

ANTERIOR SHOULDER INSTABILITY: INDICATIONS FOR OPEN VS. ARTHROSCOPIC STABILIZATION

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I. General

A. Previous Concepts

1. distinct separation of instability patterns
2. unilateral (anterior)
 - one direction
 - traumatic
 - Bankart lesion
 - high recurrence rate requiring surgery
 - bankart repair
3. multidirectional instability
 - more than one direction
 - atraumatic or microtraumatic
 - bilateral
 - voluntary
 - rehab
 - capsular shift
4. Evolving concepts
 - spectrum of instability
 - pure instability patterns rare

II. Pathoanatomy

A. Capsulabral avulsion (Bankart Lesion) – the essential lesion

1. Bankart
2. Rowe

B. Capsular ligaments

1. multiple ligamentous restraints
 - superior glenohumeral ligaments
 - middle glenohumeral ligaments
 - inferior glenohumeral ligaments
2. stabilization function shifts inferior as arm abducted
 - at 90° abduction, inferior glenohumeral ligament is most important
3. Inferior glenohumeral ligament complex

- mechanical properties: failure at glenoid insertion or midsubstance
- significant intrasubstance stretching in all cases
- 4. Biomechanical Eval of Bankart Lesion
 - anterior-inferior labral detachment resulted in only slight increase in anterior translation
 - permanent stretching or elongation of inferior ligament necc
 - Bankart lesion alone is not sufficient to allow dislocation

III. Natural History

A. Risk of recurrent dislocation

1. Age dependent
 - < 20 yrs old: up to 90%
 - 20-25 yrs old: 50-75%
 - 25-40 yrs old: <50%
 - >40 yrs old: <15%
2. Activity dependent
 - 66% overall
 - 82% in athletes
3. 10 yr study 275 pt
 - 48% dislocation rate
 - 23% require surgery

IV. Treatment Goals

- A. Address capsular laxity
- B. Repair labral detachment

V. Surgical Options

- A. Open
 1. Bankart Procedure
 2. Capsular Shift
 3. Combined
- B. Arthroscopic
 1. Labral repair with small shift
 2. Thermal shrinkage
 3. Combined

VI. Open Repair

- A. Advantages
 1. Proven reliability
 2. More effective treatment of capsule
 3. Early motion
 4. Less technical expertise required?
- B. Disadvantages
 1. Subscapularis takedown
 2. Greater risk of motion loss

3. More difficult to return to overhead sports

VII. Arthroscopic Repair

A. Advantages

1. cosmesis
2. less perioperative morbidity
3. better motion?
4. No Subscap takedown
5. Shorter, possibly easier operation

B. Disadvantages

1. less reliable (20% failure rate)
2. long term outcome unknown (thermal)
3. bridges burned (thermal)

VIII. Indications

A. Indications for arthroscopic are similar to open with some notable considerations:

1. Arthroscopic
 - a. recent initial dislocator in young overhead athlete – because of the “zone of injury” around the capsule after recent dislocation, this may be the best scenario for obtaining capsular scar with an arthroscopic procedure
 - b. technical expertise – although the procedure can be faster and easier there are special arthroscopic skills involved
 - c. patient should be informed and willing to take an added risk of failure
 - d. high performance athletes can benefit most from not having a subscap takedown.
 - e. High performance athletes require full motion

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DISORDERS OF THE BICEPS TENDON

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NOTES

I. **General**

- A. The clinical significance of the long head of the biceps tendon in the shoulder has been a source of controversy. Opinions regarding the role of the biceps tendon in shoulder function has varied the entire spectrum from those who consider it to be an “appendix of the shoulder” to those who consider it to have a critical functional role.
- B. From a historical standpoint, opinions regarding the role of the biceps tendon has fluctuated.
 - 1. 1940s - It was considered a predominant source of pain
 - 2. 1970s - Focus was on the rotator cuff as the major source of pain
 - 3. 1970s-80s - The biceps tendon was considered important for shoulder function and the recommendation was to preserve whenever possible.
 - 4. 1990s - We are beginning to critically re-examine its function and assess its clinical significance.
- C. The clinical significance of the long head of the biceps is related to a balance of the symptomatic consequences of retaining a painful tendon versus the functional deficits caused by losing the tendon. Weighing these two considerations should help us direct treatment plans.

