Partial Thickness Rotator Cuff Tears

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Problem with PTRCTs

• Lack of high-quality studies
• Most RCT studies evaluate full-thickness tears
• Natural history not well understood
• “Painful” – more ways than one!
Prevalence

- Cadaveric and Imaging Studies
  - 13-32%
- Age Dependent
  - MRI studies
    - <40yo – 4%
    - >60 – 26%
    - >70 – 80%
- Elite Overhead Athletes
  - 40%

Pathogenesis

- Intrinsic Factors
  - Hypocellularity
  - Fascicular thinning
  - Reduced blood supply
- Extrinsic Factors
  - Subacromial impingement
  - Glenohumeral instability
  - Internal impingement
- Trauma
  - Overhead athletes

Natural History

- Yamanaka et al (CORR, 1994)
  - 28% of PTRCTs progressed to Full-thickness at 1 yr
  - 80% progressed in size
- Denkers et al (AAOS Proceedings, 2012)
  - Mean of 4.4 years – serial MRI
  - 76% no progression of size
  - >50% tendon thickness – 55% tear progression
  - <50% tendon thickness – 14% tear progression
Natural History

- Healing is rare
  - Age-related degenerative change
- Non-anatomic procedures
  - Do not address the PTRCT
  - Ie. Subacromial decompression
  - Do not prevent tear progression

Classification

- Limitations
  - Coronal and sagittal plane dimensions
  - Tissue Quality
  - Acuity of tear
  - Variability of tendon thickness
    - 10-12mm

Non-surgical Treatment

- Effective in the right patient population
  - Elderly, Sedentary, Chronic, <50% thickness
- Not so effective in the wrong population
  - Young, Active, Acute, >50% thickness
- Throwing Athlete
  - Often accept up to 75% thickness
  - Limits in motion following repair
  - Address concomitant pathology
Surgical Treatment

• Indications
  – Failure of conservative treatment
  – Younger patient
  – Acute injury
  – >50% thickness without additional pathology

• Decision Making
  – Debridement +/- Acromioplasty
  – Repair

Debridement +/- Acromioplasty

– Ellman et al (CORR, 1990)
  • 50 pts, isolated SAD for PTRCT – 88% good to excellent results

– Kartus et al (Arthroscopy, 2006)
  • 33 pts, isolated SAD for PTRCT
  • Ultrasound at 2 years – 35% progressed to Full-thickness tears
  • Constant score 30 points less than C/L shoulder

– Cordasco et al (AJSM, 2002)
  • Isolated SAD
  • Excellent results PTRCTs <50 % thickness
  • Higher failure rate bursal-sided tears vs. articular-sided tears

Arthroscopic Repair

• Conversion Repair
• In Situ/ Transtendon Repair
• All intra-articular Repair
Arthroscopic Repair
• Conversion Repair
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Conversion Repair

- Complete the tear
- Removal of all diseased tissue
- Ease of fixation
- Kamath et al (JBJS, 2009)
  - 93% satisfaction rate
  - 88% repairs intact via U/S at 1 year
- Iyengar et al (Arthroscopy, 2011)
  - Significantly improved UCLA scores
  - 82% repairs intact via MRI at 2 years

Conversion Repair

- Articular vs. Bursal-sided PTRCTs
  - Kim SJ et al (AJSM, 2013)
    - 83 pts, min 2 yr f/u, MRI 6 months post-op
    - No difference clinical outcome
    - No difference retear rate (~10%)
    - Bursal group – higher rate acromial spur
  - Kim KC et al (AJSM 2014)
    - 43 pts, min 2 yr f/u, MRI 1 year post-op
    - No difference in UCLA, SST
    - Bursal-sided group greater improvement Constant score
    - Bursal-sided group 10% retear rate, articular-sided 0% (p<0.05)
In Situ Repair


In Situ Repair

- Advantages
  - Avoidance of detaching residual cuff from footprint
  - Maintains intact lateral cuff
  - Anatomic Reduction of cuff tissue
  - Maintains blood supply to cuff?

