Tendon Injuries Around the Elbow

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Consultant:
- Arthrex Inc.

Distal Biceps Rupture

- Incidence: 1.2 – 2.55/100,000 patient yrs
- Mean age: 46
- Male: 95%
- Dominant: 52-86% (decreasing)
- Factors: Smoking, High BMI
- Job: Physically demanding 50%
- MOI: Ecc load to a flexed elbow

Safran Graham CORR 2002, Kelly et al AJSM 2015
Tuberosity Anatomy

Radial Tuberosity
- Cam shaped
  - Longest moment arm at apex  
    Athwal et al JHS AM 2007
- Variable anatomy
  - Orientation, Radius, Area and RU interval
- Tendon inserts on 30%
  
  Hutchison HL, Gloystein D, JSES 2008
  Mazzocca AD et al, JSES 2007

Tendon Anatomy

- Strongest supinator at 90 degrees of flexion
- Short Head – Distal medial
  - Stronger flexor and supinator in pronation and neutral
    May rupture alone
- Long Head – Proximal lateral
  - Stronger supinator in supination

Bicipital Aponeurosis

Lacertus Fibrosis
- Originates on the short head and inserts on the medial ulna
- Protects NV structures
- Redirects biceps vector force from radius to ulna
- Intact in 59% complete tears

Devereaux et al AJSM 2013
Tear Pathogenesis

**Vascular** – hypovascular area at the fibrocartilage zone
Koch and Tillman 1993
Sieler et al JSES 1995

**Mechanical** – increased bursal size, roughening of tuberosity
Karanjia and Stiles 1988

**Bony Impingement** – mechanical repetitive stress failure against ridge
Davis and Yasmeen 1988
Sieler et al JSES 1995

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Neurovascular Anatomy

In order of injury frequency

Lateral antebrachial cutaneous nerve
Radial sensory nerve
Posterior interosseous nerve
Anterior interosseous nerve

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PIN Injury Risk

**PIN innervation varies**
- 28% within 5mm of RT
- 67% within 10 mm or RT
Duquesne et al Clin Anat 2010

**Distance of PIN to ulna**
- 22 mm at 3 cm
- 16 mm at 5 cm
At the RT, the PIN is very close to the trans-muscular approach in the supinator
Heidari et al Surg Radiol Ant 2010

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PIN Injury Risk

Av distance of PIN to button tunnel when drilling:
- Straight posterior: 8.94 mm
- 20° proximal: 11.86 mm
- 30° distal: 0.55 mm

Distance between PIN and button significantly increased by aiming the guide pin **between 0° and 20° proximal toward the RCJ** and placing the device in line with the radial shaft – also decreased by aiming ulnar.

Duncan et al Hand 2013;8(2)
Lo et al Arthroscopy 2011

Validated Tests

**Hook Test**
- Elbow flexed, active shoulder abduction, active elbow supination against resistance
  - Index finger hooked on BT
- 100% Sensitive, specific and predictive

O'Driscoll et al AJSM 2007

Diagnostic Imaging

**X-rays**
- Usually Normal
- Radial Head View to evaluate RU interval and tuberosity morphology

**MR Imaging**
- Confirm Rupture
- Partial tears, cysts, zebras
- Watch Myotendinous injury!
Considerations for Repair

- Restore the anatomy
- Recover flexion and supination strength
- Avoid complications
- Minimize dissection, surgical time, and cost

Systematic Review

Safety: Bone tunnel and button methods safer than anchor or screw methods

LACN injury: Two-incision method better

Stiffness: Two-incision method better?

Anatomic repair:
Two-incision method better?

Watson et al JBJS AM 2014

Biomechanics: Non-Anatomic Repair

Anterior non-anatomic repair results in loss of supination torque between neutral and full supination (but not in pronation) due to decrease in moment arm length between neutral and full supination

Schmidt et al JSES 2010
Schmidt et al JSES 2012
One-Incision Method

Anterior incision to find and prepare tendon
Protect LACN
Follow BT tunnel to tuberosity
Preserve the vascular structures
Supinate the forearm
Expose and prepare the tuberosity
Limit lateral retractors
Apply chosen fixation method
Deliver the tendon for fixation

Lateral and Medial Epicondylitis:

Background

- Affects 1-3% of adults yearly
- ~80% of patients report symptomatic improvement at 1 year without treatment
- 4-11% seeking medical treatment undergo surgery
  - May be as high as 25% in “referral” practices

-JAAOS 2008
1213 patients, 8% failed non-op treatment
- Open release, decortication, & arthrotomy
- 66/88 (75%) patients with excellent results
- 97% improved
- 85% resumed all pre-operative activities
- 14% had intra-articular pathology

Angiofibroblastic dysplasia

Open extensor release & reattachment
- 18/19 patients “better” after surgery
- Worse results in high demand patients
  - 60% high demand athletes stopped sport
  - 15% high demand jobs changed employment

Open v. Percutaneous

- Dunkow et al, JBJS Br, 2004
- Prospective, randomized trial of open v percutaneous release in 47 patients
- Improved result in the percutaneous group
  - Faster return to work
  - Greater improvement in patient satisfaction
  - Greater improvement in DASH scores
Open v. Arthroscopic
- Peart et al, Am J Orthop, 2004
- Compared 46 open & 29 arthroscopic releases at 6 months
  - Retrospective review, not randomized
- No difference in pain relief/function
  - ~70% G/E results
- Faster return to work with arthroscopy

Open v. Perc v. Arthroscopic
- Szabo et al, JSES, 2006
- Arthroscopic, percutaneous, and open releases compared at 2 yrs
  - 102 patients
  - Not randomized, retrospective review
- No differences between techniques
- 5.8% failure rate overall
- Additional 5.8% with recurrence successfully treated with cortisone

Medial Epicondylitis
- Olivierre et al, AJSM, 1995
  - 50 cases followed to 2 years (resection & repair)
  - All had some improvement
  - 80/30 were unable to return to sport/work
- Kurvers, JBJS Am, 1995
  - Case series of 40 patients treated with release
  - 11/16 with isolated ME did well
  - Ulnar neuritis was present in 24/40
    - 13% of these had G/E outcomes
Unanswered Questions

- Is repair necessary?
- Is drilling or decortication of the epicondyle helpful?
- Should the joint be examined?
  - 11-69% intra-articular pathology
- Should the PIN be addressed?
- What is the optimal post-operative regimen?
- Are complication rates equivalent? PLRI?

Thank You