II. **Functional Anatomy**

- A. Functional anatomy of the clinical significance of the biceps tendon is controversial.

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- B. Controversy about the biceps tendon comes primarily from the fact that it extends across two joints, the shoulder and elbow, and isolating function to either joint is difficult with studies.
- C. Established roles for the biceps include:
 - 1. elbow flexion
 - 2. forearm supination
- D. Controversial aspects of the biceps tendon include:
 - 1. humeral head depressor
 - 2. shoulder flexor
 - 3. anterior stabilizer
 - 4. passive role for proprioception
- E. In general literature to date regarding the functional anatomy of the biceps tendon can be divided into four different strategies, clinical observation, comparative anatomy, cadaveric or biomechanical research and dynamic or EGM research.
- F. Clinical Observation
 - 1. Neer warned against tenodesis as it destroyed function as a humeral head depressor to warn that loss of the biceps tendon may precipitate or escalate an impingement problem.
 - 2. Rowe observed the increased sized of the biceps tendon seen with chronic rotator cuff rupture represented increased function
 - 3. Neviasser
 - a. stated that increased size of the tendon seen in chronic tears where tendon was exposed to constant subacromial irritation.
 - b. noted that the more physiologic response of increased muscle mass with increased function was not seen with chronic rotator cuff tears.
 - c. stated that a more plausible explanation is a chronic inflammatory response of the tendon.
- G. Comparative Anatomy
 - 1. In quadrupeds the tendon is perpendicular to the glenoid and inline with motion, namely flexion. There are symmetrical tuberosities and a small deltoid.
 - 2. Humans have two heads of the biceps and the tendon now makes a 45° angle to the glenoid. To accommodate this, a smaller lesser tuberosity is present and there is large effective deltoid as a primary mover of the humerus.

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3. Inman in JBJS 1944 and Hitchcock and Bechtol in JBJS 1948 noted in both studies that there was a comparative developmental loss of function of the long head of biceps tendon as quadrupeds developed towards bipeds.
 - H. Clinical Anatomy. Two studies looking at biceps glide noted that humeral head glides on the biceps rather than the biceps moving the humeral head.
 1. Lippman, NYSJM 1944
 2. Harryman, ASES 1997
- III. Biomechanical Studies**
- A. Head Depressor
 1. Kumar, CORR 1989
 - acromial-humeral interval
 2. Flatow, ASES 1996
 - restraints to superior translation
 3. Itoi, JSES 1994
 - stabilizing function in hanging arms
 - B. Anterior Stability
 1. Rodosky, AJSM 1994
 2. Pagnani, JSES 1996
 3. Itoi, JBJS-B 1993
 - C. Shoulder EMG
 1. Biceps Active
 - a. Habermeyer - 12 pts
 - b. Ting - 3/5 pt with RCT
 2. Biceps Silent
 - a. Furlani
 - b. Gowan
 - c. Pauley
 - d. Basmajian
 3. Elbow Control
 - a. Yamaguchi - 44 shoulders, 14 RCT
 - b. Levy - 10 shoulders
- IV. Function Summary**
- A. Function
 1. Biomechanical
 - assumes activity
 - B. No Function
 1. EMG
 2. Comparative anatomy
 - C. EMG
 1. Pitchers with instability
 - 30-40% max contraction

- D. Poor vector
 - 1. ? magnitude of dynamic function
- E. Function
 - 1. Biceps tendon
 - passive role
 - 2° to elbow activity
 - proprioception
 - anterior stability
- F. Symptomatic Significance
 - 1. The biceps is an important source of pain
 - may be significant
 - may cause significant derangement of function
 - 2. “Rupture Salvatrice”
 - “saving rupture”
 - a. clinically is not uncommon that shoulder pain will spontaneously resolve after long head rupture
 - 3. Biceps Tendon Disorder
 - a. clinical significance
 - important source of pain which may remain persistent if not addressed
 - pain from tendon has more negative functional consequences than loss of the tendon itself

V. Tenodesis versus Tenotomy

At this time there is no long-term information regarding the relative attributes of tenotomy versus tenodesis. The support for tenotomy is, however, increasing as further follow-up becomes available.

