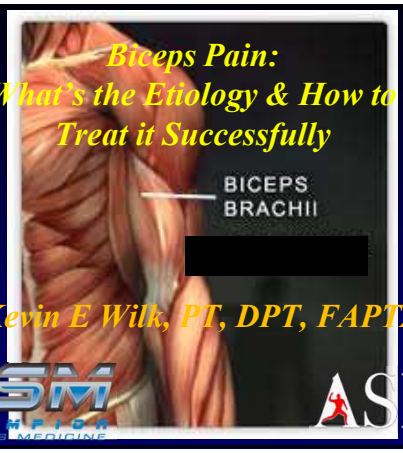
# Biceps Pain: What's the Etiology & How to Treat it Successfully




Kevin E Wilk, PT, DPT, FAPTA

CSM CHAMPION SPORTS MEDICINE

ASMI

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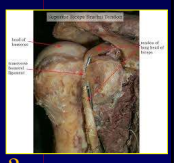
## Biceps Brachii Tendon Pain
### Introduction

- ✓ 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?



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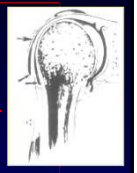
## Biceps Brachii Tendon Pain
### Introduction

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



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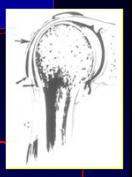
## Biceps Brachii Tendon Pain
### Introduction

- ✓ *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*



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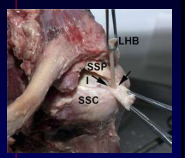
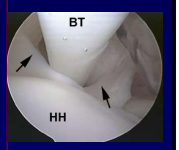
## Biceps Brachii Tendon Pain
### Introduction

- ✓ 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*

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## *Arthroscopy '11*

Level V Evidence

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

Florian Elser, M.D., Sepp Braun, M.D., Christopher B. Dewing, M.D., J. Erik Giphart, Ph.D., and Peter J. Millett, M.D., M.Sc.

**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-labral complex. The function of the LHB tendon and its role in glenohumeral kinematics presently remain only partially understood because of the difficulty of cadaveric and in vivo biomechanical studies. The purpose of this article is to offer an up-to-date review of the anatomy and biomechanical properties of the LHB and to provide an evidence-based approach to current treatment strategies for LHB disorders.

REVIEW ARTICLE

**Disorders of the long head of the biceps tendon**

Navin Sethi, MD, Rick Wright, MD, and Ken Yamaguchi, MD, St Louis, Mo

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 vestigial function and others believing it plays a critical role in shoulder stability. Historically, there have been wide shifts in the surgical management of the long head of the biceps tendon. In the 1940s the biceps tendon was seen as a major source of shoulder pain, and tenodesis was favored as a primary procedure.[19,23,39] As the focus shifted to the rotator cuff, tenodesis of the long head of the biceps became less popular. Later, concerns regarding a possible secondary role of the long head of the biceps tendon led to recommendations for preservation whenever possible.[37,43,56] More

The tendon is encased within the synovial sheath of the glenohumeral joint.[14] It traverses obliquely within the shoulder joint, arching anteriorly over the head of the humerus and exiting the shoulder joint beneath the transverse humeral ligament along the intertubercular sulcus, also referred to as the bicipital groove (Figure 1). Open only at the glenohumeral cavity medially, the synovial sheath ends as a blind pouch at the end of the bicipital groove. The long head of the biceps tendon is thus intra-articular but extrasynovial (Figure 2). The tendon is widest at its origin and progressively narrows to form the muscle belly. At the level of the insertion of the deltoid, the tendon evolves into an elongated muscle belly joined medially by the short head. The 2 bellies lie closely approximated but are separable until approxi-

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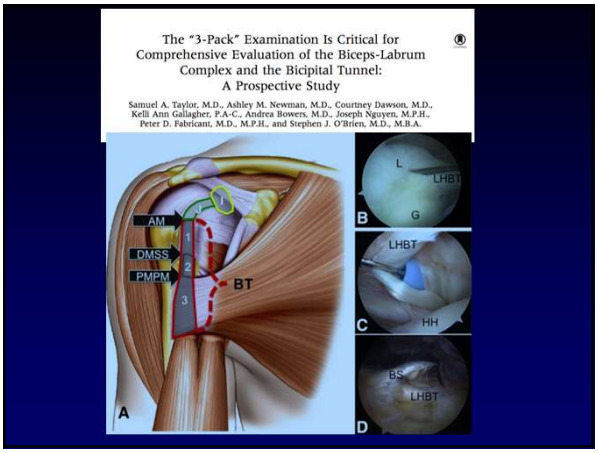


