



Biceps Pain: What's the Etiology & How to Treat it Successfully



Kevin E Wilk, PT, DPT, FAPTA










Biceps Brachii Tendon Pain

Introduction

- ✓ LHB Pain is a common clinical complaint – *"maybe too common"*
- ✓ Shoulder pain arising solely from the LHB can be quite severe causing marked decrease in shoulder function

Abbott & Saunders: Surgery '36
Becker & Cofield: JBJS '89
DePalma: Clin Orthop '54
Neviaser: Clin No Am '87
Post & Benca: Clin Orthop '89





✓ Why does the LHB hurt? Etiology?

Biceps Brachii Tendon Pain

Introduction


- ✓ Pathophysiology of LHB pain
Sethi, Wright, Yamaguchi: JSES '99
- ✓ 3 major groups of pathologic process
- ✓ Inflammatory
- ✓ Instability
- ✓ Traumatic



Biceps Brachii Tendon Pain

Introduction



- ✓ Pathophysiology of LHB pain
Sethi, Wright, Yamaguchi: JSES '99
- ✓ 3 major groups of pathologic process:
- ✓ Inflammatory
 - ✓ Biceps tenosynovitis with cuff tendinitis
 - ✓ Primary bicipital tenosynovitis
- ✓ Instability
 - ✓ subluxations (3 types) *Habermeyer & Walch '96*
- ✓ Traumatic
 - ✓ Ruptures



Biceps Brachii Tendon Pain

Introduction

- ✓ LHB (extra-articular) – stabilized by a soft tissue sling
- ✓ Biceps reflection pulley (BRP)
Made up of the CH ligament, SGHL & parts of subscapularis tendon
Werner et al : AJSM '00
- ✓ Contact with shoulder flexion & IR*
- ✓ LHB is subjected to mechanical stress in the groove, at the pulley & by pathology of cuff & subacromial space
Elser et al: Arthroscopy '11

Arthroscopy '11

Level V Evidence
Anatomy, Function, Injuries, and Treatment of the Long Head of the Biceps Brachii Tendon

Thomas Eber, MD, Sepp Braun, MD, Christopher R. Dewing, MD, J. Erik Gohart, PhD, and Peter J. Miller, MD, MSc.

Abstract Lesions of the long head biceps tendon (LHB) are frequent causes of shoulder pain and disability. Biceps tenotomy and tenodesis have gained widespread acceptance as effective procedures to manage both isolated LHB pathology and combined lesions of the rotator cuff and biceps tendon complex. The function of the LHB tendon and its role in glenohumeral biomechanics remain poorly understood. Review of the literature and a review of the anatomical and functional properties of the LHB tend to provide an evidence-based approach to current treatment strategies for LHB disorders.

REVIEW ARTICLE

Disorders of the long head of the biceps tendon

Neven Sekic, MD, Rick Wright, MD, and Ken Yamaguchi, MD, D. Louis, MD

The clinical significance of the biceps tendon to shoulder function has been a subject of controversy for some time. Opinions on the contribution of the biceps tendon have varied the entire spectrum, with some suggesting only a stabilizing function and others believing it plays a critical role in shoulder stability. Recently, new biomechanical data have led to the recognition of the long head of the biceps tendon as a major source of shoulder pain, and tenodesis was featured as a primary procedure (1,2,3). As the focus shifted to the rotator cuff, weakness of the long head of the biceps became less specific. Specific concerns regarding a possible secondary role of the long head of the biceps tendon led to re-examinations for anatomical, histological, tensile, and MRI data.

Wilk & Hooks: Clin Spts Med '16

The Painful Long Head of the Biceps Brachii
Nonoperative Treatment Approaches

Kevin E. Wilk, PT, DPT^{1,2,3,4,5,6},
Todd R. Hooks, PT, ATC, OCS, CSCS, NREMT-1, CSCS, CMPT^{1,2,3,4,5,6}

Box 1
Classification of long head biceps brachii pain

- Traumatic injuries
- Instability
- Tendinopathies
- Tendonitis
- Tendinosis
- Biomechanical dysfunction
- Scapular dysfunction
- Glenohumeral joint hypermobility
- Capitulum involvement
- SLAP lesions

KEYWORDS


- Rehabilitation • Shoulder • Elbow • Biceps

KEY POINTS

- Abnormalities involving the long head of the biceps that affect either the tendon or the supporting tissues.
- The long head of the biceps tendon can be a primary source of pain as a result of shoulder dysfunction.

Biceps Brachii Tendon Pain
Introduction - Anatomy


- ✓ LHB originates from the supraglenoid tubercle of scapula passes over humeral head then exiting through bicipital groove
Eakin, Faber, Hawkins: J Am Acad Ortho Surg '99
- ✓ Soft tissue sling (BRP) stabilizes LHB as it enters the bicipital groove
- ✓ Size of the tendon varies – intra-articular portion is typically wide & flat while extra-articular portion is rounder & smaller
Ahrens & Boileau: JBJS '07




Biceps Brachii Tendon Pain
Introduction - Anatomy

- ✓ Biceps tendon is approx 5-6 mm diameter & approx 9 cm length
- ✓ Blood supply: anterior circumflex humeral a.
- ✓ Rich sensory & sympathetic innervation
“net-like pattern”
Alpantaki: JBJS '05
- ✓ Tendon slides up to 18 mm in & out of GH joint with flexion & IR
Braun et al: AJSM '10

Biceps Brachii Tendon Pain
The Biceps is Important to People !



