Bicep: Save or Sever?

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1) Pathology of biceps lesions
   a) Classification of Habermeyer and Walch (6)

<table>
<thead>
<tr>
<th>Interval Lesions</th>
<th>Associated with RCT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biceps tendonitis</td>
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</tr>
<tr>
<td>Isolated ruptures</td>
<td>Dislocation</td>
</tr>
<tr>
<td>Subluxation</td>
<td>Extraarticular w/ subscap tear</td>
</tr>
<tr>
<td>Superior</td>
<td>Extraarticular intact subscap</td>
</tr>
<tr>
<td>At groove</td>
<td>Intraarticular w/subscap tear</td>
</tr>
<tr>
<td>Malunion of l. tuberosity</td>
<td>Subluxation w/ RCT</td>
</tr>
</tbody>
</table>

2) Biceps Tendonitis
   a) Hourglass of Boileau (JSES 2004)
      i) Similar to Gross
      ii) Hypertrophic intraarticular portion tethers biceps
      iii) Treated by arthroscopic resection
      iv) Diagnosed by tenotomy not causing tendon to retract out of joint
      v) Not uncommon after open repairs that take down subscap
   b) “Lipstick biceps” of Gross (27)
      i) Stenosis similar to Dequervain’s
      ii) Advocated in situ arthroscopic release
      iii) Diagnosis remains clinical for Gross-differential injection helpful
      iv) Iatrogenic instability a concern-not reported by Gross
      v) 78% good or excellent, 8% fair, 14% poor-clearly not a slam dunk
      vi) Good results of tenotomy and arthroscopic tenodesis may render this risk unnecessary
   c) Becker and Cofield (2) poor results with biceps tenodesis
      i) Isolated biceps problems still rare
      ii) Most “bicipital tendonitis” is in fact impingement

3) Partial Ruptures-these are important pain generators
   a) Neglect-not recommended
   b) Debride-as with partial rotator cuff tears. No good data, Caspari told me <50% debride and >50% repair however visualization of healing has never been reported. All have experienced persistently painful biceps that resolve with rupture
   c) Becoming a French “biceps killer” with time!
   d) Repair-appropriate for damage to biceps root (some SLAP 4 lesions)
Tenotomy- Why do patients tolerate the biceps deformity with injury, and so poorly tolerate this when it is created iatrogenically?
   i) Pioneered by the French (“the biceps killers”). Popularized by Walch (35,36) with few complication reported
   ii) Speer similar results (23,33) as did Hawkins (16) better than open tenotomy
   iii) Walsch “never saw a popeye” (34)
   iv) 10% decrease in strength according to Warren (39) 21% versus 8% strength loss compared to tenodesis according to Mariani et al. (20)
   v) Most have high incidence of pain and deformity according to Cameron et al (8) and West (38). 21% of patients in Cameron’s study had significant Popeye deformity; not tolerated unless detailed preoperative discussion of deformity has been done. Boileau 63% deformity.
   vi) Techniques of tenotomy can be altered to make deformity less likely, but little long-term follow-up (Narvani, et al. J Arth 2011)
   vii) Duff et al. (JSES 2012) 119 tenotomies, 95% satisfied
       (1) 3% concerned with cosmesis-none corrected, 27% with deformity
       (2) 19% complained of cramping
       (3) 31% had some complaint of weakness
       (4) Biodex results in flexion and supination however the same

Recent success with professional football quarterbacks has spiked interest in this alternative

4) Arthroscopic tenodesis
   a) Arthroscopic suture techniques
      i) Variety of suture techniques to biceps to other soft tissue structures
      ii) Kauffman and Weber (18) reviewed experience with Castagna’s technique (9)
      iii) PITT (percutaneous intraarticular transtendon technique) Sekiya et al. (28) similar to above.
      iv) Bertoni et al suture to subscap (3)
          (1) Easy, low morbidity technique
          (2) Fixation may not be perfect for high demand patient
      v) Suture anchors
          (1) Gartsman (14) and Kauffman and Weber (18)
          (2) Easy to do with associated RCT
          (3) Hard to do without tear-difficult to find tendon from bursal side
   b) Interference screws
      i) Romeo et al, (28), Boileau (3) and Klepp (19) all described
         (1) Big operation
         (2) Concerns about absorption debris of large implant (21,22)
         (3) Axillary nerve is directly behind k-wire!
         (4) Fracture reported due to distal placement of bioscrew (1) also by Romeo
         (5) Duration of procedure makes it hard to do in association with other arthroscopic procedures in the shoulder
         (6) Distally placed implants fall down humeral shaft
(7) Failure with interference screws not unheard of-Koch and Burkes (J Arth 2012) reported 3 cases, all with interference screws intact on MRI?cut tendon?

