Adjunctive plating of tibial shaft fractures prior to nailing

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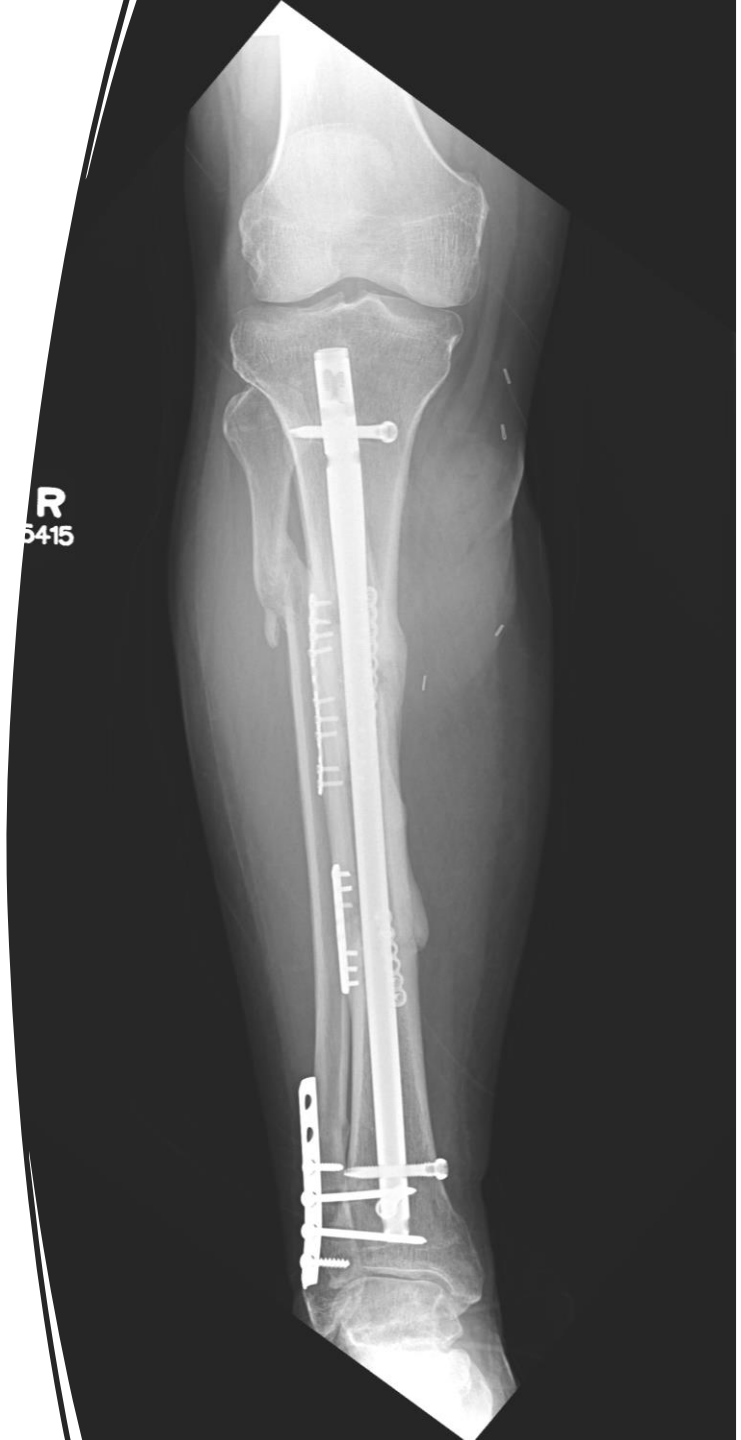
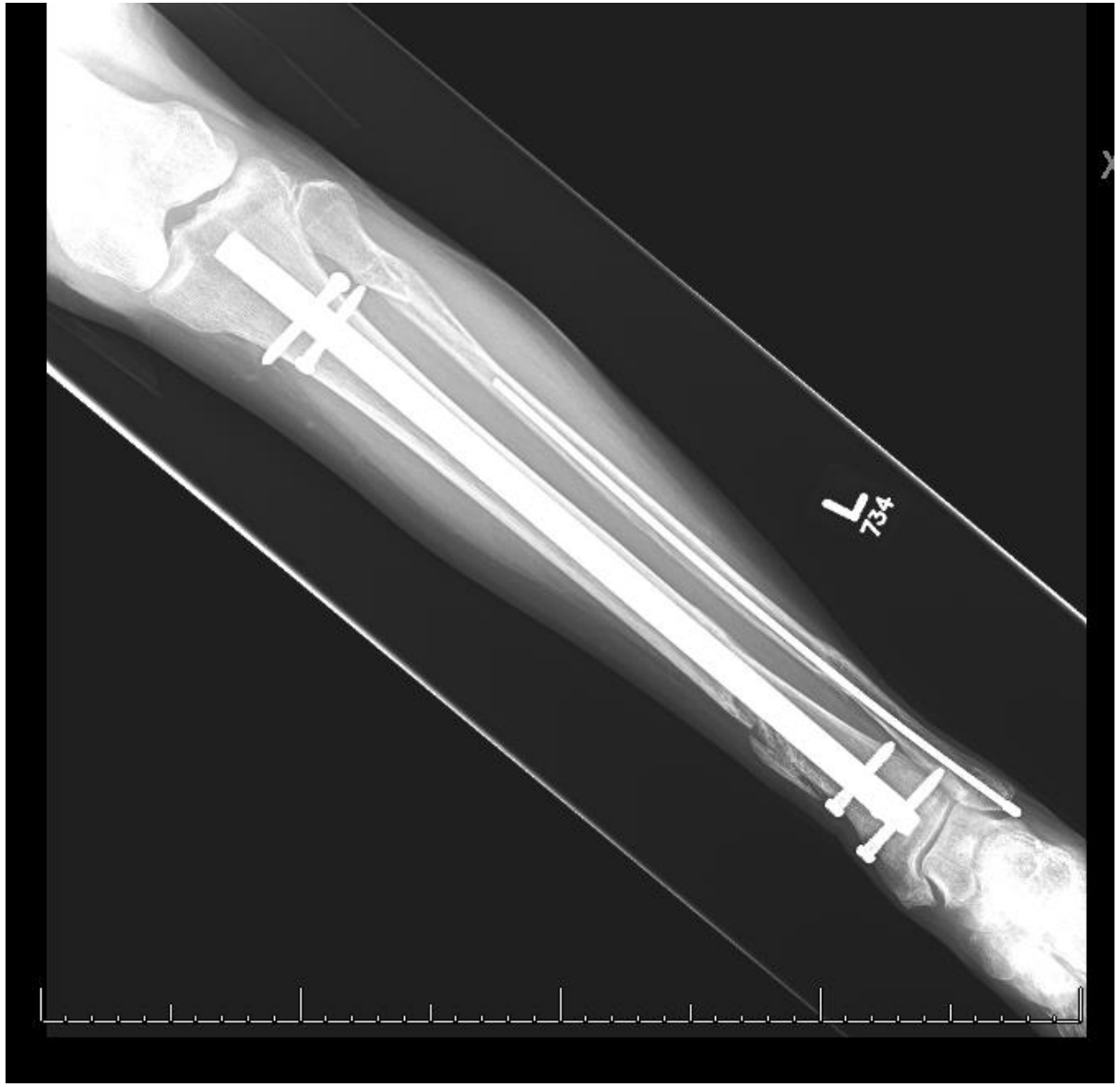