Biceps Brachii Tendon Pain
What Is the Function of the Biceps



Biceps Brachii Tendon Pain


What Is the Function of the Biceps (Biomech Cad)

- ✓ Decreased humeral head translation (A,S & I directions) at lower elevation angles
Pagnani et al: JSES '96
- ✓ Anterior stabilization during abduction & ER
Itoi et al: JBJS '93
- ✓ Anterior stabilizer – when cut increased strain to IGHL during abduction & ER
Rodosky et al: AJSM '94

Biceps Brachii Tendon Pain

What Is the Function of the Biceps



- ✓ Short head Biceps Brachii alone caused significant superior migration of humeral head with powerful elbow flexion & supination
- ✓ LHB stabilizing role during elb flex & supination
Kumar et al: CORR '98
- ✓ Stabilizing effect at 90 deg abduction & ER/IR motions
Youm et al: JSES '09



Biceps Brachii Tendon Pain

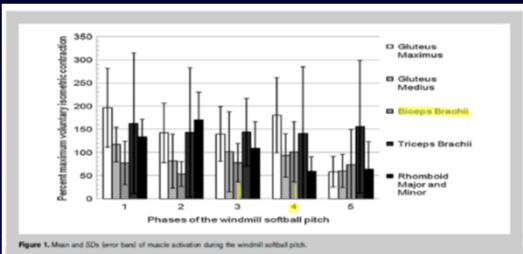
What Is the Function of the Biceps

- *EMG data on the LHB remains controversial*
- LHB stabilized HH *Sukurai: CORR '98*
- LHB stabilized HH when tension during elbow & forearm activity *Levy: JSES '01*
- ✓ LHB activity higher during windmill pitching than overhead *Rojas: AJSM '09*
- Higher activity during cocking phase & follow through & deceleration

EMG Activity During Windmill Pitching

Selected Muscles



#4 = 12:00 to 9:00

Oliver et al: JSCR '11

EMG Activity During Overhead Pitching

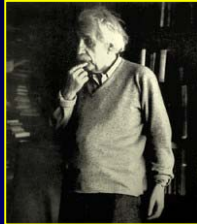
Elbow & Forearm Muscles

	No. of pitchers	Windup/cocking	Early cocking	Late cocking	Acceleration	Deceleration	Follow-through
Elbow and forearm muscles							
Triceps							
Triceps	13	4 ± 6	17 ± 17	37 ± 32	89 ± 40	54 ± 23	22 ± 18
Biceps	18	8 ± 9	22 ± 14	26 ± 20	20 ± 16	44 ± 32	16 ± 14
Brachialis	13	8 ± 5	17 ± 13	18 ± 26	20 ± 22	49 ± 29	13 ± 17
Brachioradialis	13	5 ± 5	35 ± 20	31 ± 24	16 ± 12	46 ± 34	22 ± 29
Pronator teres	14	14 ± 16	18 ± 15	29 ± 28	85 ± 39	51 ± 21	21 ± 21
Supinator	13	9 ± 7	38 ± 20	54 ± 38	55 ± 31	59 ± 31	22 ± 19
Wrist and finger muscles							
Extensor carpi radialis longus							
Extensor carpi radialis longus	13	11 ± 8	53 ± 24	72 ± 37	30 ± 20	43 ± 24	22 ± 14
Extensor carpi radialis brevis							
Extensor carpi radialis brevis	15	17 ± 17	47 ± 26	75 ± 41	55 ± 35	43 ± 28	24 ± 19
Extensor digitorum communis							
Extensor digitorum communis	14	21 ± 17	37 ± 25	59 ± 27	35 ± 35	47 ± 25	24 ± 18
Flexor carpi radialis							
Flexor carpi radialis	12	13 ± 9	24 ± 35	47 ± 33	120 ± 66	79 ± 36	35 ± 16
Flexor digitorum superficialis							
Flexor digitorum superficialis	11	16 ± 6	29 ± 23	47 ± 52	80 ± 66	71 ± 32	21 ± 11
Flexor carpi ulnaris							
Flexor carpi ulnaris	10	8 ± 5	27 ± 18	41 ± 25	112 ± 60	77 ± 42	24 ± 18

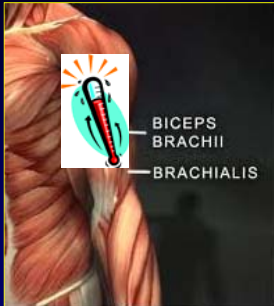
Means and standard deviations, expressed as a percentage of the maximal manual muscle test.

DiGiiovine et al: JSES '92

What About Biceps Pain !!!



