

Non-operative Management of Proximal Humerus Fractures: What's Best for Our Patients?

Brian D. Solberg MD

- 1. Define our patient(s)
 - a. What's their baseline?
 - i. DASH/ Constant scores
 - b. What's the goal of treatment?
 - i. ADLs, dominant non-dominant arm
 - c. What is possible?
 - i. Is a Constant score of 90 possible in an 80 year old?
- 2. Our previous experience –What can we learn from the past?
 - a. Operative repair
 - b. Hemi-arthroplasty
- 3. What does the recent data tell us? Are we repeating past mistakes?
 - a. Does ORIF make our patients better?
 - i. Statistical vs. clinical difference
 - b. Does ORIF burn reconstruction bridges?
 - i. What if fixation fails?
 - c. Is ORIF ANY better than non-op?
 - i. Good evidence?
- 4. Our patient
 - a. What's best for them?



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Proximal Humerus Fractures-Operative

Brian Mullis, MD

- 1. 2015 Cochrane Review-"insufficient evidence to inform management of these fractures"[1]
 - a. Following recommendations are based on author's opinion and review of the literature, which is considered weak
 - b. Keep in mind elderly are 16 times more likely to have a proximal humerus fracture than young, most studies are predominantly composed of elderly
- 2. Young patients or highly functional elderly (author's opinion)
 - a. General recs for isolated tuberosities or surgical neck
 - i. ORIF for greater tuberosty great then 3-5 mm displaced
 - ii. Closed treatment for lesser tuberosity fracture, consider ORIF for significant displacement 1cm or greater (little evidence to inform given rare isolated injury)
 - iii. 2-part surgical neck good outcomes with closed treatment, consider ORIF or IM nail for open fractures and polytrauma[2]
 - b. 3-part or 4-part fractures
 - i. Equivalent outcomes with ORIF and IM nail techniques[3]
 - ii. Consider fibula allograft for anatomic neck fractures with poor screw purchase with ORIF
 - iii. Hemiarthroplasty may be better option for head splitting
- 3. Low demand elderly patients
 - a. Closed treatment appears to be equivalent to any surgical procedure with lower complication rates, ORIF may be worst choice for all fracture patterns, reverse total shoulder may be best choice for 3 or 4-part fractures if surgery is chosen and may be superior to closed treatment (weak evidence)[4-6]

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Long vs. Short Cephalomedullary Nail – Why Longer is Better

William Min, MD

- 1. Introduction
 - a. Current literature supporting short over long
 - i. EBL
 - ii. Surgery Time
 - iii. Similar healing outcomes
 - b. Commonly stated benefit of a longer nail
 - i. Periprosthetic advantage of long over short
- 2. Other (less recognized) benefits of going longer
 - a. Metaphyseal instability
 - i. Analogous to using short retrograde femoral IMN
 - b. Thigh pain
 - c. Protection of atypical fractures in patients on bisphosphonates
 - i. Aren't all of these patient's suffering from a "pathologic fracture"?
- 3. Conclusion
 - a. Role for both short and long nails
 - i. Short nails in:
 - 1. EBL, surgery time concerns
 - a. Clinically relevant?
 - 2. Stable fracture patterns
 - a. What is truly stable?
 - ii. Long nails in:
 - 1. Everyone else (default)



Mangled Extremity: Never Amputate on the First Trip to the O.R.

William J. Ertl, MD

The definition of a mangled extremity has been varied and at times complex. Numerous scoring systems have been developed to predict limb salvage versus amputation. However, these have not been able to demonstrate predictability, sensitivity nor specificity for either limb salvage or amputation. (1, 2, 3) Further, functional outcome could also not be predicted utilizing different scoring systems. (4 The American College of Surgeons characterizes the mangled extremity "as a high energy transfer or crush causing a combination of injuries to the artery, bone, tendon, nerve and/or soft tissue." From this surgeon's perspective, as viewed as organ system, a mangled extremity is a limb that has the majority of its components injured, requiring surgical intervention. Therefore the limb threatened. The purpose of this short presentation is to provide support and examples of threatened limbs that were thought to require amputation on the day of presentation. Through the combined effort of orthopaedic surgeons, trauma surgeons, vascular surgeons and plastic surgeons, application of temporizing external fixation, vascular shunts and wound containment with negative pressure wound therapy (NPWT), immediate amputation was avoided.

Upper Extremity Case example

17 year old male sustained an accidental gunshot wound from a black powder muzzle loading rifle to his left distal humerus. A field tourniquet was applied. No median nerve function, ulnar nerve dysthesias and brachial artery disruption with no distal pulses. Orthopaedic surgery asked to perform an urgent amputation due to large wound and lost pulses. Films reviewed and discussed with trauma surgeon not to amputate but pursue limb salvage. Patient aware of limb threatening nature of the injury. Temporary shunt placed, spanning external fixation placed and forearm fasciotomies performed. Wound contained with NPWT. Vascular reconstruction of segmental arterial loss with reverse saphenous vein graft. Humeral reconstruction was accomplished two days later at a more controlled time and setting, followed by split thickness skin grafting. Sural nerve grafting occurred four months later.

Lower Extremity Case example

44 year old female sustained a 3B open left tibia/fibula fracture with segmental bone loss and gross contamination. Orthopaedic trauma consulted for operative stabilization versus amputation. Soft tissue loss was circumferential and a 5 cm segment of bone was missing. Patient understood the limb threatening nature of her injury. Underwent medullary nailing of her tibia. Ultimately required a latissimus flap with STSG.