Goals

- Know your options: Travelling traction / femoral distractor/ ex fix / suprapatellar approach / percutaneous or open reduction and clamp / modify starting point / fix fibula / adjunctive plate fixation
- Indications / Contra-indications ?
  - Why or why not?
- Technical tips/tricks
- Retention after nailing ?

Other options – fix fibula



Other options – ex fix / travelling traction

Other options – percutaneous or open reduction

Other options – Blocking screws

Why not open fracture and provisionally plate?

- Increase risk of infection?
- Increase risk of nonunion: ?
- Increased risk of malunion: ?
- Increased need for hardware removal: ?
- Increased cost: ?
- Increase time in OR: ?
- Pride ?

Why Not?

- Increase risk of infection: No
- Increase risk of nonunion: No
- Increased risk of malunion: No
- Increased need for hardware removal: No
- Increased cost: Debatable
- Increase time in OR: Debatable
- Pride

Evidence to support use

Dunbar et al JOT 2005

- Provisional plating of type III open tibia fx prior to nailing

Archdeacon and Wyrick JOT 2006 Cincinnati Technical Tricks

- Reduction Plating for Provisional Fracture Fixation (prox/distal tibia)
- Used 1/3 semitubular plates (Benirschke 1996 for prox tibia).

Yoon et al JOT 2015 / 2016 /

- IMN and adjunct permanent plate fixation in complex tibia fx / IMN and plate combo for complex distal tibia fx

Haller / Githens / Scolara / Firoozabadi. JOT 2017 (Salt Lake / Harborview Seattle / Univ CA Irvine.

- Does provisional plating of **closed** tibia fractures have higher complication rates?
- 348 fxs. 238 met criteria (minimum 6 mo f/u).
- 41 prov plating vs 197 standard reductions (
  - Prov plating (2.7 or 3.5 plates approx. ½ retained. Tendency to be higher energy / segmental /proximal)
  - Standard reduction – closed/percutaneous/open/ex fix or distractor (mostly closed)
  - **NO difference in time to union, infection, malunion, sx hwr**

Auston et al JOT 2017

- No difference in infection rate or complications with percutaneous or open reductions during IMN tibial shaft fractures

Evidence to support use

Magnusson et al U Wash Seattle – JOT 2020

- Retrospective review multiple pediatric trauma centers
- 160 pts. 136 closed / 30 open.
  - 27% closed had fracture specifically opened during surgical fixation
  - Did not retain any implants
  - NO increased risk of post op complications i.e. infections, wound issues, delayed union, or unplanned return to the OR.

