

J. Tracy Watson M.D.
Professor Orthopaedic
Surgery
The CORE Institute
University of AZ College of
Medicine – Phoenix
Banner University Medical
Center
Phoenix, AZ

Orthopaedic Trauma Boot Camp

Session VI: The Struggle is Real
Nonunion: When, What & How

Lessons Learned: Top 10 Tips for Treating Nonunions

Correct pre-op determination of “what you have”... ANALYSIS OF NONUNION

1. *Appropriate x-ray evaluation....*

Long alignment film
Determine mechanical axis malalignment
Hypertrophic vs Atrophic vs bone loss vs infected nonunion

2. *Relative value of adjunctive studies*

MRI
Nuclear med studies.
CT

3. *Infection work-up*

WBC, WSR, CRP, intraop frozen section
Combination of risk factors used to calculate overt infection risk

4. Host status:

Metabolic bone disease work-up

Cierny – Mader clinical staging of osteomyelitis

Type 1 *Medullary* osteomyelitis and is primarily an endosteal lesion
Type 2 *Superficial* infection, which involves only the outer portion of the cortex
Type 3 *Localized* osteomyelitis involving cortical sequestration with cavitation extending into the medullary cavity a
Type 4 *Diffuse* osteomyelitis is a permeating, circumferential, and through-and-through lesion with extensive involvement of the medullary cavity

Host status: A, B or C host

Operative intervention

5. *Staged reconstruction*

Debridement of all infected material and hardware
In cases where you do not suspect infected hardware.....still consider staging the reconstruction

6. *Dead space management*

AB spacers
AB beads
Negative pressure dressings
Soft tissue coverage

7. IM nails.best for hypertrophic, well aligned nonunion
Exception may be for humeral nonunions.....

Tibial nonunion after 1⁰ nailing, other clinical scenarios include:
Nonunion after casting
Nonunion complicated by infection

Dynamization

Allows compression across distraction / fracture site
Must be axial stable fracture
? Destabilize fracture
Autodynamization common...
..ride it out
Perform early...6 -12 weeks....
May not work after 4-6 months

Indications for tibial nail Rx of nonunion

Canals in relative continuity
Minimal deformity < 15o
Relative contraindications
Prior infection
Excessive shortening
Caution with prolonged external fix

Exchange nailing

Over-ream canal and place larger diameter nail...(2mm If Possible)
Locking screws?
Dynamic locking slot
Must be rotationally stable
Fibular osteotomy
Assess rotational stability.. Pre...cut
Perform if distraction at tibia
Match resection to tibial distraction
Not at same level as tibial nonunion

Tibial exchange nails success rate.....92% + (Johnson , Watson et.al...1989)

Limited with bone defects (?size)
More than 30-50% of cortex over 2cm
Increase diameter of prior nail ave. 2 mm
Results diminished after 2 prior nailings
Heavy smokers may require graft augmentation
Must minimize any distraction at fx / nonunion site (nail dynamization)

8. Tension band plating

Good deformity correction

Upper / lower meta-diaphyseal peri-articular nonunions +, - *bone graft*

Failed exchange nailing (multiple attempts) with large canal especially for repeat

Femoral revisions.

Plating can Correct mechanical axis

Proximal femur / tibia

Distal femur / tibia

Mid diaphyseal (rarely)

When to consider Plate vs ex fix

Degree of deformity to be corrected

Acute vs gradual correction (infection)

Associated problems

Bone loss

9. External fixation

Best deformity correction

Correct all axis of deformity

Re-establish limb length

Segmental defects

Bone transport

Sepsis

10. Orthobiologics

Autogenous bone graft

RIA

Masquelet' techniques

Vascularized bone grafts

Composite bone grafts

BMAC + DBM + allograft + porous ceramic

BMP's (only 1 currently FDA approved for nonunion which was taken off Market.)

Ultrasound / E-Stim