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Arthroscopic Subscapularis Repair

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Introduction

- History
 - Smith 1834 - First case report describing subscapularis tear
 - Hauser 1954 - Described a repair technique
 - Gerber 1991 - Reports small series, tho largest of its kind, open repair
 - Burkhart 2002 - Reports small series, tho largest of its kind, arthroscopic repair
 - Bennett 2003 - Reports two arthroscopic series, including cases from 1995-1999
- Clinical importance
 - Helpful to recognize early
 - To avoid further atrophy and retraction
 - Higher incidence than previously reported
 - Requires higher index of suspicion
 - Often associated with other pathology
 - Posterosuperior rotator cuff tear - supraspinatus, infraspinatus
 - Biceps pathology
- Personal Series of 81 consecutive repairs for rotator cuff tears (2005)
 - 74 involving the posterosuperior cuff
 - Subscapularis tears in 31 (42%)
 - 19 partial
 - 12 full-thickness tears
 - 5 full-thickness of a portion of the subscapularis tendon
 - 7 full-thickness of the entire subscapularis tendon
 - Biceps pathology noted in 52%
 - All ruptured biceps (6) associated with subscapularis tears
 - All dislocated biceps (4) associated with entire full-thickness subscapularis tears
 - 16 subscapularis repairs performed along with repairs of the posterosuperior cuff
 - Other 7 case of the 81

- Additional 6 isolated subscapularis tears required repair
- One formal open repair of posterosuperior cuff plus open subscapularis repair
- This is in a community shoulder practice

Principles

- Early diagnosis
 - Detailed history
 - Acute trauma
 - Forceful external rotation
 - More often males, dominant arm
 - Chronic, progressive in older patients
 - Often with posterosuperior cuff pathology
 - Tendon failure from prior surgery with subscapularis release and repair
- Directed physical exam
 - Anterior shoulder pain - lesser tuberosity (LT)
 - Increased external rotation with entire tendon detached
 - Weak internal rotation
 - Belly press
 - Lift-off
 - Modified lift-off
 - Associated biceps pathology
- Imaging
 - Radiographs - limited use, except if anterior subluxation or coracoid non-union noted
 - MRI
 - Medial retraction
 - Muscle atrophy
 - Assess coracohumeral interval
 - Ultrasound
- Ideal indications
 - Acute tear in young patient
 - Thus limited atrophy/degeneration
 - With minimal retraction
 - Limited associated pathology
 - Though plan to address likely biceps pathology
 - Small supraspinatus tear can ease technical aspects of repair
 - Compliant patient who understands the post-op requirements
- Contraindications
 - Pain free
 - Severe atrophy
 - Fatty degeneration, Goutallier grade 4
 - Arthropathy

- Non-compliant patient
- Arthroscopic > Open
 - Identify/address associated pathology
 - Faster procedure once learning curve surmounted
 - As secure a repair?
 - In my experience, I think so!
- Tear patterns
 - Intrasubstance
 - Partial tears
 - Limited detachment superolateral
 - PASTA tear equivalent
 - Full-thickness (complete) tears involving a portion of the tendon, i.e., 33% or 50%
 - Full-thickness (complete) tears involving entire tendon, therefore 100%
 - Variable retraction, tho MRI important pre-op

Arthroscopic Repair Principles

- Arthroscopic instruments
 - Mobilizing devices
 - Elevators, cautery
 - Shuttling tools
 - Spectrum tray, etc.
 - Penetrators
 - Straight, occasionally angled
- Anchors
 - Metal - one step insertion
 - My preference
 - Oblique angle can cause skiving
 - Pointed metal anchor tip helps this
 - Absorbable - requires three-step insertion
 - Impact hole, tap hole, insert screw
- Suture
 - For repair - high tensile suture, #2, double-loaded on anchor
 - Traction suture - with full thickness tear, #1 PDS or similar
 - Shuttling suture - #0 Prolene, or similar, shuttle relay
- Other issues
 - Beach chair or lateral decubitus
 - Beach chair for me
 - Anesthesia - interscalene block, with LMA
 - McConnell or Tenet Spider arm holder helpful
 - One quality assistant - for suture management, scoping, anticipating, etc.
 - Work swiftly/deliberately as swelling can add difficulty to surgical steps