(8) Open tenodesis-open “keyhole” probably of historic interest (10,11,13,15,17,22,25,32)

(9) Comparative reviews in all three specialty journals
(a) Excellent review by Slenker et al. (J Arth 2012) “comparatively favorable results” but little level 1 evidence. “The lack of prospective, randomized trials limits our ability to recommend 1 technique over the other.”
(b) Hsu, et al. JSES 2012 “This review demonstrated a higher incidence of cosmetic deformity in patients treated with biceps tenotomy compared with tenodesis, with an associated lower load to tendon failure. However, there was no consensus in the literature regarding the use of tenotomy vs. tenodesis for LHB tendon lesions”
(c) Frost, et al. AJSM 2009 “Tenotomy is easy and quick, with less need for postoperative rehabilitation. We therefore suggest that biceps tenotomy be the preferred method. Clinical Relevance Biceps pathologic lesions are common. There is no evidence base for their most appropriate management”
(d) Same data…

1) Complete Ruptures
   a) Neglect—not a bad option.
      i) After four weeks, tenodesis not often possible due to resorption of the tendon. Can explore mini-open, but warn patient may not be successful.
      ii) All are modestly weak-supination weakness especially annoying
      iii) Chronic, deep aching in retracted biceps a rare but unsolvable problem.
          Because of this, I tend to offer tenodesis in young, active, repairable patients
   b) Others-recognize that the tendon is not in the joint, and arthroscopic repair techniques are not applicable
      i) Subpectoral tenodesis
      ii) Taught to me by Caspari
      iii) Published 1993 (40) Long-term follow-up presented (Weber and Kauffman, AANA, AOSSM, AAOS 2004) Also presented by Snyder as Caspari-Weber Technique
      iv) Not truly arthroscopic, but easy outpatient procedure
      v) Ideal fixation for high demand patient who do not tolerate deformity or weakness

2) SLAP lesions-to be covered?
   a) Type 1 and 3 debride
   b) Type 2 repair recognize that these are currently being over treated. Both McFarland and I have pointed out that symptomatic SLAP 2 lesions in patients who are not overhead athletes are rare. Labral deformity in patients over 40 years of age is common and rarely pathologic. SLAP repairs should be no more than
3% of your patients. Repair of normal variants with tacks results in stiff shoulders

c) Type 4 repair or tenodesis. Have to individualize. Suture of SLAP lesions that split into biceps can heal, review as you would a meniscus repair.

3) Biceps subluxation and dislocations. This is a rare entity. While painful shoulders with snapping were often thought to be subluxing tendons, this is very uncommon. I’ve only seen a handful of subluxing tendons; dislocated tendons with subscap tears are more common.

a) Superior-rare I’ve never seen this
b) Subluxation at groove
   i) Not common-subluxing biceps still a rare cause of snapping shoulder in my experience
   ii) Associated with partial subscap rupture
c) Extraarticular with subscap tear
   i) Dislocates superficial to subscap rolled border
   ii) Rare in my experience
d) Extraarticular intact subscapularis
   i) “Extremely rare” 3% in series (6) (I’ve never seen this)
   ii) Intraarticular w/subscap tear
      (1) Far and away most common
      (2) Always associated with subscap tearing (29)
      (3) Easy to see arthroscopically

4) Diagnostic studies
   i) Radiographs-helpful for lesser tuberosity malunions only
   ii) Arthrogram-occasionally visible
   iii) MRI-check axial cuts carefully. Dislocated biceps and/or subscapularis damage invariably missed by radiologists.
   iv) Ultrasound reasonable

5) Surgical treatment
   a) Neglect not popular
   b) Stabilization-Recently revisited by J Arth this year
      i) Not easy to keep in groove
      ii) Can create painful, stenosed biceps as described by Gross (28)
      iii) Most tendons damaged by subluxation. Caspari (7) suggested tenodesis tendons >50% torn
      iv) Tenotomy
      v) Tenodesis

6) Recent reports by Saunders and Warner (AAOS 2008) of problems with “proximal fixation”
   a) 188 patients only 9.2 month AVERAGE follow-up (how did this get accepted?)
   b) not clear from abstract or presentation how many in each group
   c) 35% revision rate with proximal suture anchor tenodesis
   d) 2.7% with distal fixation (p<0.02)
   e) groups however not similar (far more RC pathology in proximal group)
f) felt that “residual synovium in the biceps groove is a cause of failure”
g) most important, distal tenodesis did not improve patient scores
a) 47 patients with Castagna repairs
b) long-term follow-up
c) two patients minor deformity
d) no reoperations
e) Burkhart over 300 proximal tenodesis without revision
8) Why the difference?
a) Suture anchors?
b) bad run of luck
c) small sample size with very short term follow-up
d) there isn’t an operation for the painful distal biceps tenodesis, but there’s one more chance to operate on the patient with a proximal tenodesis…
e) ? similar to coplaning data in acromioplasty
   i) Gross poor results
   ii) never validated by any other series
9) My Flow Chart-Diagnostic arthroscopy shows:
a) Tendonitis consistent with clinical exam-Castagna tenodesis
b) Partial biceps rupture-Castagna repair except in high demand individual, then subpect repair
c) Recent complete rupture-subpect repair
d) Chronic complete rupture-neglect
e) Subluxation or dislocation-Castagna repair except in high demand patient who needs subpect repair. Watch for subscap
f) Slap lesion-debride or repair except bad type 4-Castagna tenodesis
10) Summary
a) Biceps a more important pain generator than historically reported
b) Neglect a common cause of residual stiff and painful shoulder
c) PE difficult
d) Careful attention to MRI axial cuts critical MRI generally poor
e) Pick an appropriate technique for you

References


34. Walch G, pers. comm.


Figure 1. Approach for mini-open repair