Stoddart et al (Britain) JOT July 2020 – Gustillo Type IIIB open tibial diaphyseal fractures. "In – fix vs Ex – fix". Small frag plate at initial debridement then exchanged for new plate/screws after 2nd debridement before nailing

- 98 pts : 67 Retained Adjunctive Plating and 31 non RAP.
- Main outcome measures: Re-operation rate, deep infection, non-union, flap-related complications. NO statistically signif difference between both groups

Cinats et al (Canada) JOT 2020. Plate-Assisted IMN of Proximal Third Tibia Fractures. 468 IMN – 60 proximal – 53 met criteria. 24 plate (88% open fx) vs 29 IMN alone. 2.7/3.5 plates.

- NO difference in infection/nonunion/addnl surgery.

Why do I prefer it ?

- Technically easier than perfect blocking screws placement.
  - Sometimes blocking screws just won’t work
- Occasionally get by without an ex fix with provisional mini-plating
- Helps maintains reduction after nailing
- Helpful when no / little help available
- Most helpful in meta-diaphyseal regions or segmental fractures where obtaining/maintaining reduction with nail alone more challenging

Technical tips/tricks

- Avoid direct medial surface of tibia most of time
  - Anterolateral plating provides good soft tissue coverage (or posteromedial)
  - Washout and debride thoroughly thru this separate incision
- Avoid unnecessary periosteal stripping
- 2.4 miniplates seem to be right size in my hands and are not too stiff. They are also very low profile if indeed you need to place medially
- Cut screws down to 4 or 5 mm as to avoid intramedullary protrusion and avoid reamer getting dull or incarcerated. Locking vs nonlocking based on bone quality
  - More important in diaphyseal region
- Can perform suprapatellar approach and washout/reduce/plate fracture concurrently to decrease OR time.
- Still clamp fracture site while reaming and driving nail as plate very flexible and can deform / displace during nailing.
- Typically avoid tourniquet use (if I do use it goes down when start reaming)
- I prefer to once again leave in to maintain as anatomic a reduction as possible.

Case #1. 40 y/o male tripped down stairs at beach house. Closed distal tib fib fx