Biceps Pain


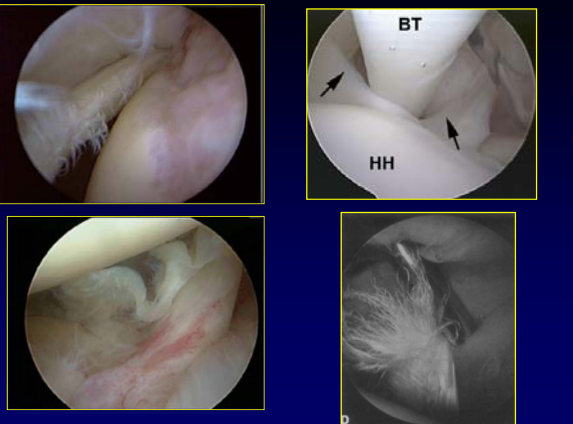


Biceps Pain

Overview

- Often referred to as biceps tendonitis
- Is it tendonitis ???
- Also referred to as “Groove Pain”
- *Often means something else*
- Biceps function is controversial
 - » Humeral head compressor ?
 - » Anterior stabilizer ?
- ***Differential Diagnosis is the key !!!***

Assess \longleftrightarrow Don't Guess

Biceps as a Pain Generator


The Proximal Biceps as a Pain Generator and Results of Tenotomy

Irvin Szabo, MD, PhD, Pascal Boileau, MD,† and Gilles Walch, MD‡*

Sports Med Arthrosc. 2008 Sep;16(3):180-6.

“it seems that isolated arthroscopic biceps tenotomy or tenodesis is a valuable option for the treatment of rotator cuff tears in selected patients. Although it does not improve shoulder strength, tenotomy or tenodesis reduces pain and improves the functional range of motion with a high degree of patient satisfaction.”

Biceps Tendon Pain Receptors

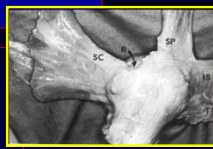
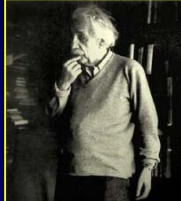


- Investigated the presence of sympathetic innervation and $\alpha 1$ -adrenergic receptors of the long head of the biceps brachii tendon (LHB)
- A strong correlation between the expression of NPY/S-100, $\alpha 1$ -adrenergic/S-100, and $\alpha 1$ -adrenergic/NPY was found.
- The LHB tendon has sympathetic innervation and $\alpha 1$ -adrenergic receptors in acute and chronic pathological conditions.

LHB Pathologies & Pain

Classification

- ✓ LHB rupture
- ✓ Biceps tendon instability
- ✓ Peritendinitis
- ✓ Tendonosis
- ✓ Biomechanical causes (ST)
- ✓ Hypermobility GH joint
- ✓ Capsular inflammation
- ✓ Biceps-Labral Lesion (SLAP)

LHB Pathologies & Pain

Making the Differential Dx

- Efficacy of ultrasound in the diagnosis of long head of biceps tendon pathology

Armstrong, Teefey, Wu, et al: JSES '06

- ✓ *Excellent in determining normal biceps (97%)*
- ✓ *Abnormal biceps tendon (sensitivity 49%)*
- ✓ *Excellent with ruptures, dislocations etc...*



LHB Pathologies & pain

Tendon Rupture

- Most common site of rupture: tendon's origin & at the exit of bicipital groove near MT junction *Rowe '88*
- Usually occurs in people aged 50 & >
- "pop-eye deformity"
- 96% of all biceps ruptures are LHB
- Often associated with tendon degeneration

Warren RF: Instr Course Lect '85



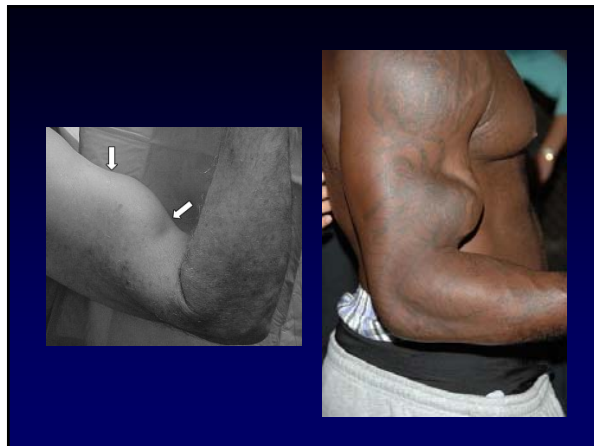
Does the Popeye Deformity Cause Pain ??



Kelly, Drakos, ... O'Brien: AJSM '05

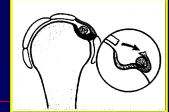
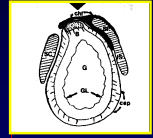
- 54 patients with biceps pain &/or tendinitis
- Arthroscopic release of LHB
- 9 had the release as an isolated procedure
- ✓ *68% good – excellent results*
- ✓ *None had pain at rest*
- ✓ *Popeye deformity seen: Males 83% Females 36%*
- ✓ *38% c/o of fatigue discomfort (cramping)*





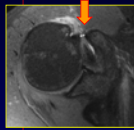
Biceps Instability

- ✓ LHB instability & BRP lesions
Walch JSES '98
Lafosse Arthroscopy '07
- ✓ Often assoc with cuff tears (subscapularis tears)
- ✓ Different types of lesions involving SGHL, SS tendon, Subscapularis
Habermeyer JSES'04
- ✓ Sign correl b/t pulley lesions & SLAP tears, cuff tears, LHB pathology
Braun: AJSM '11



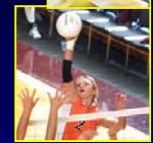
LHB Pathologies & Pain Coracoid Impingement

- Defined as impingement of coracoid bursa & subscap tendon b/t coracoid & lesser tub.
- Potential cause of degenerative wear of pulley sling & subscap tendon insertion
- Coracohumeral interval (CHI)
Gerber: CORR '87
- *Millet et al* narrowing of CHI related to LHB pathologies & RTC *Braun 2010*



