Diaphyseal Humerus Fractures: Functional bracing history, Surgical approaches, Radial nerve

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Sir John Charnley

• “It is perhaps the easiest of the major long bones to treat by conservative methods”
Functional Bracing

- Sarmiento et al “Functional bracing for the treatment of fractures of the humeral diaphysis” JBJS(A) April 2000
- 922 patients (f/u on 585)
- 98% union rate for closed fractures
- 87% had less than 16° angulation
- Closed fractures healed at a mean of 11 weeks
- Comminuted fractures healed more rapidly than transverse fractures
Functional bracing requires:
- gravity
- no active abduction
- splint adjustment
- patient cooperation

Functional bracing does not allow early U/E wt bearing

There are failures.....
Healing Rates

- Transverse fractures healed slowest - 14 weeks on average
- Comminuted fractures healed well - not associated with a higher nonunion rate
- Mean time to union 10-16 weeks
- Long term follow-up rare, functional data rare
• 27 year old polytrauma pt.

• Distracted, angulated humeral fracture

• Ipsilateral BBOF

• Ipsilateral scaphoid #

• Multiple L/E injuries
Anterolateral approach
Humeral Nonunion

- 64 yr old female
- Closed, isolated injury
- Pain and weakness
- Grossly mobile fracture site
39 yr old real estate lawyer, injured in squash game, “biggest deal of my life” in two weeks overseas.
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Humeral Shaft RCT: Splint versus ORIF

46 Montreal General Hospital
7 Royal Columbian Hospital
6 Queen Elizabeth II Centre
1 Hôpital du Sacré-Coeur
10 Sunnybrook Health Sciences Centre
19 St. Michael's Hospital
27 Ottawa Hospital - Civic Campus
9 Vancouver General Hospital
4 Winnipeg Health Science Centre
5 Foothills Medical Centre
12 Peter Lougheed Centre
6 Memorial University
7 Hamilton Health Sciences Centre
2 University of Saskatchewan

160/180 patients enrolled
When to intervene?

- It is often difficult to determine if union is progressing
- Egol et. al.

- Examine at 6 weeks: If gross motion and pain is present:

- Risk of eventual nonunion high
Modern Humeral Nails

- Larger diameter
- "Reamed" insertion
- Lockable: screws, expansion bolt, ridged fins
- Insertion site morbidity high
- Used in 15-20% of humeral fractures in North America
- Difficulty in reconstructing failures
Pathological fracture
Technique – Plate size
Associated radial nerve palsy

- Natural history of radial palsy in closed #’s good:
  - Pollock JBJS 1981 90%
  - Ogawa J Trauma 1997 100%
  - Ward Skeletal Trauma 1993 95%

- No evidence exploration improves recovery

- Primary repair rarely possible

- If no recovery (older patients, diabetics), explore at 3-6 months - nerve grafting or tendon transfers

- Exception may be Holstein-Lewis #
Conclusions

- Most isolated humeral shaft fractures can and should be treated non-operatively.
- ORIF with a 4.5 mm plate is the treatment of choice for those that require fixation.
- IM nails may be preferable for pathological fractures.
- Most associated radial nerve palsies recover with time.
- Gross motion and pain at 6 weeks may identify those fractures unlikely to heal.
- New RCT’s may identify those that benefit from 1˚ ORIF.