Suggested overall approach

- 1) Rapid efficient transport of the patient from the injury scene.
- 2) Complete overall assessment of the injured limb
 - a. Size of wounds
 - b. Amount of contamination
 - c. Bone loss?
 - d. Ankle/Brachial Index (ABI) to rule occult vascular injury
 - e. Resuscitation (plug the holes)
- 3) Quality imaging
 - a. Advanced imaging should **not** delay the patient to the O.R. for surgical stabilization
- 4) Emergent surgical intervention
 - a. Temporize (external fixation)?
 - b. Definitive fixation?

Summary

Management of the patient with the mangled extremity requires the utilization of multiple surgical specialties. The role of the orthopaedic surgeon is early and has an important impact of the outcome the patient may ultimately have. In some instances, the decision is obvious to perform an immediate amputation when there is significant soft tissue loss, bone loss and/or limited reconstructive choices. However, temporizing the limb allows the surgeon to engage the patient and family in treatment options and the potential futility of limb salvage. An amputation may ultimately be required but it can now be performed on in a controlled, reconstructive manner.

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- 5) Am J Surg, 172(5): 569-73, 1996.



Session 1: Orthopaedic Trauma Hot Topics

Nail or Plate: Distal Tibia-Nail

Daniel N Segina MD

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Current evidence: Plate vs Nail for distal tibia fractures



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Treatment principles remain same

- Respect soft tissues
- Restore appropriate alignment
- Promote mobility and function

BOTH NAILS AND PLATES ARE EFFECTIVE

According to some prior literature....

IM nails

- malalignment in distal fractures
- knee pain

Plates

- more infections and nonunions
- prominent implants

Technical innovations in plating

- Minimize surgical trauma
- Avoid tourniquet
- Large v small fragment fixation
- Standard v locking plates

<u>Issues</u>

- Implant prominence
- Cost



Plate reduction



Technical innovations in nailing

- Nail design: multiplanar locking
- Fixed angle locking bolts
- Suprapatellar nailing

Review of comparative literature

• 7 RCTs

- -3 with locking plates
- -2 with anterolateral tibia plates
- -2 with conventional medial plates

Summary of existing literature

- Alignment: Nails more malalignment than plates
- <u>Union</u>: Locked plates more nonunions than nails; Nails with more nonuions than standard plates
- <u>Outcomes</u> similar: depends on time to WB; nails show better outcomes 6wk-3mo, then no difference
- **<u>Costs</u>**: Locked plate > Nail >> Standard plate

Review of comparative literature

- Methodological issues
 - -Small samples
 - -Selection bias
 - –Variable implant selection
 - -Variable technique
 - -Fibula fixation



Hypotheses

- Nails will be associated with malalignment, nonunion, and knee pain
- Plates will be associated with prominent hardware



Inclusion criteria

- Distal tibia fracture
- 4 11 cm from plafond
- Skeletally mature



Radiographic and Clinical Comparisons of Distal Tibia Shaft Fractures (4 to 11 cm Proximal to the Plafond): Plating Versus Intramedullary Nailing

Heather A. Vallier, MD,* T. Toan Le, MD,† and Asheesh Bedi, MD‡

- 76 nails, 37 plates, retrospective
- More malalignment (29% v 5%) and delayed healing (12% v 3%) w/ nails
- Malunion more common after open fx
- Nonunion more common after ORIF fibula

JOT 2008

Randomized, Prospective Comparison of Plate versus Intramedullary Nail Fixation for Distal Tibia Shaft Fractures Heather A. Vallier, MD. Beth Ann Cureton, BS. and Brendran M. Patterson, MD

- 56 nails, 48 plates, prospective RCT
- More malalignment (23% v 8.3%) and nonunion trend (7.1% v 4.2%) w/ nails
- Malunion more common after open fx
- Nonunion more common after ORIF fibula

Infection

- No wound complications
- 6% deep infections
- Unrelated to type of fixation
- All reported concurrent tobacco use
- 83% had open fx (p<0.001)

Nonunion

- 4.2% after plate
- 7.1% after nail
- 83% reported tobacco use
- All had open fx (p=0.0007)





Malalignment

- 8.3% after plate
- 23% after nail (p=0.02)
- NO fibula ORIF in 85% of malunion with IMN



Malunion

- 6 other cases with late malalignment
- 2 catastrophic failures after plate when walking AMA
- 5 with progressive valgus displacement (<u>3 plate, 2 nail</u>)





Secondary procedures

- 11 pts had 15 procedures after initial plating
- 5 w/ prominent implants
- 10 pts had 14 procedures
 after initial IMN
- 5 w/ prominent implants

Functional outcomes

- Ankle and knee pain are common after tibia fracture, but not limiting to function
- Generalized and extremity-specific scores demonstrate residual dysfunction
- 95% returned to employment
- Unemployed pts reported more pain and had worse functional outcome scores

Summary of current literature

- Plates and nails both effective
- Delayed healing is associated with:
 - Locking plates
- Delayed healing may be associated with:
 - IM nail (vs plate)
 - Fibula fixation

Conclusions

- Infection, secondary procedures, & functional outcomes are comparable for plate vs nail
- Infection, nonunion, and malunion are associated with open fracture and comorbidities

Costs per case

Plate

- 4.5mm LCDCP: \$250
- 4.5mm medial distal plate: \$850
- Locking plate: **\$2,200-4,000**

Nail: **\$2,500-3,500**