- Disadvantages
  - Technically challenging
  - No tuberosity bony preparation

In Situ Repair

- Trans-tendon repair technique
  - High graded articular-sided tears

- Clinical outcomes
  - >90% patient satisfaction rate
  - Castagna et al (AJSM, 2009)
    - 54 pts, Min 2 year f/u
    - 98% satisfaction rate, All outcomes improved
    - 41% residual pain during ABD and IR
    - Better outcomes:
      - less tendon retraction, a larger footprint exposure, of younger age, clinical history of trauma
In Situ Repair

• All Intra-articular “Intra-tendon” technique
  – Altchek et al (Arthroscopy, 2008)
  – Avoids overtensioning the bursal-sided fibers vs articular fibers
  – Articular-sided PTRCTs
  – Park MC et al (AJSM, 2009)
    • Similar biomechanical characteristics to two over-the-top mattress sutures

Conversion vs. In Situ

• Biomechanical Comparison
  – Gonzales-Lomas et al (JSES, 2008)
    • Transtendon Repair
      – Less gap formation
      – Higher ultimate failure load
  – Peters et al (Arthroscopy, 2010)
    • Transtendon Repair
      – Higher ultimate failure load

• Castagna et al (KSSA, 2015)
  – Level 2 Prospective, Min 2 year f/u
  – 74 pts
  – No sig difference improvement VAS, Constant
  – Conversion – Sig increased strength vs. TT

• Shin SJ (Arthroscopy 2012)
  – Level 2 Prospective, Mean 31 mo f/u
  – 48 pts
  – No significant difference ASES, Constant
  – Transtendon group significant higher pain in first 3 months post-op
  – 0% retear rate Transtendon group vs. 8% Conversion
Conversion vs. In Situ

- Franchesci et al (Int Orthop, 2013)
  - Level 2 Prospective Randomized Controlled Trial
  - 32 pts Transtendon, 28 Conversion
  - Mean 38 mo f/u, MRI at final f/u
  - No difference ASES, Constant score, ROM
  - No difference retear rate (~3%)

Conversion vs. In Situ

- Kim YS et al (Arthroscopy, 2015)
  - Level 2 Prospective Comparative
  - 100 pts (50/50) articular-sided and bursal-sided PTRCTs, minimum 1 year f/u
  - TOE suture-bridge in all cases
  - MRI at 6 and 12 mo
  - No difference clinical outcomes – ASES, Constant, SST
  - MRI
    - Retear rate: 4.3% Transtendon, 15.6% Conversion
    - All conversion retears were bursal-sided tears

Conversion vs. In Situ

  - Meta-analysis
  - In Situ vs. Conversion of articular-sided PTRCTs >50% thickness
Conversion vs. In Situ

- Meta-analysis (cont’d)
  - 323 patients – 99 Conversion, 124 transtendon
  - 9 studies, Mean Quality Index – 12.5 (Max 32)
  - No difference in ASES outcomes
  - Transtendon Retear Rate 4.3%
  - Conversion Retear rate – 11.3% (p<0.05)

Overhead Athlete

- Connor et al (AJSM, 2003)
  - MRI asymptomatic shoulders elite throwers
  - 40% partial or full-thickness RCT
  - None required any surgery at 5 yrs
- Debridement +/- SAD treatment of choice
  - Address concomitant pathology – labrum, capsule
  - Concern for stiffness, time off, altered motion

Overhead Athlete

- Payne LZ et al (AJSM, 1997)
  - Overhead athletes <40yo PTRCTs
  - Acute traumatic injuries
    - 86% satisfactory outcomes, 64% return to sport
    - Insidious onset of pain
      - 45% return to sport
- Reynolds SB (CORR, 2008)
  - 76% Elite pitchers return to throwing after debridement, 55% at same level
Conclusions

• Based on current evidence
  – PTTCTS <50% thickness
    • Do well with debridement +/- SAD
  – PTRCTS >50% thickness do better with repair
    • Articular-sided and Bursal-sided
    • Bursal-sided tears – higher retear rate
  – Conversion vs. In Situ Transtendon Repair
    • No difference in clinical outcomes
    • Slightly higher retear rate with Conversion repair
    – Avoid repair in the Overhead Athlete

Conclusions

• Heterogeneity in current studies
  – Patient age, activity level, hand dominance, occupation
  – Concomitant pathology – Biceps, Labrum, OA
  – Repair techniques
• Technique chosen
  – Surgeon comfort level
  – Anatomic reduction
  – Avoid overtension

Thank You