- A. Support for biceps tenotomy.
 - 1. In a large series of patients undergoing isolated biceps tenotomy and not tenodesis for irreparable rotator cuff repairs, Gilles Walch and coauthors have reported approximately 80% good and excellent results with no residual anterior arm pain.

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2. In a retrospective study of patients treated for anterior shoulder pain, Gil, Hawkins et al showed in 30 consecutive patients that arthroscopic tenotomy resulted in excellent pain relief in ASCS scores. The average score was 81.8. Only 1 of the 30 patients had residual pain and one other patient complained of a cosmetic deformity without pain.
 3. Recently in a study by Osbahr and Spear, 80 consecutive patients with tenotomy were compared to those with tenodesis. The average age of those with tenodesis was 54 and those with tenotomy was 58. At long-term, at nearly 2-year follow-up, there was no significant difference in the cosmetic appearance of the biceps, residual anterior spasm, or anterior shoulder pain.
 4. My anecdotal experience is that tenotomy is a more reliable pain-relieving procedure as compared to tenodesis.
- B. Reasons why tenodesis is not preferred over tenotomy.
1. Tenodesis requires more surgery and for many people changes an arthroscopic procedure to an open procedure.
 2. In some instances, complete pain relief from a tenodesis requires healing in a tenodesis site, whereas tenotomy does not require any specific healing.
 3. Length-tension issues may be more important with tenodesis, especially if the biceps is over-tensioned.
 4. Tenodesis done in an arthroscopic fashion requires the use of implants and associated complications.
 5. Tenodesis does not appear to give any significant advantages over tenotomy, which is a much more simpler surgery.
- C. Reasons why tenodesis may be preferred over tenotomy.
1. A more reliable cosmetic result may result from tenodesis versus tenotomy. This is more of a concern in younger, thinner patients.

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2. There are at least anecdotal reports of biceps spasms occurring following tenotomy, which may not occur after tenodesis. How long these spasms occur and whether they are just temporary has not been determined yet.
- D. Reasons why a tenotomy does not necessarily lead to cosmetic deformity.
1. Tenotomy involves release of the origin of the lateral head of the biceps only. The medial head still remains as a proximal tether.
 2. Tenotomy can be performed in the wide portion of the biceps, which can get “stuck” in the narrow bicipital groove in comparison to the more distal narrow portion of the biceps.
 3. A biceps is an extra-synovial structure, which is encased in synovial sheath, which may have chronic changes tethering the tendon proximally. This can include also tethering from the associated vasculature proximally.
 4. At least in older individuals, there is considerably less activity in the lateral head of the biceps and thus the tenotomy site can be “detected” until a normal tenodesis has occurred.
 5. Ultrasound experience has shown multiple patients with spontaneous rupture to have adhesion and healing of the proximal biceps within the bicipital groove without distal retraction.

VI. Treatment

- A. Individualized based on likelihood pain will resolve
- B. Tenotomy or Tenodesis Indications
 1. Irreversible structural changes
 - atrophy
 - partial tearing > 25%
 - any luxation
 2. autotenodesis likely
 - fractures
 - TSR?

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- C. Relative tenotomy or tenodesis indications
 - 1. Massive/chronic tear with good function
 - 2. Revision decompression- relief w/
intraarticular injection

VII. Conclusions

- A. Individualize treatment based on likelihood pain will resolve
- B. When structural changes are not present - inflammation resolves
- C. Routine tenotomy or tenodesis is not supported
- D. Most patients do not require tenodesis