Arthroscopic Repair Techniques

- Portals
 - Posterior
 - Principle viewing portal
 - Anterior
 - Principle suture passing portal
 - Can be used for anchor insertion
 - Just lateral to coracoid
 - Anterolateral
 - Principle anchor placement portal
 - More inferior if two anchors planned
 - Also for suture management in isolated subscapularis repair
 - Lateral (subacromial) portal
 - Through supraspinatus cuff defect
 - Simplifies suture management when shuttling
 - Accessory anterolateral
 - For traction suture, in line with tendon repair
 - Inferior and more lateral
 - No cannula usually
 - Percutaneous access
 - i.e., for anchor placement, if needed
- Diagnostic arthroscopy
 - Address biceps pathology first, when present
 - Removes a viewing obstacle during repair
 - Identify medial wall of biceps groove, if possible
- Partial tears
 - Intrasubstance tears
 - Degeneration of superior rolled edge
 - When repair felt to be indicated
 - Simple suture(s) to imbricate tear
 - Often absorbable suture, i.e., #1 PDS
 - Partial tears
 - If debridement is not enough
 - Single anchor placement usually, and repair as described below
- Full-thickness tears
 - Tears involving complete detachment of the tendon
 - Varies from just superior portion torn to entire tendon detached and retracted
 - Tendon mobilization is essential
 - Especially with more tendon involved, with more chance for retraction medially
 - Traction suture may be helpful

- Clear out (ablate) rotator interval, including middle glenohumeral ligament
- Anterior release to base of coracoid
 - Can expose entire posterior of coracoid
 - Often release coracohumeral ligament
 - Especially when posterosuperior tear present
- Can use anterolateral portal to view when working thru anterior portal
- Axillary nerve
 - At risk anterior to subscapularis when inferior to coracoid
 - At risk posterior to subscapularis when inferior along glenoid
- Mobilize posterosuperior cuff at this point, if needed
 - Helps subscapularis mobilization
- Lesser tuberosity preparation
 - Anterior or anterolateral portal used
 - Expose bone, though no trough is created
 - Between biceps groove to articular margin
 - Rarely need to remove articular cartilage
 - Dimensions (Burkhart, D'Addesi)
 - Approximately 25mm from superior to inferior
 - Approximately 18mm from lateral to medial
- Anchor insertion
 - Single-row repair, placed laterally, is the principle approach
 - Work from inferior to superior
 - Two anchors used when >50% full-thickness tear
 - Anterolateral approach
 - External arm rotation presents anchor position to portal
 - If portal too high, use stab incision for anchor placement
 - Can use anterior portal with internal arm rotation
 - With lateral anchor placement
 - Can pass sutures in simple or mattress fashion
 - Usually a combination of both
- Suture passage
 - Arm can be internally rotated to improve exposure
 - And enable good, healthy bite of tendon more medially
 - Use traction suture to deliver tendon when retracted medially, then released
 - Also helps to enable good, healthy bite of tendon more medially
 - Retrieve more medial suture, from one of double-loaded sutures
 - thru lateral portal if available, or other empty cannula/portal
 - With Spectrum hook, pass through healthy bite of tendon
 - Usually 15-20 mm "bite"
 - If 100% tear, go as inferior as able