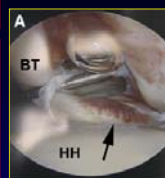
LHB Pathologies & Pain Tendinitis-Peritendinitis

- ✓ Biceps tendinitis
- ✓ Primary tendinitis is rare
- ✓ Approx 5 % of all cases
Favorito et al Arthroscopy '01
Curtis & Snyder: Orthop Clin NA 93
- Often contributed to associated shoulder pathology
Mair JBJS '07
- Some do believe can be primary or secondary pathology
Burkhead: The Shoulder '04



LHB Pathologies & Pain Tendinitis-Peritendinitis

- ✓ Biceps tendinitis –specific type
- ✓ *Hour glass shaped* LHB tendon
Boileau JSES '04
- Mechanical symptoms attributed to thickened inflamed intra articular LHB engages superior aspect of bicipital groove
- ✓ *Similar to trigger finger*
- Treatment: subpectoral biceps tenodesis



LHB Pathologies & Pain Peritendinitis

- Inflammation of biceps (RTC ?)
- Tenosynovitis
- Anterior shoulder pain
- Worse with activities
 - » Arm away from body
 - » Overhead sports
- Tenderness to palpation
- Site of pain moves with ER
- *"Biceps tension sign"*
- *Active compression, Speeds*



LHB Pathologies & Pain

Peritendinitis Rx

- ✓ *Treat similar as rotator cuff tendonitis*
- ✓ Active rest
- ✓ Ice, modalities
 - ✓ Laser therapy
 - ✓ Iontophoresis "patch" (dexta)
 - ✓ NSAID
 - ✓ Long wear continuous US
- ✓ Biceps strap ??
- ✓ Scapular position & strength
- ✓ Enhance posterior flexibility
- ✓ Improve dynamic stabilization
- ✓ Gradually increase applied loads



LHB Pathologies & Pain

Tendonosis

- ✓ Similar subjective complaints
- ✓ *Pain present at rest*
- ✓ Often associated with cuff tendonosis
- ✓ *Treatment significantly different than paratendonitis*
- ✓ Tendon degeneration-- attritional tear
- ✓ Tendon failure – poor healing response



LHB Pathologies & Pain

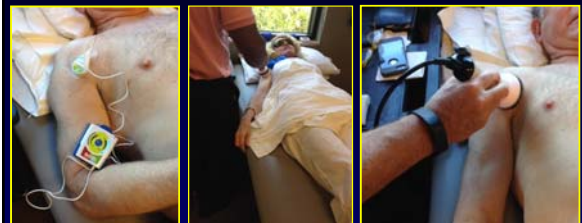
Tendonosis Rx

- ✓ Promote tendon healing – circulation
- ✓ Heat & ultrasound: No Ice
- ✓ Stretch biceps
- ✓ No NSAIDs
- ✓ Eccentric muscle training
- ✓ Transverse massage, soft tissue
- ✓ Laser Therapy (Class IV)
- ✓ Cuff strengthening program
- ✓ Gradually increased applied loads
"progressive loading program"



LHB Pathologies & Pain

Tendonosis - Rx



LHB Pathologies & Pain

GH Joint Laxity

- Hypermobility of the GH joint
- Increased demands on surrounding muscles
 - » Rotator cuff
 - » Biceps brachii
- Biceps muscle is working overtime to stabilize
- ↑ EMG activity biceps – ant instab.

Gloussman: JBJS '88

- ✓ Rx: reduce inflammation of biceps, enhance dynamic stabilization of shoulder, gradual return to sports



LHB Pathologies & Pain

GH Joint Laxity

- ✓ Enhance dynamic stabilization



Advanced Thrower's Ten Program



Advanced Thrower's Ten Program



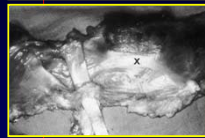
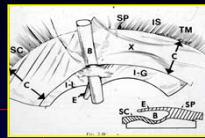
LHB Pathologies & Pain

Capsular Inflammation

- ✓ Capsular inflammation – synovitis
- ✓ Capsule-biceps interwoven
- ✓ Inflammation of anterior capsule
- ✓ Stimulation of capsule causes biceps reflexive response (2.7 msec)

Guanche: AJSM '95

- ✓ Rx: reduce inflammation, Laser therapy, ionto patch, NSAID, injection (?) & enhance dynamic stability