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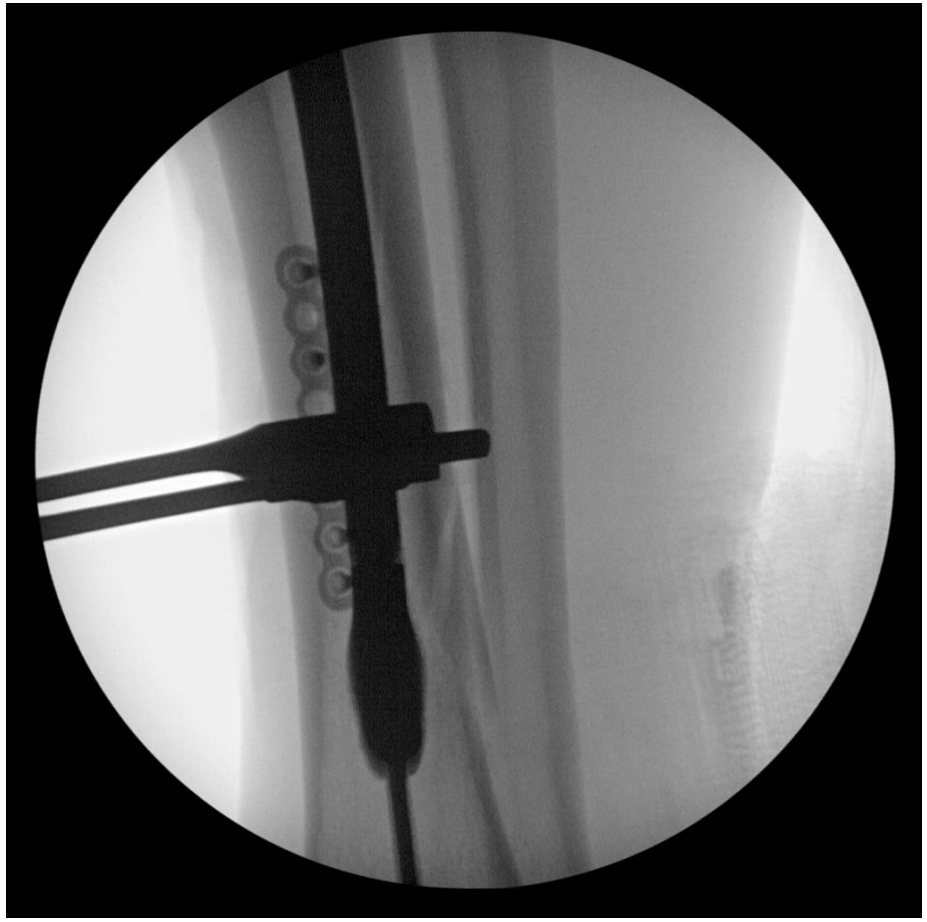