- Use penetrator if the anchor suture can be delivered to the instrument tip
- Most often pass both sutures from each anchor in simple fashion
 - Especially in 100% tears
- Mattress used more often when one anchor placed
- Suture tying
 - Internally rotate arm for less tension
 - Allows for tendon to move laterally as suture is tied, covering footprint
 - Tie when both sutures are passed from one anchor
 - Makes case easier to tie prior to placing second anchor
 - Does not make second anchor placement, or suture passage, harder
 - Sliding knot preferred
 - Post is always the suture passed thru tendon
 - Tie thru anterior portal, tho can be anterolateral
- When second anchor planned
 - Plan to space these from inferior to superior
 - At least 10mm apart
 - Repeat steps with second anchor for placement, suture passage, tying, etc.
- Assess repair
 - Externally rotate arm to insure secure repair
 - Internally rotate to insure secure apposition of tendon to lesser tuberosity
- Coracoplasty
 - Indicated when coracohumeral interval is <7mm (Burkhart 2003)
 - If 5.5mm cannula is tight in the space following repair, coracoplasty performed
 - Glenohumeral approach is used
 - Performed less frequently in my cases
- Sling (avoid arm extension), anesthetic infusion, cryotherapy, hydrocodone and ketorolac used post-op, as has always been out-patient for my cases.
- Rehabilitation & Physical Therapy
 - Progress based on:
 - Tendon involvement
 - Repair security
 - Patient tendon/bone quality
 - Detailed protocols for 50% and 100% subscapularis repairs available at
 - <http://www.lishoulder.com/arcrr rehab.htm>

Outcomes

- Limited studies
- Lafosse 2007 - Arthroscopic repair
 - 17 isolated subscapularis repairs of full-thickness tears
 - 7 tears of sup 1/3, 6 tears of sup 2/3, 4 tears of entire tendon
 - 29 month mean f/u, mean age 47

- Constant score 58 ↑ to 96
- UCLA score 16 ↑ to 32
- Pain score 5.9 ↑ to 13.5
- Significant gains in mean flexion, ER, IR, abduction strength
- Edwards 2006 - Arthroscopic debridement + biceps tenotomy
 - 11 isolated subscapularis tears, full-thickness
 - 4 tears of sup 1/3, 2 tears of sup 2/3, 5 tears of entire tendon
 - 9 also had biceps subluxation or dislocation treated with tenotomy
 - 34 month mean f/u, mean age 64
 - Constant score 49 ↑ to 80
 - 9 patients very satisfied or satisfied
- Kim 2005 - Arthroscopic repair
 - 29 isolated subscapularis repairs of partial articular tears
 - 16 tears <1cm, 13 tears >1cm
 - Biceps tears (partial or subluxation) in 25 patients
 - 27 month mean f/u, mean age 54
 - ASES scores - 18 excellent, 10 good, 1 fair
 - Biceps tenodesis did not effect results
- Bennett 2003 - Arthroscopic repair
 - 8 isolated subscapularis tears
 - 6 complete, 2 partial (no further description)
 - 2-4 year f/u
 - All outcome measures significantly improved
 - Except objective Constant score (includes active IR)
 - Internally rotate arm to fully visualize subscapularis insertion to detect small/partial tears
 - Test repair with IR and ER to assess stability
 - 1-2 fixation devices used
 - Mattress suture repair, especially inferiorly, and simple suture repair
 - Evaluate coracohumeral interval for compromise post-repair
 - IR thru ER to assess
 - 4 inferolateral coracoplasties
 - Biceps tears <50% torn debrided and >50% tenodesed
 - Also see Bennett *Arthroscopy* 2003;19:21-33
- Burkhart 2002 - Arthroscopic repair
 - 25 subscapularis repairs of full-thickness tears
 - 17 combined with posterosuperior cuff tears, 8 isolated
 - 10.7 months mean f/u (min 3 months), mean age 61
 - UCLA score 10.7 ↑ to 30.5
 - 92% good/excellent
 - Similar outcomes in isolated or combined repairs
 - 14 with biceps pathology

- 6 debridements, 4 tenotomies, 4 tenodeses
- Belly-press (Napoleon sign - Imhoff)
 - Negative (-) if $< \frac{1}{2}$ of tendon completely torn
 - Intermediate (+/-) if $> \frac{1}{2}$ but $< \frac{2}{3}$ of tendon torn
 - Positive (+) if entire tendon torn

Conclusion

- Subscapularis tears are not as uncommon as once thought
- During arthroscopic shoulder surgery with suspected tendon pathology, be prepared to address subscapularis pathology, and also look for any associated biceps pathology
- Identify tendon (when retracted), mobilize it carefully and completely, prepare the lesser tuberosity bed, insert anchors laterally (for a single row repair), securely repair the tendon (often one anchor for 50% tear, two anchors for more tendon involved)

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