Decision making in Biceps Pathology of the Shoulder:

How to treat the biceps once it is cut

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I. Biceps Tendon Anatomy

   a. Originates from Supraglenoid Tubercle and the top of Labrum, exits through Rotator Interval, into bicipital groove \(^7,25\),

   b. 9cm in length, 5-6 mm in diameter, and tapers distally\(^1\)

   c. Superior “anchor” is a misnomer, as there is frequently looseness and mobility of the labrum in this region\(^6\)

   d. blood supply: anterior humeral circumflex artery (articular portion)\(^8\)

   e. nerve supply: muscle: musculocutaneous nerve, but the tendon itself has a rich sensory and sympathetic “net” of fibers concentrated proximally at anchor\(^2\)

   f. Arthroscopic visualization: can see50% of the biceps from the groove arthroscopically with correct position of the arm: 30 ff, 40 abd, 90 elbow flex, neutral rotation\(^11\)

II. Function of the biceps tendon

   a. Stabilizing effect of GH joint- restricting abnormal translations?

      1) Pagnani et al\(^19\) simulated contraction of the biceps in cadavers and found that this decreased humeral head translations anteriorly (10mm), superiorly (1mm), and inferiorly (5mm).

      2) These authors also noted disruption of the biceps anchor resulted in increased ap and superior translation\(^19\)
3) Itoi et al\textsuperscript{13} echoed these findings, and noted that the biceps stabilizing function in abduction and external rotation is more pronounced after creation of a bankart.

4) Rodosky et al\textsuperscript{20} simulated the throwing shoulder in abduction and external rotation. These authors found that tensioning of the biceps could increase the torsional rigidity of the glenohumeral joint, thereby acting as a tensioner of the GH ligament complex. Further, a tear at the biceps origin resulted in increases in strain of the IGHL complex, and a tensioned biceps off loaded this strain.

b. The biceps as head depressor:

1) Su et al loaded the long head of the biceps and found decreased antersuperior and superior GH translation in all types of rotator cuff tears.\textsuperscript{24}

2) Intraoperative e-stim of biceps results in compression of the GH joint\textsuperscript{3}

3) patients with LHB rupture have higher riding humeral heads \textsuperscript{15, 26}

4) Eakin et al note that biceps release in the setting of massive irreparable cuff tears does not result in superior migration\textsuperscript{7}

c. Biceps in throwing shoulder:

1) Jobe et al pioneered several EMG studies evaluating throwing mechanics, and noted that the biceps is primarily activated in cocking to achieve elbow flexion, and again during follow thru to decelerate the forearm.\textsuperscript{14} (this peak activity of the biceps has been proposed by Andrews as a mechanism for SLAP tear\textsuperscript{3})

2) Rojas found even higher activity during windmill pitch, suggesting role in deceleration is more important than in cocking \textsuperscript{21}

3) Glousman noted increase in biceps activity during acceleration phase of throwing in patients with anterior instability compared to normal controls \textsuperscript{10}

4) Chalmers et al \textsuperscript{5} compared pitchers with SLAP repair to throwers with Biceps tenodesis: BT better restored throwing mechanics, and slap repairs altered thoracic motion during the pitch.

5) Dugas et al\textsuperscript{16} looked at biomechanics of pitchers after slap repair; less Horizontal abduction, ER, forward trunk bend, than controls
d. Biceps instability

1) Relies on the structure of the rotator interval (see rotator interval section). Simple sectioning of transverse humeral ligament not enough\textsuperscript{18}

2) Walch described the “hidden lesion” which included pathologic changes in the biceps tendon as well as the rotator cuff. They found instability of biceps with upper 1/3 subscapularis tears (JSES 1994)

3) In isolated subscapularis lesions, Gerber et al noted more than half to have biceps abnormalities\textsuperscript{9}

4) Biceps instability is generally noted in the presence of a anterosuperior rotator cuff tear, and isolated biceps instability – nearly non existent\textsuperscript{7}

V. Tenotomy and Tenodesis

1) what is the comparison between scope suprapec and open sub pec?

Werner et al\textsuperscript{27} Cadaver study of 18 matched; metallic bead: Arthroscopic technique resulted in 2.15 cm of overtensioning, compared with .78cm overtensioning in the open technique

Load to failure: arthroscopic: 138; open 197

2) which of the techniques for tenodesis has best biomechics?

Su et al\textsuperscript{23} compared 5 techniques: wedge, t-wedge, suture anchor, If screw, and PITT tech

Wedge (ball o suture) similar to IS and better than others- better stiffness and cyclical load to failure.

3) what are results of proximal tenodesis?

Brady/ Burkhart, et al\textsuperscript{4}:1083 cases, 4 revisions, for rate of 0.4%

Pain scores 6.4 to 1

4) Tenotomy vs. tenodesis : which has more deformity?

Hsu et al\textsuperscript{12}: reported that tenotomy has 45% deformity, tenodesis 25% deformity

5) How often is there still biceps pain post tenotomy/tenodesis?

Ciccotti et al:\textsuperscript{22}

Similar G/E results (74%-77%);

Deformity: tenodesis: 8%, tenotomy 43%

Bicipital groove pain tenotomy: 19%; Tenodesis: 24%
4 studies compare the techniques directly: none show diff clinically, but show increase in cosmetic deformity

6) Differences in supraperosotal scope vs. open?

See question 1 above for more tensioning; clinically:

-Werner, et al28: scope suprapec had more stiffness (18%) than open(6%)

Also those that were stiff had more proximal tenodesis than non stiff (32mm vs 50 mm from top of humeral head)

Risk factors for scope stiffness were female (66%) and smokers (37% vs.16%)

Rhee27 did open subpecs and analyzed; all had tears that extended into the middle of the groove. 80% had pathology extending distal, and thus concluded that subpec should be the preferred method.

References