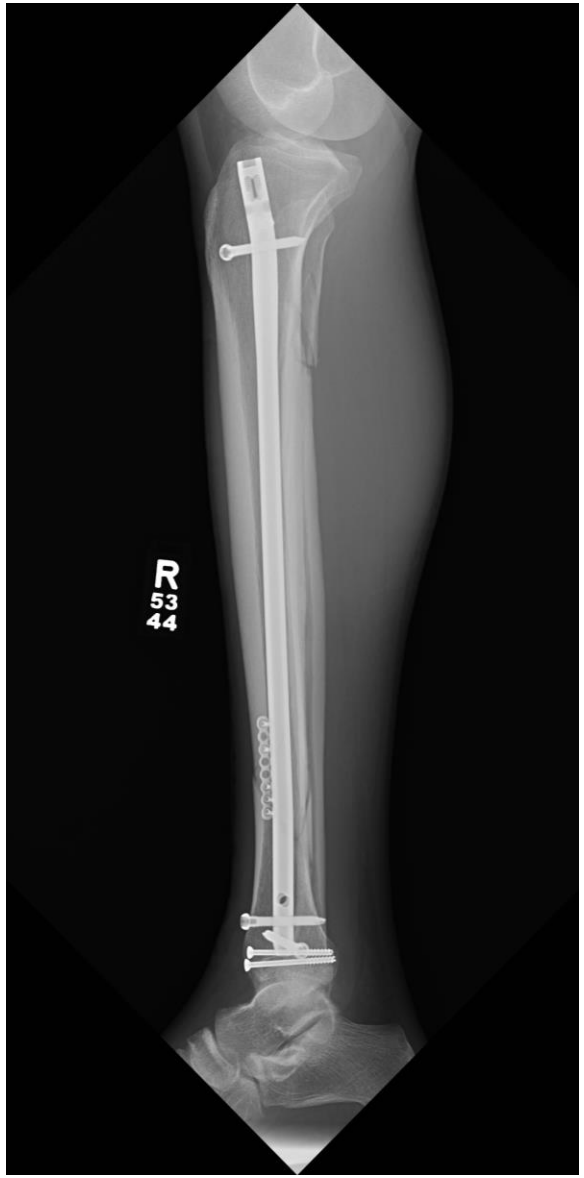
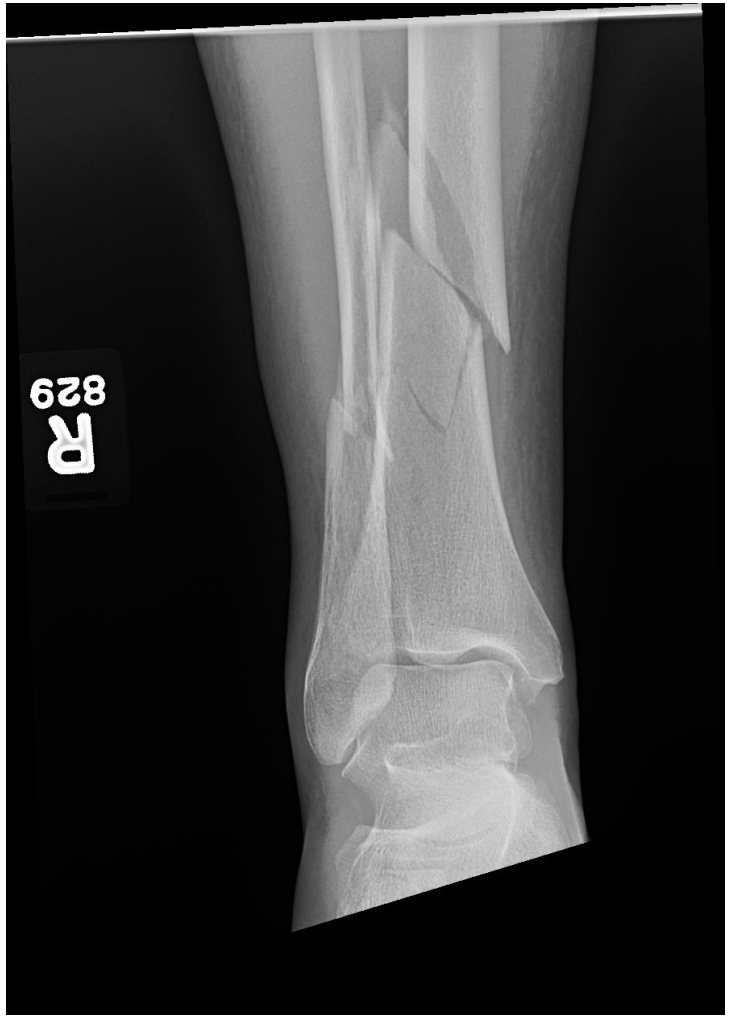


