Elbow Fractures
ORIF VS Arthroplasty

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Disclosures

• No disclosures

Distal humerus fractures

• 0.5-0.7% of all fractures
• 30% of all elbow fractures
• Bimodal etiology
  - Young age – high energy trauma
  - Elderly patients – low energy falls
AO Classification

- A – Extra-articular
- B – Intra-articular
  - Single column
- C – Intra-articular
  - Both columns

Milch classification

- Lateral trochlea ridge intact
- Fracture through lateral trochlea ridge

Jupiter and Mehne Classification

- A – High T
- B – Low T
- C – Y
- D – H
- E – Medial Lambda
- F – Lateral Lambda
Unique challenges

- Poor bone stock
- Elbow intolerant to prolonged immobilization
- Neurovascular structures
  - Radial, ulnar nerves
- Access to articular fragments
- Small fragments
- Elbow stability

Treatment

Non-op

- Non-operative treatment
  - Limited indication
  - Old unstable patients
  - Disuse of extremity
  - Non-articular, distal 1/3 fractures

Operative treatment

- Open reduction and internal fixation
  - Plates and screws
  - Isolated screw fixation – shear fractures
  - Both
  - Olecranon fixation for osteotomy
- Total elbow arthroplasty
ORIF

- Most fractures
  - Nearly all supracondylar fractures
- Young patient
- Good bone stock
- Non-articular fractures
  - High level

ORIF Considerations

- Plate fixation
  - Parallel vs "90-90" plating?
- Approach
  - Triceps?
  - Olecranon?
- Ulnar nerve
  - Transpose?

Parallel vs Orthogonal plating

- Mostly biomechanical studies
  - More studies favor parallel fixation
  - Some reports favoring orthogonal fixation
- No clear clinical difference
- Locking screws clearly favored
  - Regardless of fixation
- Both techniques sensitive to bone density
- Case by case
Approaches

- Triceps split
- Triceps/anconeus reflecting
- Triceps reflecting (BM)
- Olecranon Osteotomy

Ulnar nerve

- No strong evidence to support ulnar nerve transposition
- Some evidence to suggest increased ulnar nerve disease with transposition

Principles of fixation (O'Driscoll)

- Every screw in the distal fragments should pass through a plate
- Engage a fragment on the opposite side that is also fixed to a plate
- As many screws (long) as possible
- Each screw should engage as many articular fragments as possible
- The screws in the distal fragments should lock together by interdigitation, creating a fixed-angle structure
- Plates should be applied such that compression is achieved at the supracondylar level for both columns
- Plates must be strong enough and stiff enough
**Principles Summary**

- Fixation in the distal fragment must be maximized
- All fixation in distal fragments should contribute to stability between the distal fragments and the shaft (Fixed angle).

**Avoiding headaches**

**Avoiding Headaches Pre-op**

- Complete pre-op planning
- CT scan
- Soft tissue management
- Time management/expectations
- Manage expectations
- Adequate staff
Avoiding headaches
Intra-op

• Have all necessary equipment
  – E.g. headless screws, TEA
• Consider patient, x-ray position
• Fix distal to proximal
• Articular reduction is priority
  – Independent of approach
• Proper stress exam
• Enemy of good......

Case examples
High T fracture

Case examples
Capitellum shear fracture
1/28/2017

1 week
Failure of olecranon fixation

Revision of olecranon hardware
Case examples
Low linear fracture
Complications

- Complications ~ 11-29%
- Helfet et al ORIF of delayed union and non-union of distal humerus JBJS 2003
  - Nonunion – 2-10%
  - Re-operation – 29%
- Ulnar neuritis – up to 12%
- Olecranon osteotomy complication
  - Removal of hardware ~25-30%
Total elbow arthroplasty

- Historically for elbow arthritis
- Trauma
  - Elderly patients
  - Poor bone quality
  - Sufficient bone stock for prosthesis
  - “Un-reconstructable”
  - Salvage for failed ORIF

Total elbow arthroplasty for fractures

- Cobb, Morrey: TEA for distal humerus fracture JBJS 1997
  - 20 patients
  - Avg 3.3 yr follow up
  - Avg age = 72
  - 15 excellent, 5 good results
  - ROM = 23-130 degrees

- Kamineni and Morrey: Distal humerus fractures treated with TEA - JBJS 2004
  - 43 fractures
  - Avg age: 69 yrs, Min 2 yr f/u
  - 33 type C fractures
  - ROM: 24-134
  - 35% complication rate
  - 10 revision surgeries
Total elbow arthroplasty for fractures


- 7 patients
- Avg age: 23 yrs
- ~10 yr follow up
- 5/7 poor results – septic and aseptic loosening

Considerations
Pre-op

- Implant design
  - Hinged on non-hinged
  - Hinged more common for fracture
- Olecranon status
- Amount of bone loss
- Approach
  - Triceps on or off

Considerations
Intra-op

- Assess center of rotation
- Cementation technique
- Triceps on if possible
- Radial head?
- Assess for impingement
- Ensure full ROM in OR
Capitellum fracture in elderly

CT
Complications of TEA Literature

- Higher in fracture case
- Higher in younger patients (<60 years)
- Loosening ~ 5%
- Infection 3-11%
- Ulnar nerve ~ 2-5%
- Periprosthetic fracture – loose stem
- Triceps insufficiency ~ 1-5%
  - Complete triceps release ~11% insufficiency
- Wound complications ~ 5.5%

TEA vs ORIF RCT

[Graph showing comparison between ORIF and TEA]
TEA vs ORIF

- Obremskey et al. ORIF vs TEA for distal humerus fracture JOT 2003
  - Case series comparison – No difference
- Frankle et al. ORIF vs TEA for distal humerus fractures in women JOT 2003
  - Better results in TEA (MEP scores)
- Prasad and Dent Primary TEA vs TEA after failed ORIF JBJS Br 2008
  - No difference at 4.7 yrs

Summary

- ORIF for young patients
- TEA for "unreconstructable" fractures in elderly
- Comfort with both techniques
- Manage expectations
- Surgeon preference and comfort

Thank you