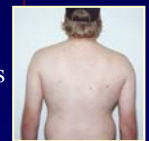


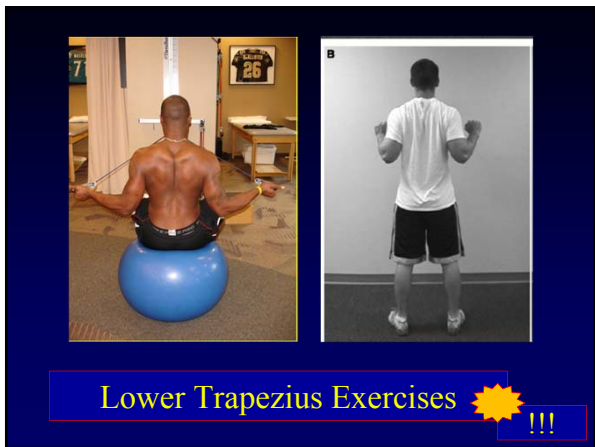
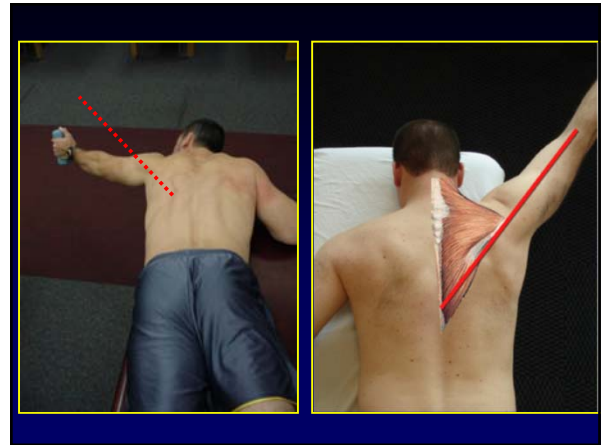
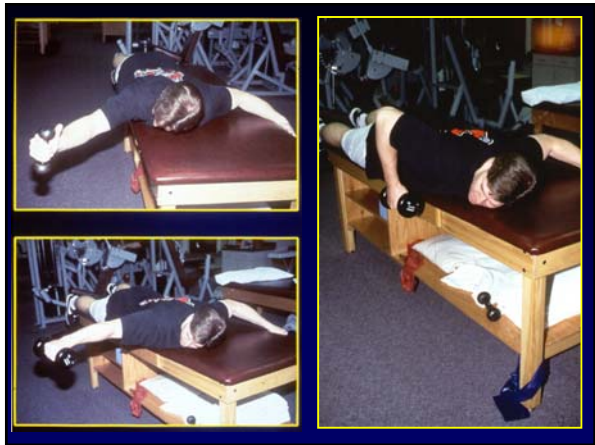
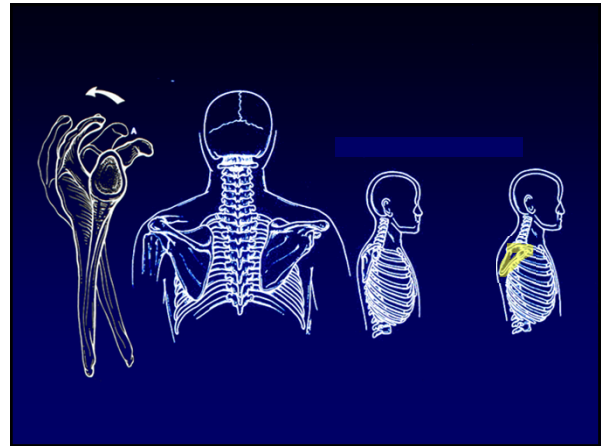
LHB Pathologies & Pain

Scapular Dyskinesia

- ✓ *Scapular dyskinesia:*
- ✓ Improper scapular position or movement
- ✓ Scapular malpositioning may affect biceps effectiveness and function
- ✓ May cause increased activity of biceps and may cause poor muscle activation and ability to generate force

Kibler et al: Br J Spts Med '10





Lower Trapezius Exercises  !!!





P Comparison of three stretches for the pectoralis minor muscle
 J Shoulder Elb Surg '06
 John D. Borstad, PhD, PT,* and Paolo M. Ludewig, PhD, PT,* Columbus, OH, and Minneapolis, MN

Overview

Pectoralis Minor Muscle Stretching

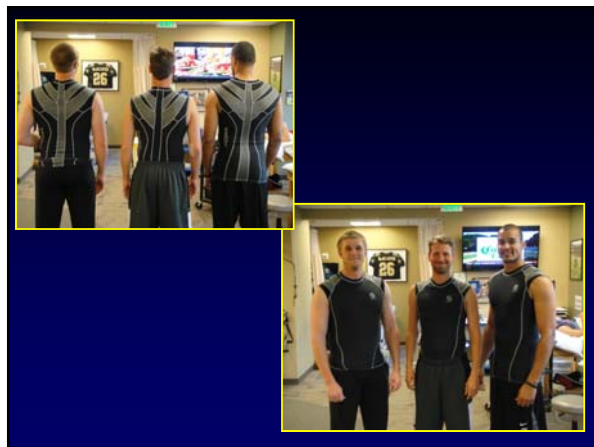
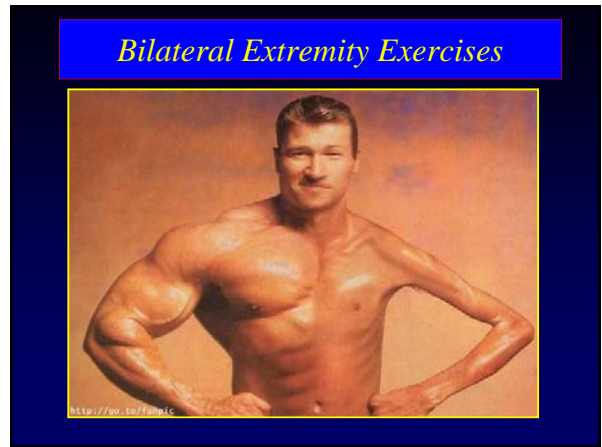
Factors affecting stretch

