Shoulder Fractures:
The Greater Tuberosity

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  • Biomet

• Royalties
  • Biomet

• Institutional/Program Support:
  • Smith & Nephew
  • Biomet
  • DJO
  • Arthrex

• AANA:
  • Member JBOT
  • Member BOD
  • First VP, Executive Committee
Shoulder Trauma In Skiing/Snowboarding

- 4-11% of All Injuries
- ~ 70,000 Injuries/Yr.
- Stable Inc. Rate
Greater Tuberosity Fractures

• 17-21% of Proximal Humerus Fractures
• 15-30% Associated With Anterior Dislocation

Bahrs et al ‘06
Kim et al ‘05
Bhatia et al ‘06
Bigliani et al ‘98
Green, Izzi ‘03
Shoulder Fracture Classification

• a la Neer 1970
Displacement >10 mm
Angulation >45°
Illustration of the Morphologic Classification of greater tuberosity fractures.
A, The avulsion type involves a smaller fragment with a horizontal fracture line.
B, The depression type involves an inferiorly displaced and impacted greater tuberosity.
C, The split type is a large fragment characterized by a vertical fracture line.
GT Fracture Displacement

- 163 Fractures
- 57% Involved Both SS and IS Insertions

Ogawa et al ‘03
Arthroscopic-Assisted Plate Fixation for Greater Tuberosity Fractures

- 11 Patients
- Median Age: 64 y/o
- Large, Comminuted Fractures
- Displacement >5mm
- Mean Pre-op Displacement:
  - Posterior: 19.5mm
  - Superior: 5.5mm
- Mean F/U 26 M

Park et al ‘15
Does Fracture Assessment and Treatment Recommendation Vary based on Imaging Modality for GT Fractures?

- X-Ray Only vs. 2D CT vs 3D CT
- 164 Orthopedic Surgeons Randomized Into 3 Groups
- 22 Fractures
- Interobserver Agreement Did Not Vary
  - Amount of Displacement
  - Direction of Displacement
  - Recommendations for Surgery

Janssen et al ‘16
My Take Home?

• Posterior Displacement Can Be Underestimated Using X-Ray Alone

• Always Get a 3D CT to Evaluate Proximal Humerus Fractures
GT Fracture Fixation Options:

- Suture/s
- Cannulated Screw (With or Without Washer)
- Percutaneous
- ORIF With Plate/Screws
- Arthroscopic With Suture Anchors
- Combined Scope/Open
Arthroscopic Technique vs. ORIF
Greater Tuberosity Fractures

- 32 Patients: 17 ORIF, 15 Arthroscopic Rx.
- Tuberosity Displacement: ≥5mm and <20mm
- Bias: Treatment Strategy
  - Displacement >10mm
  - Fragment Size >30x30mm
  - Displacement <10mm
  - Fragment Size <30x30mm
- F/U Ave 34 M

Liao et al ‘16
Arthroscopic Technique vs. ORIF
Greater Tuberosity Fractures

- Arthroscopic Rx.- Longer Surgical Time (95 Minutes vs. 62 Minutes)
- Bone Union Equal and Healed By 3 Months
- Scope Group
  - Better Elevation
  - Better Abduction
  - Higher ASES Score
  - Differences Small- ? Clinical Importance
- Complications Equal

Liao et al ‘16
Cuff Sutures Tied to the Plate In Cases of Comminution

Liao et al ‘16
Arthroscopic-Assisted Plate Fixation for Greater Tuberosity Fractures

- Scope GT Reduction/Fixation With Medial Row Anchors (Trans-tendon)
- Locking Plate of Distal Bony Fragment (Deltoid Split)
- Post-Op Displacement:
  - Posterior: 0.7mm
  - Superior: 2.8mm
- Partial Articular Side SS Tear: 10/11
- This Technique Provided Accurate Reduction

Park et al ‘15
Use the Anterior Fracture Line to Reduce the Fracture

Rouleau et al ‘16
My Take Home?

• Do What You Do Best

• Don’t Be Afraid to Convert an Arthroscopic to A Mini-Open Technique
Let’s Not Call It Mini-Open

Let’s Call It: Maxi-Arthroscopic
Greater Tuberosity Fracture Management

- Find Them - 3D CT
  - Determine Displacement
- Fix if $\geq 5$ mm Displacement (Superior and/or Posterior)
- Surgical Approach:
  - Open - Split Type
    - Time Matters
    - Outcomes Matter
    - Large, Comminuted Fx’s
  - Open/Scope - Split Type and Some Avulsion Types
  - Scope - Avulsion Types and Some Split Types
Thank You