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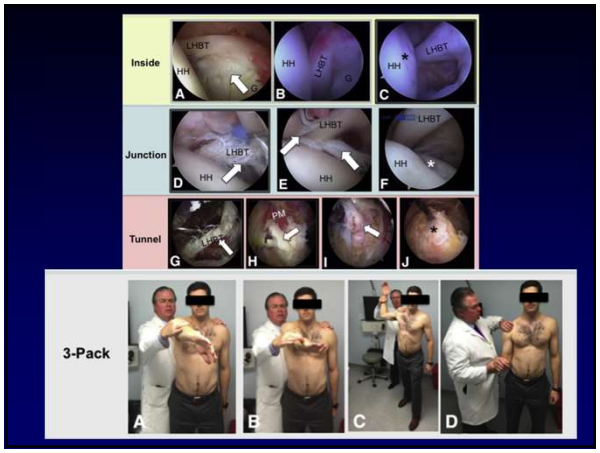


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## *Wilk & Hooks: Clin Spts Med '16*


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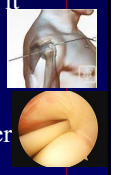
## Biceps Brachii Tendon Pain

*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*



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## 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*

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## Biceps Brachii Tendon Pain

*The Biceps is Important to People !*

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## 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*

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## 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*

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## 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

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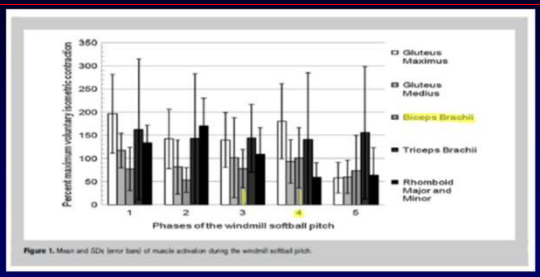
## EMG Activity During Windmill Pitching
*Selected Muscles*




*#4= 12:00 to 9:00*

*Oliver et al: JSCR '11*

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## EMG Activity During Overhead Pitching
*Elbow & Forearm Muscles*

| | No. of pitchers | Windup | Early cocking | Late cocking | Acceleration | Deceleration | Follow-through |
|---|---|---|---|---|---|---|---|
| Elbow and forearm muscles | | | | | | | |
| 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 ± 24 | 22 ± 29 |
| Pronator teres | 14 | 14 ± 16 | 18 ± 15 | 39 ± 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 | 13 | 11 ± 8 | 53 ± 24 | 72 ± 37 | 30 ± 20 | 43 ± 24 | 22 ± 14 |
| Extensor carpi radialis brevis | 15 | 17 ± 17 | 47 ± 26 | 75 ± 41 | 55 ± 35 | 43 ± 28 | 24 ± 19 |
| Extensor digitorum communis | 14 | 21 ± 17 | 37 ± 25 | 59 ± 27 | 35 ± 35 | 47 ± 25 | 24 ± 18 |
| Flexor carpi radialis | 12 | 13 ± 9 | 24 ± 35 | 47 ± 33 | 120 ± 66 | 79 ± 36 | 35 ± 16 |
| Flexor digitorum superficialis | 11 | 16 ± 6 | 20 ± 23 | 47 ± 52 | 80 ± 66 | 71 ± 32 | 21 ± 11 |
| 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.

*DiGiovine et al: JSES '92*

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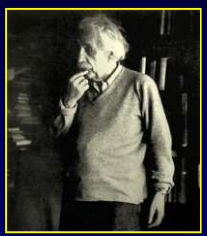
## *What About Biceps Pain !!!*



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## Biceps Pain


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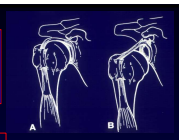
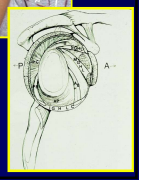
## Biceps Pain
*Overview*



- 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* ⟷ *Don't Guess*



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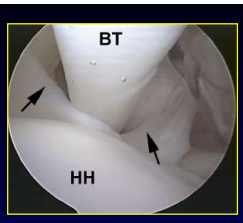


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## Biceps as a Pain Generator

The Proximal Biceps as a Pain Generator and Results of Tenotomy

*Istvan Szabó, 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."