4 weeks post op



Case #2. 60 y/o female missed last 2 steps beach house. Closed injury



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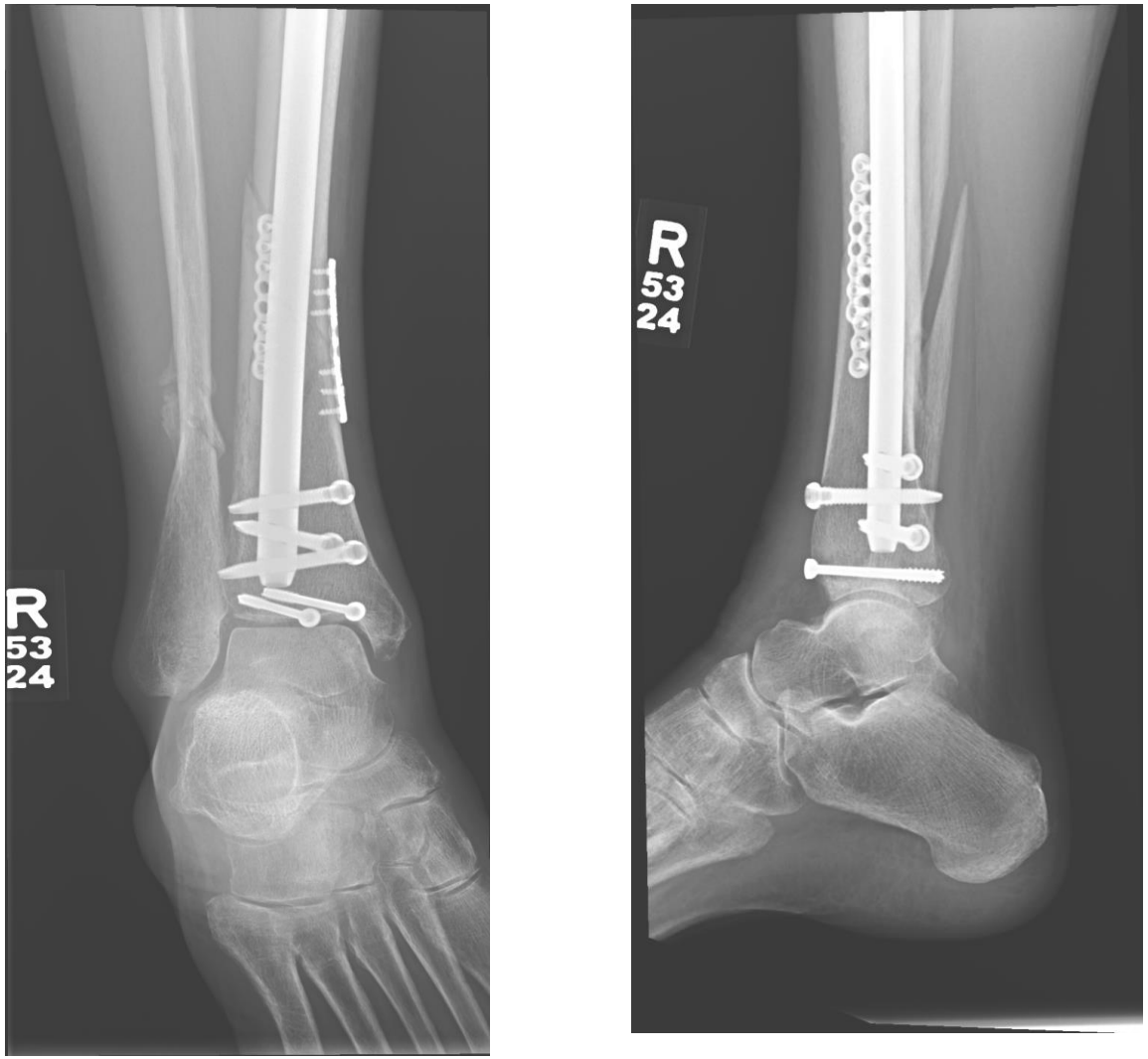
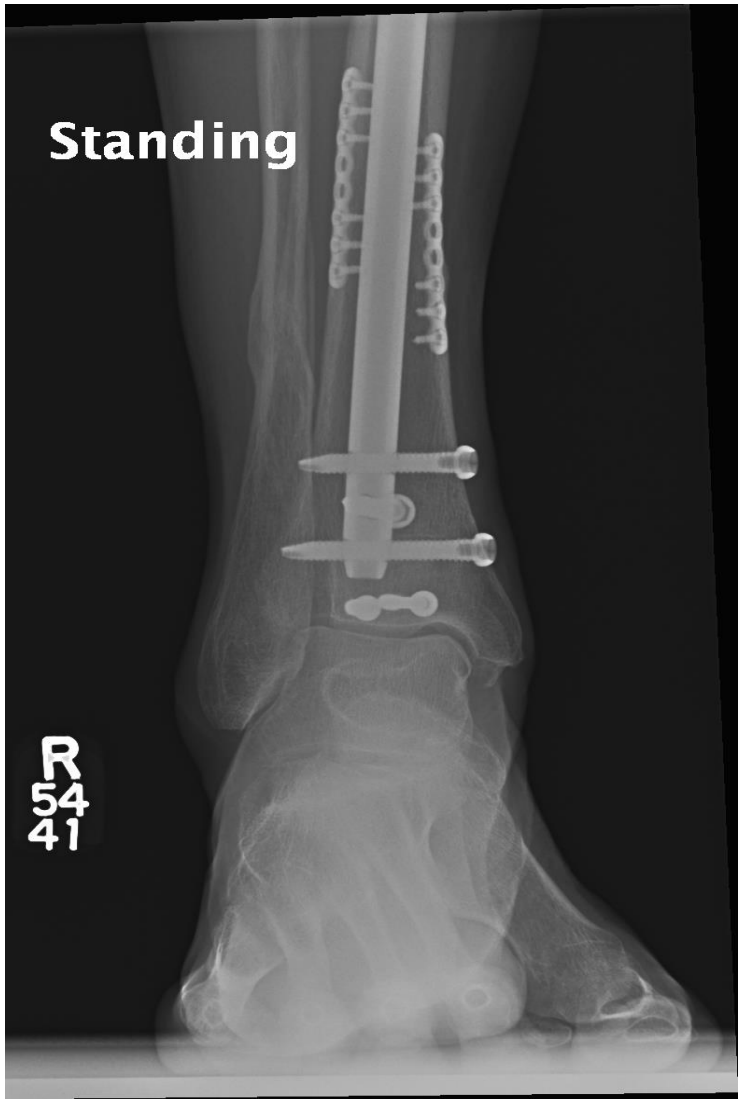


