

Which Fractures Require Internal Fixation?

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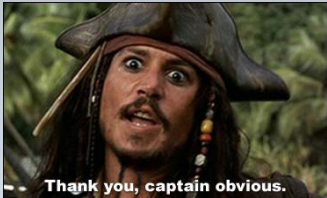
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Background

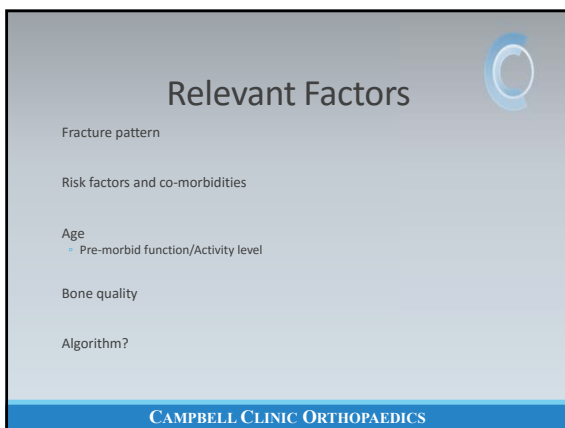
The literature supports internal fixation for the treatment of acute displaced proximal humerus fractures with a variety of devices

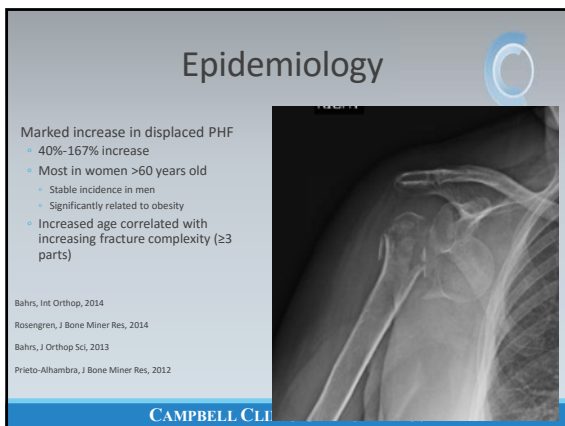


Thank you, captain obvious.

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Current Decision-Making

Agreement among surgeons regarding non-operative vs operative treatment is mixed

- Better agreement on treatment than fracture classification among experienced surgeons
- Interobserver agreement moderate but intraobserver agreement less consistent




Brorson, BMC Musculoskelet Disord, 2012
Petit, J Shoulder Elbow Surg, 2010

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Current Decision-Making

Treatment decisions based on...

- Age
- Associated orthopaedic injuries
- Fracture severity/displacement
- Dislocation
- Medical co-morbidities



Okike, Injury, 2013
Murray, JBJS Br, 2011

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Fracture Pattern

Neer classification

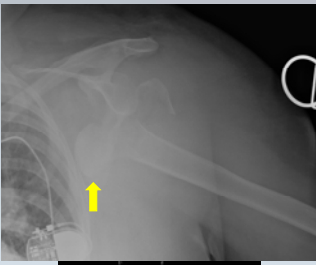
- Reliability has been questioned
- But descriptive and widely accepted
- Can clarify treatment options

Comminution

- 3 and 4-part fractures
- Head splitting patterns

Degree of displacement

- Fracture-dislocations

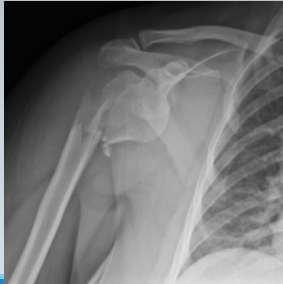


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Fracture Pattern

Residual varus angulation predicts worse functional outcomes

Sudkamp, J Shoulder Elbow Surg, 2011



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Fracture Pattern


NON-OPERATIVE TREATMENT

Comminution predicts poorer functional outcome

Humeral head position and deformity not predictive

- Despite malunion

Canbora, Int J Shoulder Surg, 2013



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Fracture Pattern

DISPLACED 2 PART FRACTURES


Benefit of internal fixation has been questioned

RCT from UK

No difference between operative and non-operative treatment

Did not stratify by any other factors

Rangan, JAMA, 2015



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Risk Factors

- Smoking
- Substance abuse
- Diabetes
- Rheumatoid disease
- Immunocompromise
- Active malignancy

Murray, JBIS-8, 2011



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Risk Factors

Predictors of adverse medical events after PHF

- Increased age
- Male
- Concomitant LE fracture
- Head trauma
- Operative intervention
- CHF
- Alcoholism

2.3% mortality


Neuhaus, Clin Orthop Relat Res, 2013
Petrigliano, JBIS-A, 2014



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Risk Factors

- Psychiatric disease
- Social factors



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Age

Older age associated with higher likelihood of recommending non-operative treatment
Hageman, J Shoulder Elbow Surg, 2014



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Age

AGE ≠ FUNCTION

Poor outcome after PHF not independently associated with age

Social independence more predictive of outcome

- Living at home
- Shopping
- ADL's
- Recreational activities

Clement, Bone Joint J, 2014



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Age

COMPARATIVE STUDIES

Locked plating series

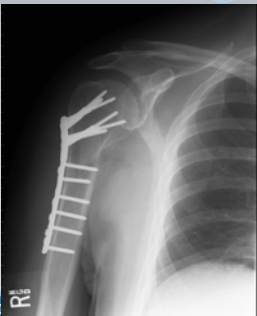
ORIF 2 part fractures

- No difference in outcomes or complications between young (<65) and older (≥65) cohorts at average 16mo follow up

ORIF 3 and 4 part fractures

- Similar cohort
- No difference in functional scores

Shulman, Geriatr Orthop Surg Rehabil, 2013
Grave, Geriatr Orthop Surg Rehabil, 2012



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Age

COMPARATIVE STUDIES


ORIF vs non-operative

- No significant differences in function or satisfaction versus locked plating in the elderly
- ROM favors non-op

Hemi vs non-operative

- 4-part fractures
- No significant differences in ROM or Constant score in the elderly
- Pain and quality of life scores favor hemi

Olerud, JSES, 2011
Sanders, JSES, 2011
Olerud, JSES, 2011



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Bone Quality

PHF comprise 20% of all fragility fractures

Osteoporosis treatment programs significantly reduce the hazard ratio for PHF

Mechanical failure rate after ORIF not affected by humeral head bone density at 1 year

Giannotti, Clin Cases Miner Bone Metab, 2012
Singh, J Shoulder Elbow Surg, 2014
Kralinger, JBJS-Am, 2014



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Which fractures require internal fixation?

Fracture pattern/displacement

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    graph TD
      A[Fracture pattern/displacement] --> B[Acceptable varus/comminution/displacement]
      A --> C[Significant varus/comminution/displacement]
      B --> D[Non-operative treatment]
      C --> E[Risk factors not acceptable]
      C --> F[Acceptable risk factors]
      E --> D
      F --> G[Physiologically old]
      F --> H[Physiologically young]
      G --> I[3 and 4 part fractures  
Fracture-dislocations]
      H --> J[2 part fractures]
      I --> K[RTSA]
      I --> L[Fixation]
      J --> L
  
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Thank You