Biceps Pathology: How I Diagnose and How I Manage

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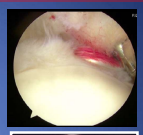
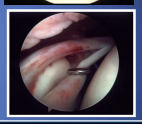
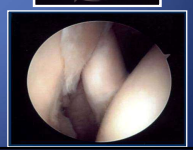
   - None

BICEPS TENDON PATHOLOGY

- Spectrum of pathology
  - **Inflammatory/degenerative lesions**
    - 1º and 2º tendinitis
  - **Traumatic lesions**
    - Ruptures
    - SLAP lesions
  - **Biceps instability**
    - Pathology within restraining structures
    - Medial subluxation/dislocation
  - **Biceps may require release**
    - Tenodesis or tenotomy





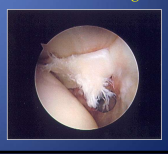


BICEPS PATHOLOGY

HISTORY

- c/o anterior shoulder pain
- Difficult to differentiate from other causes
  - Impingement
  - Subscapularis tears
  - Conditions usually co-exist

"Where's it Hurt" sign

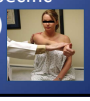


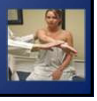
BICEPS PATHOLOGY

PHYSICAL EXAM

- Point tenderness most common P. E. finding
- Several provocative tests described

- Selective injections helpful but not specific
- Yergason, Speed, SLAP tests (O'Brien)





A practical, evidence-based, comprehensive (PEC) physical examination for diagnosing pathology of the long head of the biceps

Samuel Rosas, MS[1], Michael K. Krill, BS, ATC[1,2], Kelms Amoo-Achampong, BA[1], KiHyun Kwon, MS[1], Benedict U. Nwachukwu, MD, MBA[1], Frank McCormick, MD[1,3,*]

JSES 2017

- Systematic review
- Biceps palpation tenderness highest sensitivity and specificity
- US guided injection also sensitive/specific

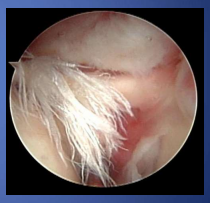
Table III Results of physical examination test combinations

Test combinations	Method	Sensitivity (%)	Specificity (%)
Uppercut + US	Series	64	100
	Parallel	97	76
Speed's + US	Series	68	100
	Parallel	94	79
TTP + US	Series	50	99
	Parallel	95	71
Yergason's + US	Series	36	100
	Parallel	93	77
TTP + Uppercut	Series	42	94
	Parallel	88	56
TTP + Speed's	Series	31	95
	Parallel	80	58
TTP + Yergason's	Series	23	94
	Parallel	75	57

TTP, tender to palpation in bicipital groove; US, ultrasound.

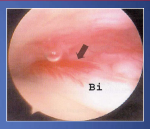
PROXIMAL BICEPS TENDON LESIONS

- Biceps tendinitis
  - –Primary
  - –Secondary
- Biceps instability



PRIMARY BICEPS TENDINITIS

- Isolated inflammation of long head in bicipital groove
- Associated shoulder pathology absent
- Uncommon
  - – 5% of biceps tendinitis



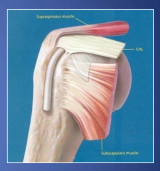
"Lipstick" biceps

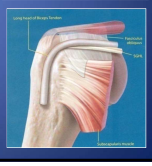
SECONDARY BICEPS TENDINITIS

- "Tendinosis"
  - –Tendon degeneration without inflammation
- Most common cause of biceps symptoms
- Rotator cuff pathology usually present

BICEPS TENDON INSTABILITY

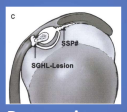
- Biceps makes 30º - 40º turn into bicipital groove
- Biceps stability maintained by pulley system (Habermeyer)
  - CHL
  - SGHL
  - Supraspinatus fibers
  - Subscapularis fibers
- Progressive disruption of pulley leads to biceps instability