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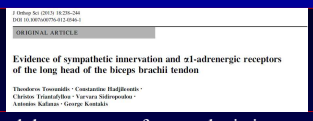
## Biceps Tendon Pain Receptors



ORIGINAL ARTICLE

Evidence of sympathetic innervation and α1-adrenergic receptors of the long head of the biceps brachii tendon

- Investigated the presence of sympathetic innervation and α1-adrenergic receptors of the long head of the biceps brachii tendon (LHB)
- A strong correlation between the expression of NPY/S-100, α1-adrenergic/S-100, and α1-adrenergic/NPY was found.
- The LHB tendon has sympathetic innervation and α1-adrenergic receptors in acute and chronic pathological conditions.

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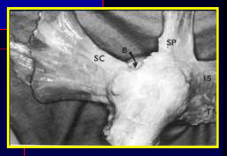
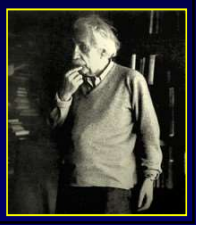
## LHB Pathologies & Pain
*Classification*



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



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## 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…*


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## 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 & >
- *"popeye deformity"*
- 96% of all biceps ruptures are LHB
- Often associated with tendon degeneration

*Warren RF: Instr Course Lect '85*

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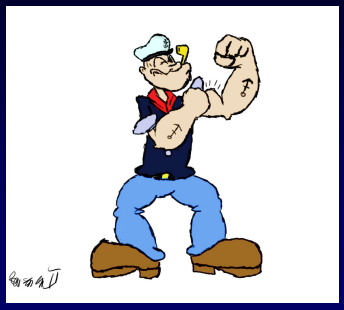
## *Does the Popeye Deformity Cause Pain ??*



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## *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)*

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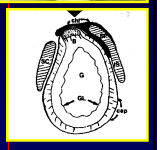
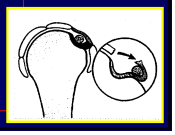
## Biceps Instability





- ✓ 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*

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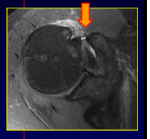
## LHB Pathologies & Pain
### *Coracoid Impingement*



- 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*

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## 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*

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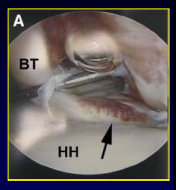
## LHB Pathologies & Pain
### *Tendinitis-Peritendinitis*





- ✓ 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

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## 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*

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## LHB Pathologies & Pain
*Peritendinitis Rx*

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

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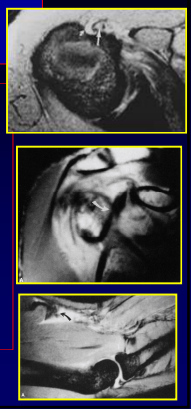
## LHB Pathologies & Pain
*Tendonosis*

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



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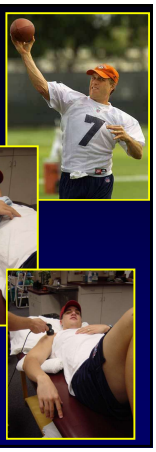
## LHB Pathologies & Pain
*Tendonosis Rx*

- ✓ 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"*



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## LHB Pathologies & Pain

*Tendonosis - Rx*



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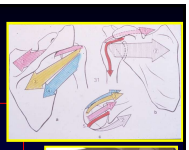
## LHB Pathologies & Pain

*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



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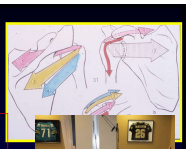
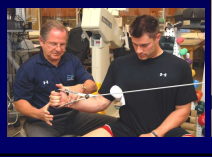
## LHB Pathologies & Pain

*GH Joint Laxity*

✓ Enhance dynamic stabilization



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## Advanced Thrower's Ten Program

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## Advanced Thrower's Ten Program

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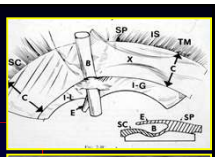
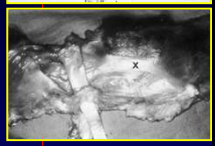
## LHB Pathologies & Pain