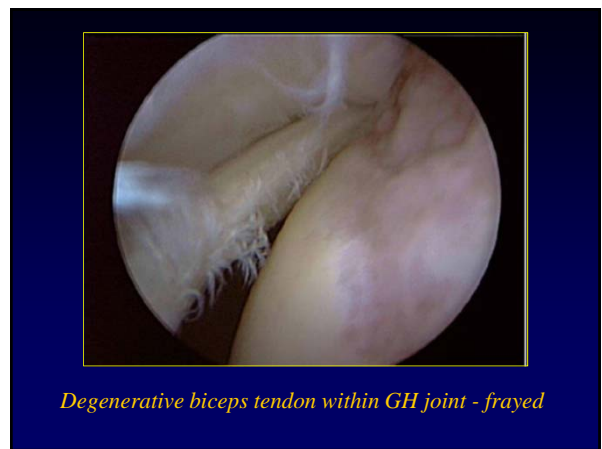
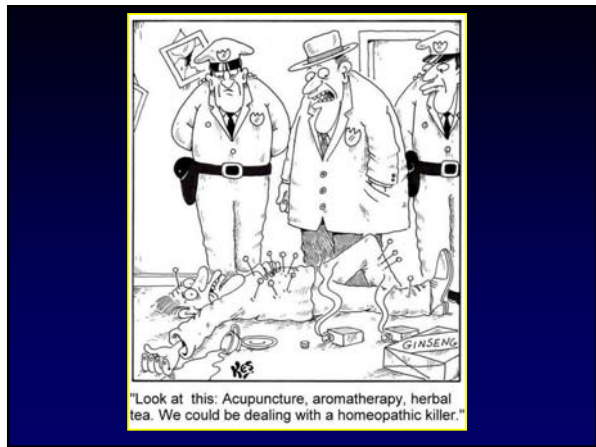
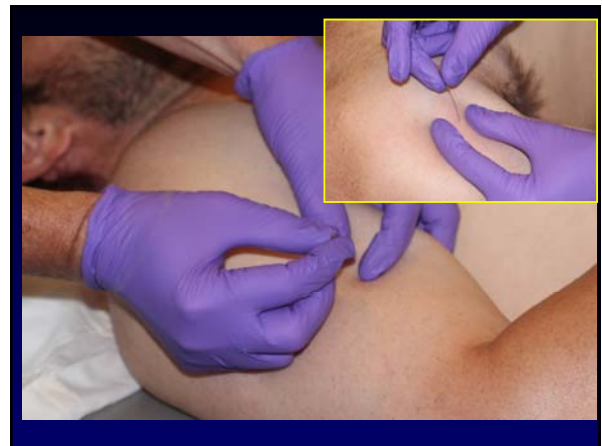
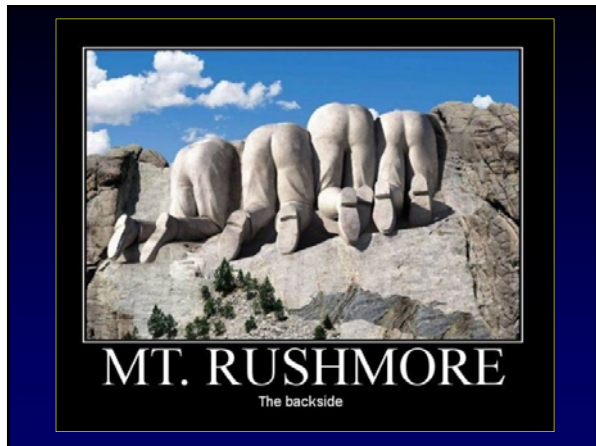
- Ability to relax
- Humeral abduction
- Humeral ER
- Position of scapula
 - Posterior tilted

Figure 2 Undilateral corner stretch. Load by a vertical plane before the stretch.

Figure 3 The investigator holds the patient's hand above the 90° flexion before through the coronal plane up with the arm lying with a neutral ball-and-socket joint.

Statistics	Mean (SE) (one)
2.24 (0.10)	
0.27 (0.11)	
1.70 (0.10)	







Degenerative biceps tendon within GH joint – performing a tenotomy



Degenerative biceps tendon within GH joint – tenotomy



RAMPAGE

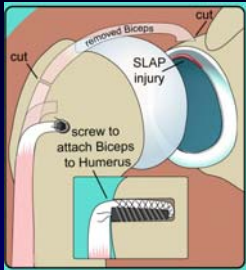
- REMOVE
- ALL
- MAJOR
- PAIN
- GENERATING
- ENTITIES