PULLEY LESIONS

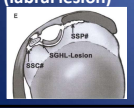
Articular sided supraspinatus tear → SGHL tear → Subluxation of LHB

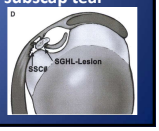


Subluxation of LHB → Partial articular subscap tear

Partial articular subscap tear → Progressive subluxation of LHB

Progressive subluxation of LHB → Anteriosuperior instability (labral lesion)





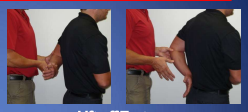
BICEPS INSTABILITY

HISTORY

- Anterior shoulder pain
- Popping <u>not</u> common complaint
- "Always" associated with subscapularis tears

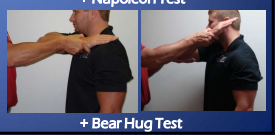
SUBSCAPULARIS TEARS

- Anterior shoulder pain
- Almost always present with biceps instability
- Specific tests to evaluate integrity



+ Lift-off Test

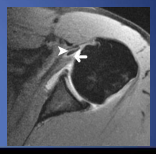
+ Napoleon Test



+ Bear Hug Test

RECOGNITION OF BICEPS INSTABILITY

- MRI excellent tool
  - Edema/subluxation
  - Subscapularis tears
- Arthroscopic evaluation
  - Visualize
  - Probe

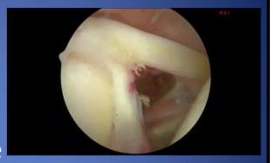


TENOTOMY VS. *TENODESIS*

- Controversial topic
- Arguments/data that support both techniques
- Implications and consequences for treatment decisions
  - Current opinion and discussion of clinical applications for tenotomy vs. tenodesis

BICEPS TENOTOMY

- Quick
- Simple
- Cheap
- Not always best choice
  - –Thin patients
    - –Cosmesis
  - –Muscular patients
    - –Function
    - –Residual symptoms



BICEPS TENOTOMY

MY INDICATIONS

- Older and
- Sedentary and
- Heavy
  - No cosmetic deformity
- **Or** willing to accept cosmetic deformity
  - Informed consent (complicated interaction)

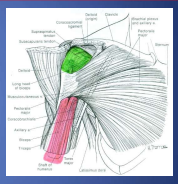
BICEPS TENODESIS

MY INDICATIONS

- Younger
- Active/Laborer
- Thinner
- Cosmesis concerns
- My personal philosophy
  - Any patient that may notice a deformity gets a tenodesis

LOCATION OF BICEPS TENODESIS

- **Proximal** (suprapectoral)
  - ***Arthroscopic*** almost always
  - Easily combined with other arthroscopic procedures
- **Distal** (subpectoral)
  - ***Open*** procedure
  - Biceps tendon excised—eliminates potential for theoretical "groove pain"



Arthroscopic Proximal Biceps Tenodesis at the Articular Margin: Evaluation of Outcomes, Complications, and Revision Rate

Paul C. Brady, M.D., Pablo Narbona, M.D., Christopher R. Adams, M.D., David Huberty, M.D., Peter Parten, M.D., Robert U. Hartzler, M.D., M.S., Paolo Arrigoni, M.D., and Stephen S. Burkhart, M.D.

Arthroscopy 2015

- 1,083 arthroscopic suprapectoral biceps tenodesis cases
  - Proximal tenodesis site
  - Interference screw technique
- Mean follow-up 2.6 years
- Biceps revision surgery rate 0.4%
- Pain scores, UCLA and Simple shoulder test p<.0001

All-Arthroscopic Suprapectoral Versus Open Subpectoral Tenodesis of the Long Head of the Biceps Brachii

Mufaddal Mustafa Gombera,*† MD, Cynthia A. Kahlenberg,† BA, Rueben Nair,† MD, Matthew D. Saltzman,† MD, and Michael A. Terry,† MD
Investigation performed at Northwestern University, Chicago, Illinois, USA