*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*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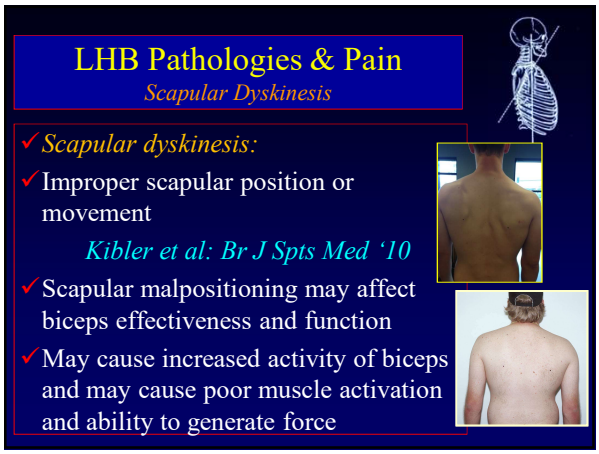
## LHB Pathologies & Pain

*Scapular Dyskinesis*

- ✓ *Scapular dyskinesis:*
- ✓ Improper scapular position or movement

*Kibler et al: Br J Spts Med '10*

- ✓ 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



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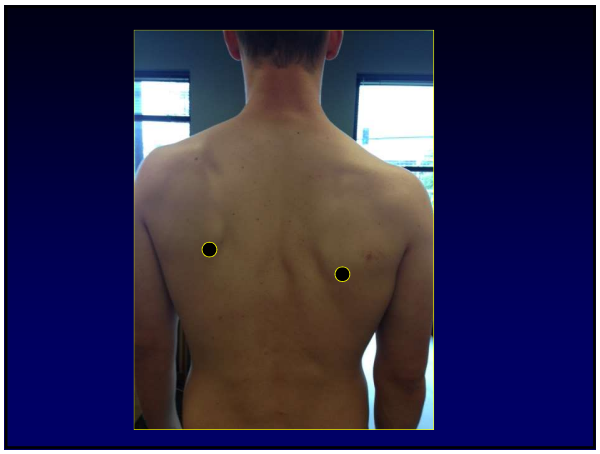

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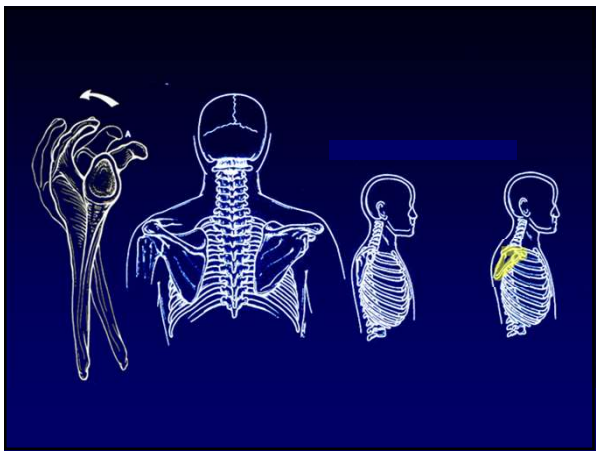

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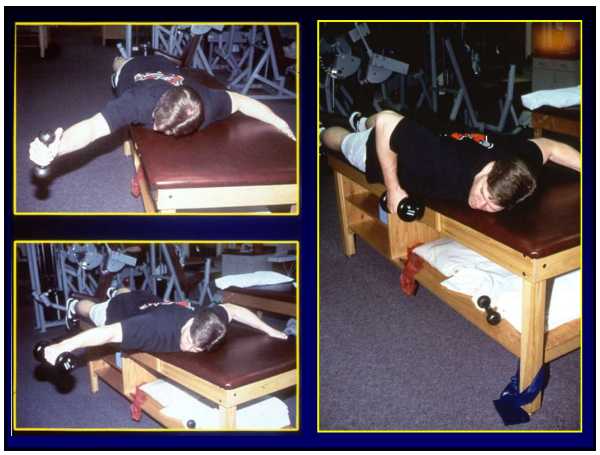

