tight posterior capsule produces obligate anterosuperior head translation with shoulder flexion.
Conservative Treatment

Shoulder Strengthening Exercises

Shoulder Service—Department of Orthopaedics
The University of Texas Health Science Center at San Antonio

Do each exercise ______ times. Hold each time for ______ counts. Do exercise program ______ times per day.

Begin with Yellow Theraband for ______ weeks.
Then use Red Theraband for ______ weeks.
Then use Green Theraband for ______ weeks.
Then use Blue Theraband for ______ weeks.
Then use Black Theraband for ______ weeks.
Then use Gray Theraband for ______ weeks.

EXERCISE 1

EXERCISE 2

EXERCISE 3

EXERCISE 4

EXERCISE 5
Conservative Treatment

When is enough enough?

- No true consensus
- Minimum of 6 weeks
- Continue for at least 3 months if there is improvement within the first 6 weeks.
- MRI patients with symptomatic plateau.
Conservative Treatment
Cortisone injections

- Inflammatory cells not part of histopathology.
- Degenerative/tendinosis caused by avascularity, aging, or overuse.
- Randomized, double blind study demonstrating some symptomatic relief with steroids.
- Randomized, double blind study demonstrated no efficacy.
Conservative Treatment
Cortisone injections

Watson JBJS 67B, 1985

- Reviewed surgical findings of 89 RCR’s
- Those with no injections had strong cuff tissue
- The more injections prior to surgery, the worse the tissue.
- Cortisone may relieve pain & improve ability to perform H&P.
- First shot is best shot.
- Cortisone probably not helpful & quite possible harmful for full thickness RCT’s.
Open Acromioplasty
Open Acromioplasty
Shoulder Arthroscopy

- Rapidly becoming one of the most frequently used orthopaedic techniques
- Tool of choice for treatment of:
  - rotator cuff tendinitis or tears
  - AC arthritis
  - SLAP lesion
  - recurrent instability (anterior, posterior, multi-directional)
  - avascular necrosis
  - adhesive capsulitis
  - early osteoarthritis
Rotator Cuff Repair
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Irreparable Tears
Irreparable Tears
Patient #1
- 55-year-old male with 1 month history of shoulder pain & positive impingement signs.
- PCP treated with NSAID’s & ordered MRI which demonstrated a large rotator cuff tear.

Patient #2
- 65-year-old female fell down stairs & suffered an anterior shoulder dislocation radiographed and reduced in ER.
- 3 weeks later, patient still has ++ pain and poor arm elevation.

Patient #3
- 55-year-old male driver of MVA T-boned on left side 3 months ago.
- Left shoulder pain persists with no benefit from NSAID’s, PT, and subacromial cortisone.
- MRI demonstrates small, full-thickness RCT.
The Future

Rotator cuff disorders represent a syndrome of painful tendon degeneration/rupture with multiple & complex underlying causes.

Improved understanding of causes (static & dynamic) will help guide treatment
- When to pursue therapy, what therapy
- When to take patient to surgery
- Optimal surgical technique

Imaging studies should be ordered & interpreted in context of clinical impressions.
Long Head Biceps Rupture

- Most common of biceps ruptures
- Most common 40-60 years old
- Males similar incidence to females
- Usually caused by chronic attrition/impingement
Long Head Biceps Rupture

- Spontaneous ruptures left alone (minimal functional loss)
- Surgical release (tenotomy) of degenerative biceps is indicated
- Many techniques for tenodesis of released biceps to anterior humerus described (caused by guilt?)
Distal Biceps Rupture

- 3-10% of biceps ruptures
- Incidence increasing or better recognized
- Nearly all male, muscular, 40-60 years old
- 80% right arm
- Usually caused by single forceful event
Distal Biceps Rupture

- Often missed by first provider evaluating patient.
- Comparison to contralateral arm very useful to detect altered contour.
- Chronic loss leads to loss of supination > flexion power (esp when lacertus fibrosis remains intact).
- 1 or 2 incision repair techniques with good results.
Hand Flexor Tendon Injuries

- Most are result of lacerations
- Remember that tendon is cut at the level the tendon is at when it’s cut (usually finger flexed)
- Clinical exam is important
- Explore the wound with good lighting, hemostasis & anesthesia
Hand Flexor Tendon Injuries

- Active mobilization following primary tendon repair -> greater & more reliable excursion than passive mobilization
- This requires patient compliance, excellent hand therapy and strongest possible repair
Hand Flexor Tendon Injuries

Strength of repair depends on many factors:
- # of suture strands
- Suture locking technique
- Suture travel through tendon
- Suture thickness, braided
- Placement of core sutures
- Placement of knots
- Epitenon suture
Hand Flexor Tendon Injuries

- Rehab protocol will depend on surgeon preference, patient and injury factors
- “Place and Hold” common, passive still useful
- Skilled hand therapist indispensable
Extensor Tendon Injuries

- Usually associated with a laceration
- Retraction not as much of an issue as with flexors
- Tendons are thinner and minimal tenosynovium
- Repair allowing for early active ROM usually not possible
- Stiffness less of an issue but still important
Mallet Finger

- Closed injury; usually axial “jammed” finger
- Presents as extensor lag
- Finger tends to be frequently reinjured if adequate extension power is not restored but moderate loss of active extension arc usually well tolerated
- Early closed treatment better than late surgery
Acute Infection

- Typically introduced by local skin penetration
- Host factors often important:
  - Diabetes
  - Alcoholism, malnutrition
  - Chronic corticosteroid use
  - Autoimmune disorder
  - HIV
- Most common Staph and Strep
  with increasing incidence of MRSA
Acute Infection

- Prevention with good wound care, allow drainage
- Prompt treatment required to prevent proximal spread
- Surgical irrigation and debridement often required
- Antibiotic selection tailored to likely organisms
"You might need rotator cuff surgery, but let's just try not throwing money at problems for 6-8 weeks first, senator."