4 months post op

1 year post op



Case #3. 59 y/o male mvc polytrauma pt with Grade 3A open segmental tib fib with syndesmotic injury

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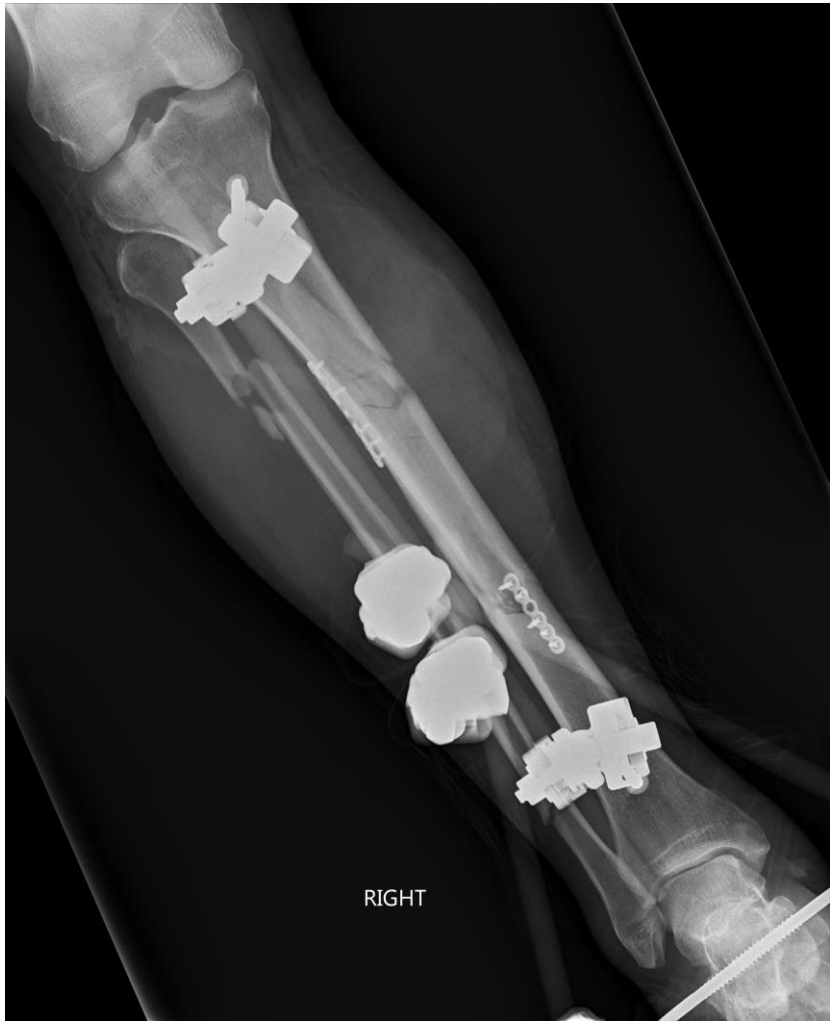
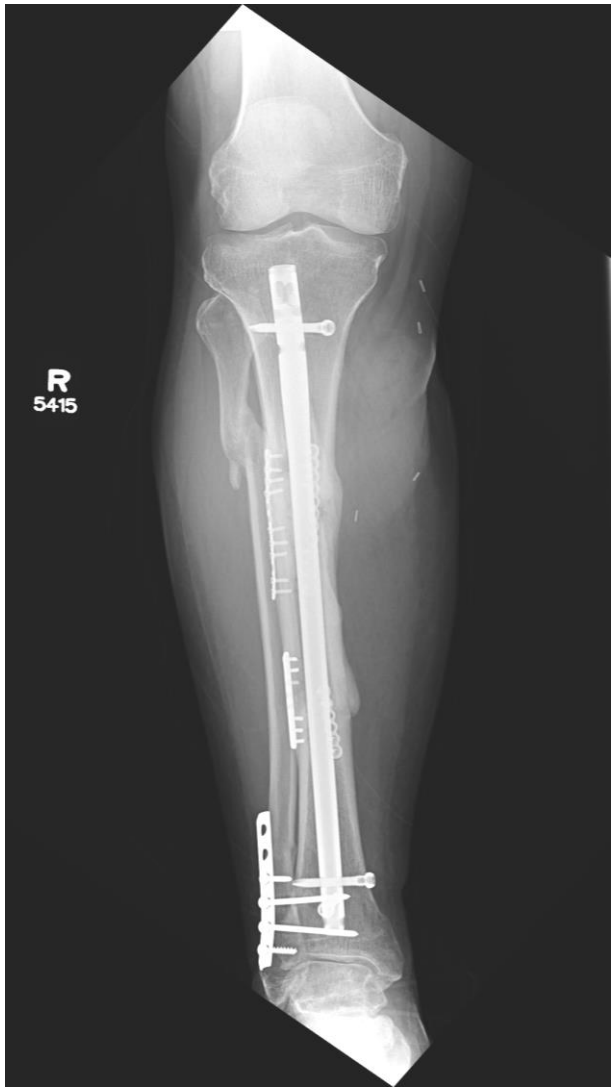
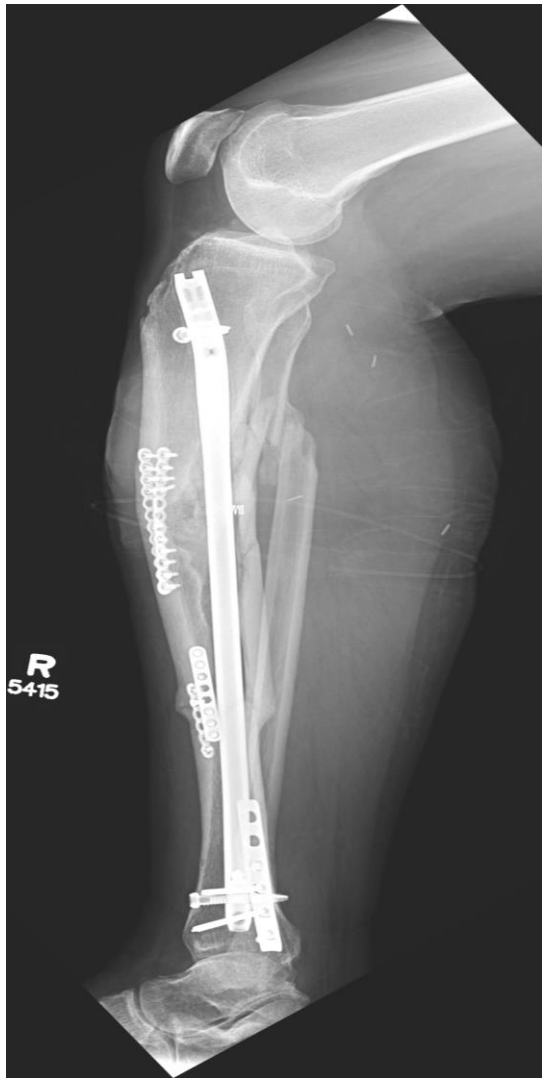
Case #3. 59 y/o male mvc Grade 3A open segmental tib fib with syndesmotic injury after initial debridement and temp stabilization