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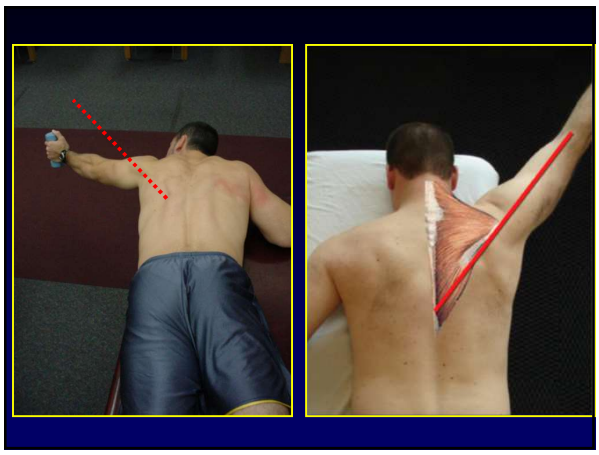

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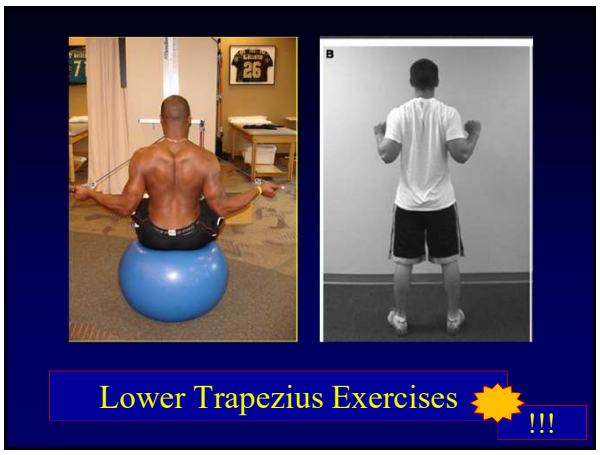


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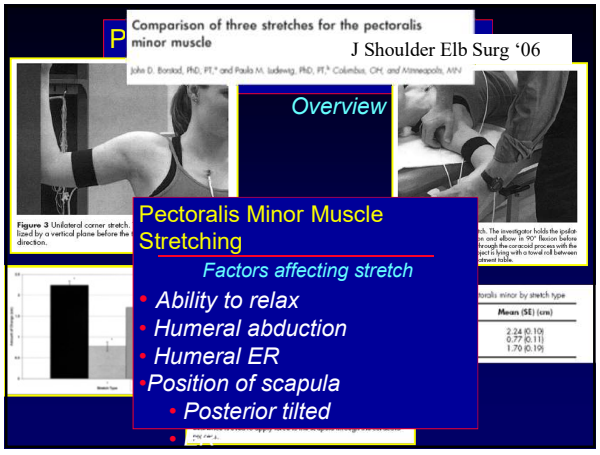


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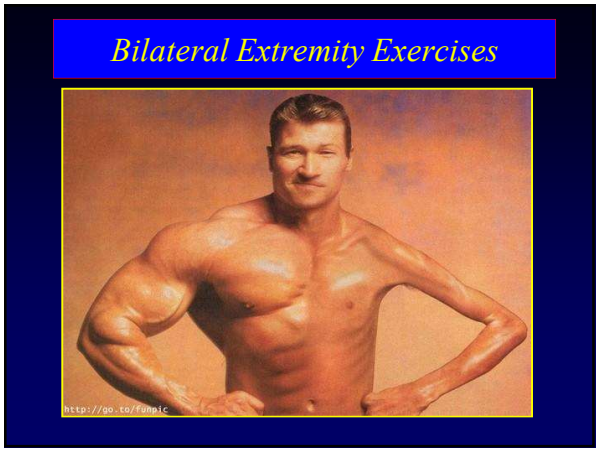


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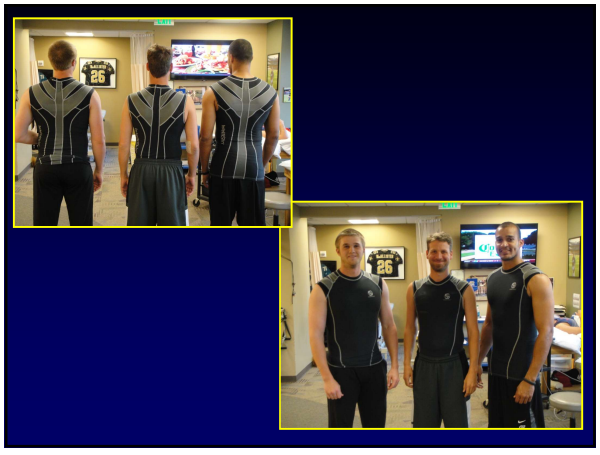