4 Cardinal Pain Generators

- Cuff
- Biceps
- AC Joint
- Subacromial Arch










Biceps Tenodesis


Subpectoral Biceps Tenodesis




A



B

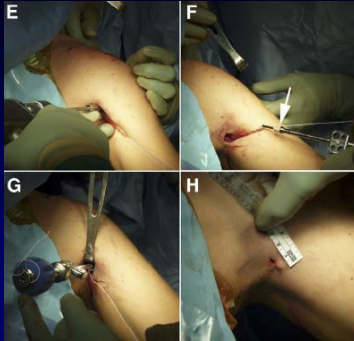


C



D

Subpectoral Biceps Tenodesis

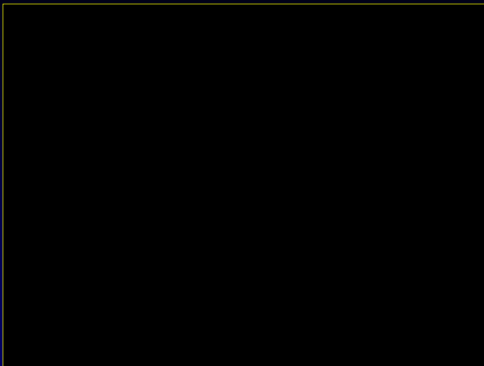


Comparison Tenotomy vs. Tenodesis

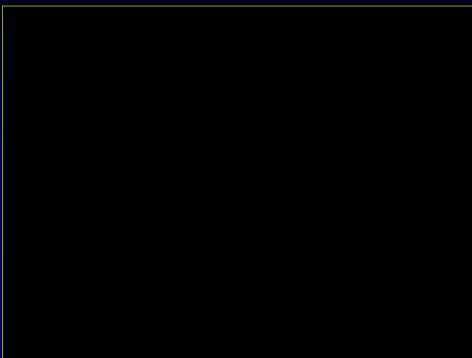
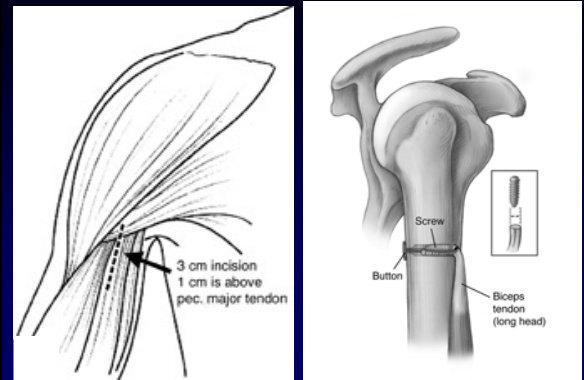
Which is best ??

- ✓ Consider cosmesis (important in many pts)
- ✓ Glenohumeral joint concomitant pathologies
- ✓ Tenotomy excellent for pain relief
- ✓ Tenodesis has been shown to better restore supination strength & endurance
- ✓ Tenotomy can result in biceps cramping with excessive biceps activities

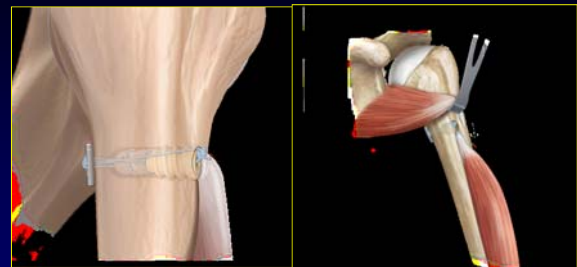
Which procedure is best ??



Supra pec with screw (Burks)



Biceps Tenodesis (Burks)



Cortical Button

Biceps Button

Complications of Biceps Tenodesis

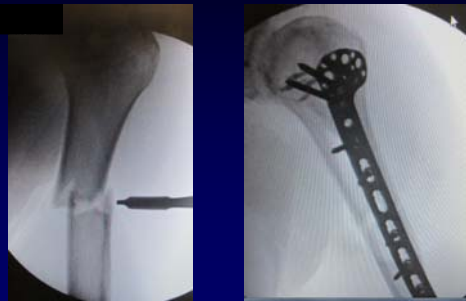


- The incidence of complications after subpectoral biceps tenodesis with interference screw fixation in a population of **353 patients over the course of 3 years** was **2.0%**

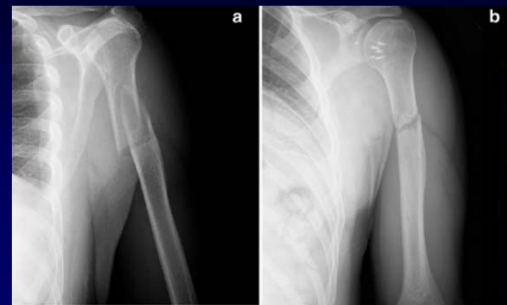
Proximal Humerus Fracture after Biceps Tenodesis



Proximal Humerus Fracture after Biceps Tenodesis



Proximal Humerus Fracture after Biceps Tenodesis



Humerus Fracture after Biceps Tenodesis with an Interference Screw- A Biomechanical Evaluation

Torsional Fracture of the Humerus after Subpectoral Biceps Tenodesis with an Interference Screw: A Biomechanical Cadaveric Study
David P. Beason^{1,2}, Jay P. Shah³, James W. Duckert⁴, Patrick W. Jost⁵, Glenn S. Fleming¹, E. Lyle Cain Jr.⁶

ARTICLE INFO

ABSTRACT
Background: Humeral fractures following subpectoral biceps tenodesis have been previously reported. However, there is a paucity of biomechanical data regarding the varying torsional strength of the tenodesis. The aim of this study was to determine if there is a difference in torsional strength between tenodesis with an interference screw and tenodesis with a suture anchor. We hypothesized that both methods of tenodesis would have similar torsional strength and similar medial rotation fracture compared to unoperated controls and that the larger screw size would result in higher mechanical properties compared to the smaller. Methods: Twenty fresh-frozen cadaveric humeri were subjected to a standardized biceps tenodesis using either a 2.5 mm or 3.0 mm interference screw. All specimens underwent mechanical testing to failure. Results: There was no statistically significant difference in torsional strength between the two groups. There was a statistically significant difference in medial rotation fracture between the two groups. There was no difference between screw sizes. While both screw sizes were combined into a single group, there was no difference between screw sizes.