AJSM 2015

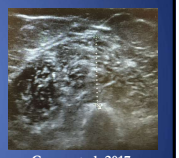
- 46 patients
  - 23 arthroscopic suprapectoral
  - 23 open subpectoral
  - Interference screw fixation
- No differences in outcomes
- No "Popeye" deformities in either group
- Complications: 0 arthroscopic, 2 open (1 plexus)

All-Arthroscopic Suprapectoral Versus Open Subpectoral Tenodesis of the Long Head of the Biceps Brachii Without the Use of Interference Screws

Jamison M. Green, M.D., Mark H. Getelman, M.D., Stephen J. Snyder, M.D., and Joseph P. Burns, M.D.

Arthroscopy 2017

- 15 arthroscopic suprapectoral
- 23 open subpectoral using similar technique (f/u > 2 years)
- No concomitant rotator cuff or labral repairs performed
  - Homogeneous group
  - No complications in either group
- Outcomes, satisfaction, function, contour, and ultrasound all same



Green et al, 2017

Systematic Review of Biceps Tenodesis: Arthroscopic Versus Open

Vineet Thomas Abraham, M.B.B.S., M.S., Bryan H. M. Tan, F.R.C.S.(Edin), and V. Prem Kumar, M.B.B.S., F.R.C.S.(Edin), F.R.C.S.(Glas)

Arthroscopy 2016

- Systematic review of 16 studies
  - 271 open tenodesis
  - 205 arthroscopic tenodesis
- 98% good/excellent outcomes with both procedures
  - Conclusion: No advantage to tenodesis location or fixation method

BICEPS TENODESIS COMPLICATIONS

- Relatively uncommon for both techniques
  - Nho et al (JSES 2010) – 2% open subpec
- Subpectoral tenodesis
  - Open surgical procedure
  - Fixation to diaphyseal bone
  - Proximity to neurovascular structures
  - Complications can be significant

OPEN SUBPECTORAL TENODESIS COMPLICATIONS

- **Deep Infections***

Complications of Proximal Biceps Tenotomy and Tenodesis

Mandeep S. Virk, MD[a,b], Gregory P. Nicholson, MD[a,b,*]

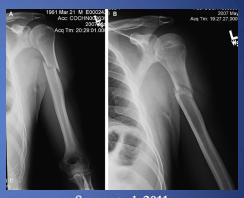
Virk, 2016

OPEN SUBPECTORAL TENODESIS COMPLICATIONS

- Deep Infections*
- **Humeral Shaft Fractures***

Humeral fracture following subpectoral biceps tenodesis in 2 active, healthy patients

Benjamin W. Sears, MD[a], Edwin E. Spencer, MD[b], Charles L. Getz, MD[a,*]



Sears et al, 2011

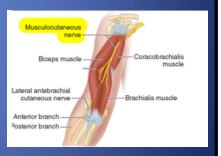
OPEN SUBPECTORAL TENODESIS COMPLICATIONS

- Deep Infections*
- Humeral Shaft Fractures*
- **Musculocutaneous Nerve Damage**

Musculocutaneous Nerve Entrapment

An Unusual Complication After Biceps Tenodesis

Hanley Ma,* MD, Ann Van Heest,*† MD, Colleen Glisson,* MD, and Shounuck Patel,† MD
*From the *Department of Orthopaedic Surgery, University of Minnesota, Minneapolis, Minnesota, and the †Midwestern Chicago College of Osteopathic Medicine, Chicago, Illinois*



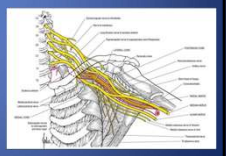
OPEN SUBPECTORAL TENODESIS COMPLICATIONS

- Deep Infections*
- Humeral Shaft Fractures*
- Musculocutaneous Nerve Damage
- **Brachial Plexus Injuries**

Iatrogenic Brachial Plexus Injuries Associated With Open Subpectoral Biceps Tenodesis