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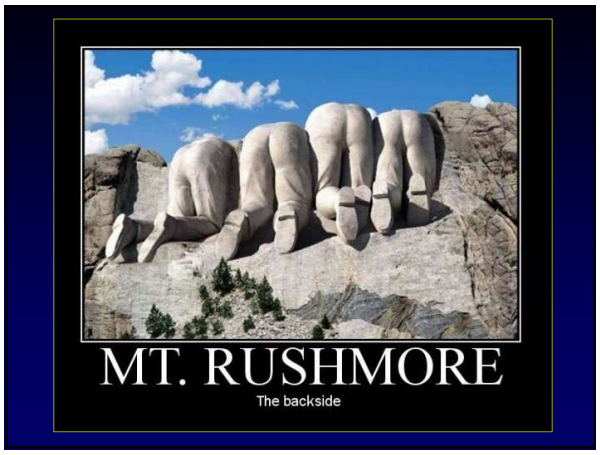


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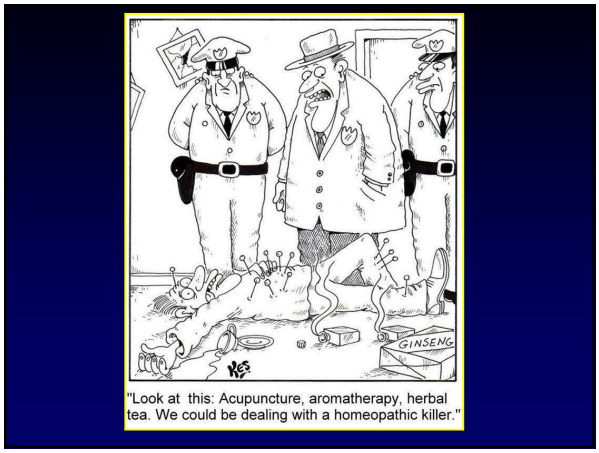


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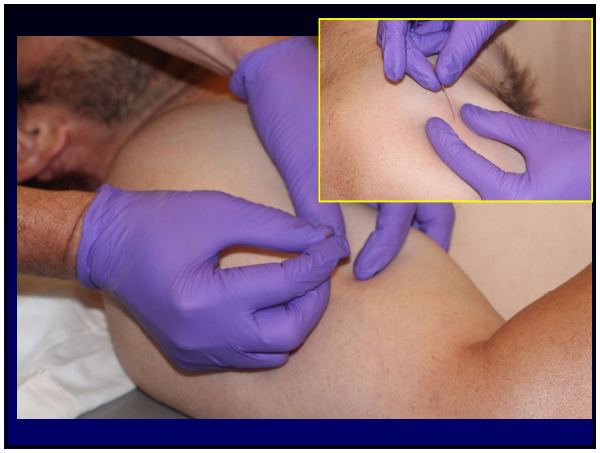

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*Degenerative biceps tendon within GH joint - frayed*

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*Degenerative biceps tendon within GH joint – performing a tenotomy*

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*Degenerative biceps tendon within GH joint – tenotomy*

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# RAMPAGE

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

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## 4 Cardinal Pain Generators

- Cuff
- Biceps
- AC Joint
- Subacromial Arch


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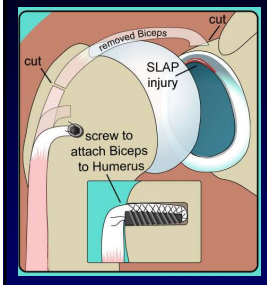


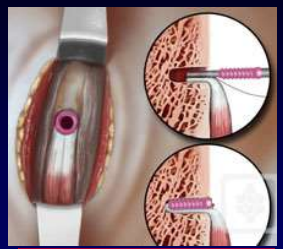

Biceps Tenodesis

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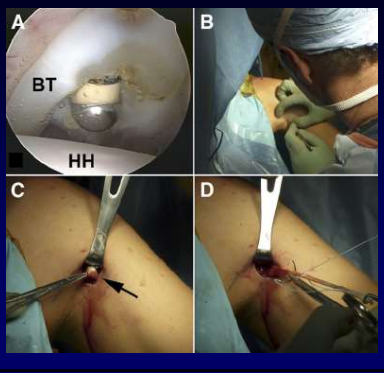
## Subpectoral Biceps Tenodesis