Interpretation
Based on our experiment, there is an increased risk for humeral spiral fracture when subjected to torsional external rotation after subpectoral biceps tenodesis with an interference screw compared to an intact humerus; however, there is not a significant difference between a 2.5 mm and 3.0 mm screw. Surgeons may elect to use alternative fixation methods in patients at high risk (e.g., overhead throwing athletes, etc.) for humeral heads and fractures.

Torsional Fracture of the Humerus after Subpectoral Biceps Tenodesis with an Interference Screw: A Biomechanical Cadaveric Study



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Torsional Fracture of the Humerus after Subpectoral Biceps Tenodesis with an Interference Screw: A Biomechanical Cadaveric Study

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Clinical Biomechanics

- Significant reduction in maximum torque and fracture torsion angle in the tenodesis group compared to control
- 35% reduction in maximum torque to fracture
- 52% reduction in fracture torsion angle
- No significant difference found between the 6.25mm and 8mm screw size

Group	Screw Size	Maximum Torque (N)		Fracture Torsion Angle (deg)	
		Mean	SD	Mean	SD
Tenodesis	6.25 mm	244 (19.2)	18.4 (6.76)	2.40 (1.70)	1.82
	8 mm	234 (23.4)	17.7 (7.76)	2.39 (1.86)	1.82
Control	6.25 mm	374 (21.1)	14.7 (7.46)	3.39 (1.89)	2.00
	8 mm	367 (23.1)	16.7 (10.2)	2.99 (1.89)	2.00

Fig. 3. Maximum torque and fracture torsion angle (degrees) for the tenodesis and control groups.

Tenotomy or Tenodesis: Is it the Future?

Rehabilitation Following Subpectoral Biceps Tenodesis

- **Fixation method:**
 - Bioabsorbable screw, suture anchor or interference screw
- ✓ Immediate shoulder PROM & AAROM
- ✓ Caution with active elbow flexion & supination
- ✓ No biceps for 6-8 weeks
- ✓ No resisted biceps for 8 weeks
- ✓ Cuff program week 2

Smith, Dugas, Cain: ASMI Fellows '16

- Biceps tenodesis 12 scholastic baseball players
- 85% college, 15% high school
- 69% previous shoulder surgery
- 5/12 had previous SLAP surgery
- ✓ 11/12 returned to play baseball
- ✓ 3 changed position – not able to pitch
 - ✓ 25% experienced improvement performance
 - ✓ 33% experienced decrease in performance
 - ✓ 42% performance unchanged

Case Study – Shoulder 810

- 20 yr old D1 scholastic college volleyball player – front
- Dominant shoulder pain – biceps region
- Onset was from spiking & blocking drills
- Now pain is all the time
- Pain is “bad” at rest (8/2010)
- Been treated for this past 2 yrs with some relief (rest, injection, iontophoresis, strengthening) ...”this time is worse

Case Study – Shoulder 810

- Pain location: pain over proximal biceps tendon
- Right shoulder PROM:
 - » Flexion: 180 deg
 - » ER @ 90 deg: 142 deg
 - » IR @ 90 deg: 65 deg
- Left shoulder PROM – ER 125, IR 57
- Right shoulder strength:
 - » ER 4/5, IR 5/5, Abd 4/5
 - » Scapular strength: LT 4/5, Retract: 4/5, Protract 4/5

Case Study – Shoulder 810

• Treatment:

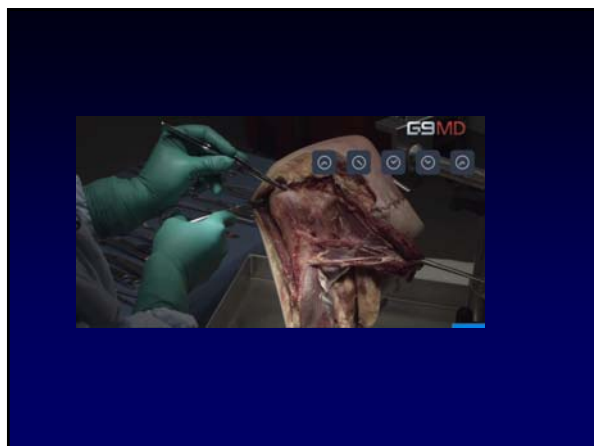
- ✓ Postural stretching
- ✓ Scapular strengthening exercises
 - ✓ Isolated & NM control drills – integrated
- ✓ Rotator cuff exercises
- ✓ Core & hip on stability
- ✓ Scapular strength
- ✓ Conditioning drills but no spiking or blocking until painfree plyos performed



LHB Pathologies & Pain

Key Points & Conclusions

- ✓ Need more information – research
- ✓ Controversy regarding the function, pathology & causes of biceps pain
- ✓ Myriad of factors may contribute to lesion
- ✓ Complex biomechanics poorly understood
- ✓ Numerous pathologies may exist – not always a simple solution
- ✓ Treatments: non-op & operative
- ✓ *More research is coming – “I hope”*



Rehab Overhead Athlete

Return to Play Criteria

- ✓ Full sport specific non painful ROM
- ✓ Strength which meets the criteria
- ✓ Excellent stability and no painful special tests
- ✓ Demonstrates proper throwing mechanics
- ✓ Successfully has completed rehab program
- ✓ Appropriate rehab progression completed
- ✓ Satisfactory functional scoring

An Objective Criteria is Important