A Report of 4 Cases

Peter C. Rhee,* DO, MS, Robert J. Spinner,* MD, Allen T. Bishop,* MD, and Alexander Y. Shin,*† MD
Investigation performed at Mayo Clinic, Rochester, Minnesota

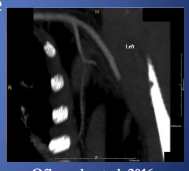


OPEN SUBPECTORAL TENODESIS COMPLICATIONS

- Deep Infections*
- Humeral Shaft Fractures*
- Musculocutaneous Nerve Damage
- Brachial Plexus Injuries
- **Axillary Artery Injuries**

Axillary artery injury associated with subpectoral biceps tenodesis: a case report

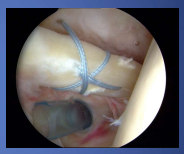
Kamilcan Oflazoglu, BS[a], Mariano E. Menendez, MD[c], David Ring, MD, PhD[b,*], Todd M. O'Brien, MD[b], Jason D. Archibald, MD[b]



Oflazoglu et al, 2016

ARTHROSCOPIC TENODESIS OPTIONS

- **Soft tissue tenodesis**
  - Quickly performed
  - Inexpensive
- **Bony tenodesis**
  - More secure fixation
  - Implants required



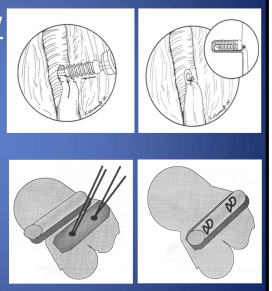
SOFT TISSUE TENODESIS

- Suture fixation to rotator cuff within subacromial space

- Intra-articular fixation to RI or subscapularis

ARTHROSCOPIC BONY TENODESIS OPTIONS

- Interference screw techniques
- Suture anchor techniques
- Fixation location
  - –Intra-articular
  - –Biceps groove

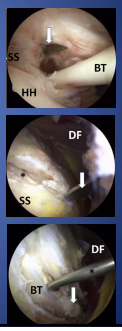


Identifying and Exposing the Proximal Biceps in Its Groove: The "Slit" Technique

Mathew J. Mazoch, M.D., Wesley F. Frevert, M.D., and Larry D. Field, M.D.

Arthroscopy Techniques 2017

- Technique to expose biceps tendon in the bicipital groove
  - – Intra-articular view
  - – Knife advanced percutaneously
  - – Transverse humeral ligament incised ("Slit") exposing biceps tendon location and orientation within subacromial space



Clinical success of biceps tenodesis with and without release of the transverse humeral ligament

Brett Sanders, MD[a,*], Kyle P. Lavery, BA[b], Scott Pennington, MD[c], Jon J.P. Warner, MD[b]

JSES 2012

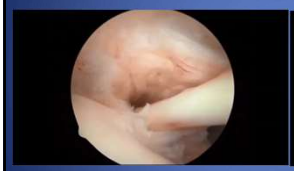
- 127 patients
- Revision biceps tenodesis rate lower when THL released
- Residual pain due to "biceps groove" elements?
- THL should be released

Sanders et al, 2012

PREFERRED TENODESIS TECHNIQUE

- Arthroscopic suprapectoral in biceps groove
  - Release THL to expose biceps ("Slit" technique)
  - Suture anchor fixation with locking sutures or screw fixation
- Open subpectoral
  - Acute and chronic retracted ruptures
  - Severe biceps degeneration
  - Revision cases
  - Use small diameter button or "all suture" anchors in diaphyseal bone
    - Decrease stress risers

ARTHROSCOPIC SUPRAPECTORAL TECHNIQUES



Suture Anchor

Interference Screw

SUMMARY

- History / P. E. key to diagnosing biceps pathology
- Careful arthroscopic assessment also important
  - Tendinitis
  - Instability
- Arthroscopic and open tenodesis techniques commonly utilized
- Both techniques reliable and effective
  - Comparative studies demonstrate equivalent outcomes and cosmesis
- Complication rates low for both techniques
  - Open subpec complications can be consequential

THANK YOU