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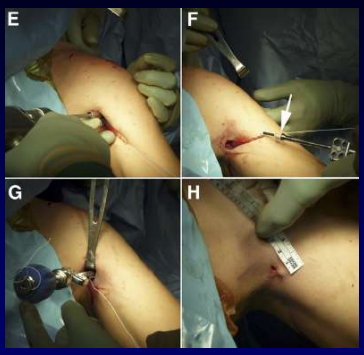
## Subpectoral Biceps Tenodesis

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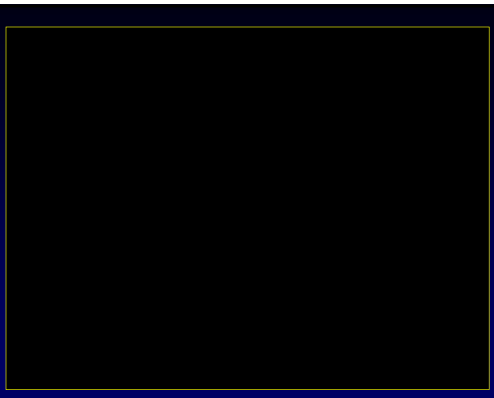
## Comparison Tenotomy vs. Tenodesis

*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 ??*

82



*Supra pec with screw (Burks)*

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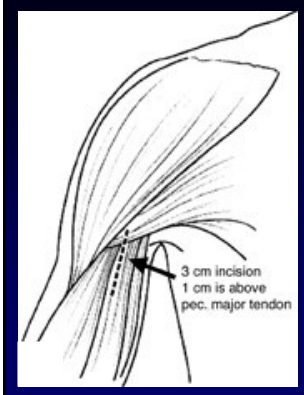


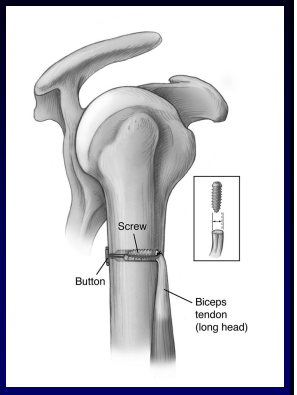


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*Biceps Tenodesis (Burks)*

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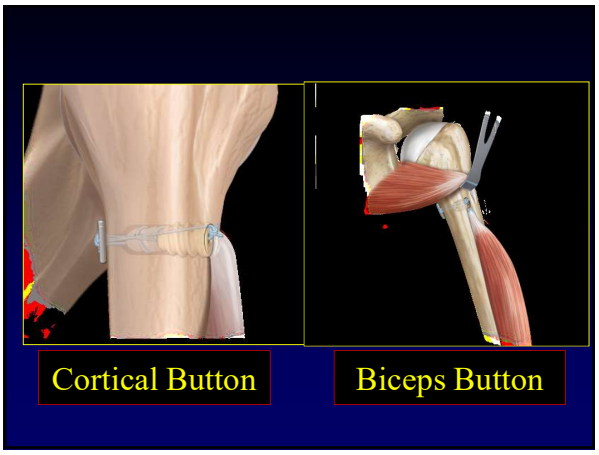


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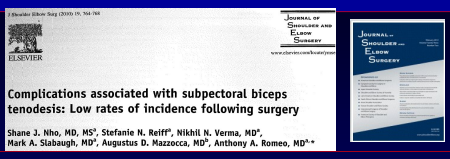
## Complications of Biceps Tenodesis



Complications associated with subpectoral biceps tenodesis: Low rates of incidence following surgery

Shane J. Nho, MD, MS[a], Stefanie N. Reiff[a], Nikhil N. Verma, MD[a], Mark A. Slabaugh, MD[a], Augustus D. Mazzocca, MD[b], Anthony A. Romeo, MD[a,*]

- 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%*

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## Proximal Humerus Fracture after Biceps Tenodesis

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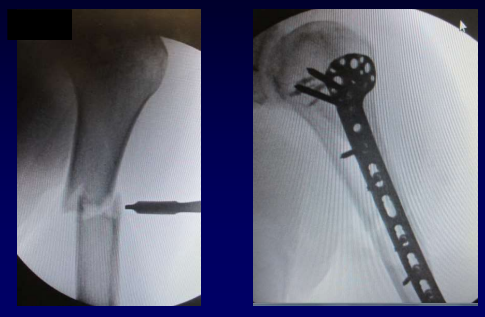
## Proximal Humerus Fracture after Biceps Tenodesis



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## Proximal Humerus Fracture after Biceps Tenodesis


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## 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 [a,*], Jay P. Shah [b], James W. Duckett [a], Patrick W. Jost [a], Glenn S. Fleisig [a], E. Lyle Cain Jr. [a]

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ARTICLE INFO

*Article history:*
Received: 10 February 2015
Accepted: 20 July 2015

*Keywords:*
Biceps tenodesis
Biomechanical
Humerus
Spiral fracture
Humerus
Interference screw

ABSTRACT

*Background:* Humeral fracture following subpectoral biceps tenodesis has been previously reported; however, there are no published biomechanical studies reporting the resulting torsional strength of the humerus. Our purpose was to determine if there is an increased risk of humerus fracture after subpectoral biceps tenodesis with an interference screw and to determine if screw size is also a factor. We hypothesized that limbs receiving the procedure would have reduced failure torque and rotation under external rotation compared to untreated controls and that the larger screw size would result in inferior mechanical properties compared to the smaller.
*Methods:* Twenty matched pairs of embalmed cadaveric humeri were subjected to subpectoral biceps tenodesis using either a 6.25 or 8.0 mm interference screw, with the untreated contralateral limb serving as a control. Each humerus was mechanically tested in torsional external rotation to failure.
*Findings:* Maximum torque and rotation to failure were reduced in the tenodesis group compared to controls; however, there was no difference between screw sizes. When both screw sizes were combined into a single group, paired t-tests also showed similar differences.

Interpretation

Based on our experiment, there is an increased risk for humerus 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 6.25 mm and 8.0 mm screw. Surgeons may elect to use alternative fixation methods in patients at high risk (e.g., overhead throwing athletes, etc.) for torsional loads and fracture.

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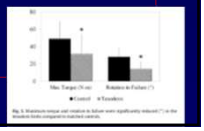
- Significant reduction in maximum torque and fracture torsion angle in the tenodesis group compared to control
- 35% reduction in maximum torque to fracture
- 52% reduction in fracture torsion angle
- No significant difference found between the 6.25mm and 8mm screw size



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## Tenotomy or Tenodesis: Is it the Future?

95

## 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

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## *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*

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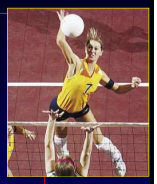
## Case Study – Shoulder 810

- 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



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## 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
  - » Scpaular strength: LT 4/5, Retract: 4/5, Protract 4/5

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## Case Study – Shoulder 810

- *Treatment:*

✓Postural stretching

✓Scapular strengthening exercises

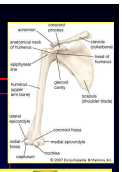
✓Isolated & NM control drills – integrated

✓Rotator cuff exercises

✓Core & hip on stability

✓Scapular strength

✓Conditioning drills but no spiking or blocking until painfree plyos performed



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## LHB Pathologies & Pain
### *Key Points & Conclusions*

✓*Need more information – research*

✓*Controversy regarding the function, pathology & causes of biceps pain*

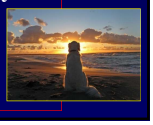
✓Myriad of factors may contribute to lesion

✓Complex biomechanics poorly understood

✓Numerous pathologies may exist – not always a simple solution

✓Treatments: non-op & operative

✓*More research is coming – "I hope"*



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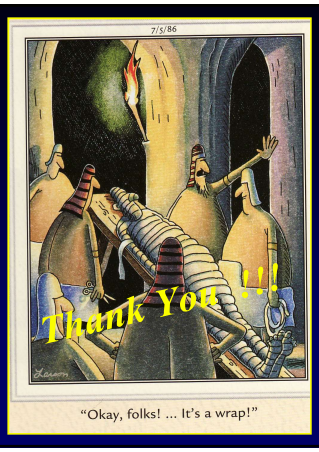


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