Case #3. 59 y/o male mvc Grade 3A open segmental tib fib with syndesmotic injury s/p repeat debridement/nail/plate/flap

Case #3. 59 y/o male mvc Grade 3A open segmental tib fib with syndesmotic injury one year post op





57 y/o female severe osteoporosis s/p plant and twist with right leg

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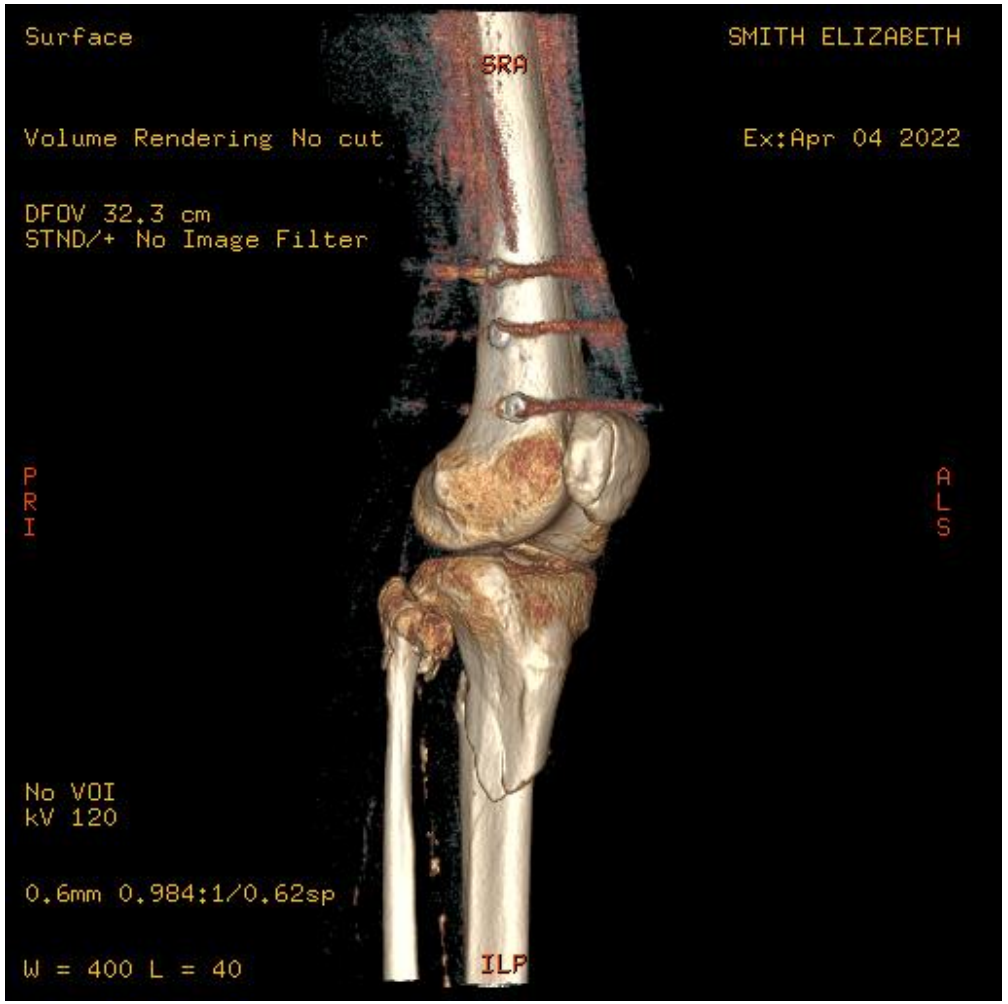

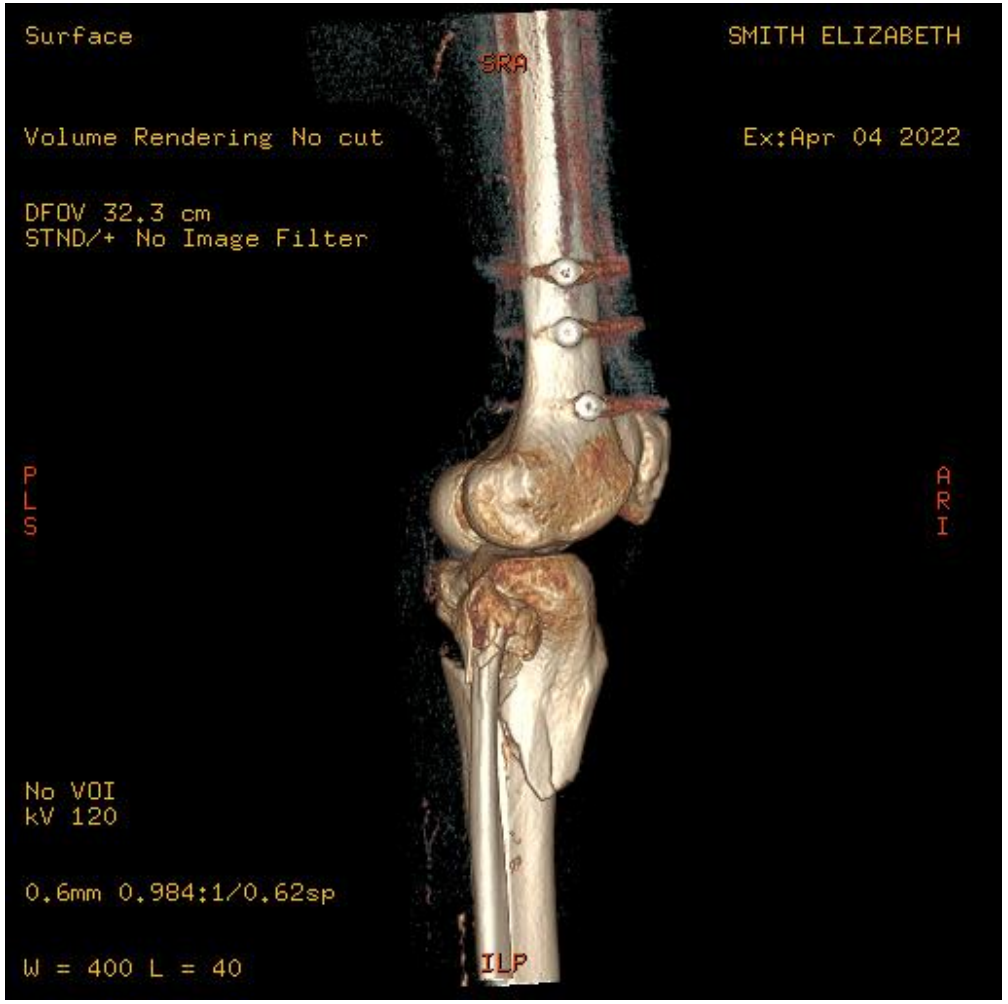

57 y/o female severe osteoporosis s/p plant and twist with right leg

57 y/o female severe osteoporosis s/p plant and twist with right leg immediate post op films via semi-extended supra/transpatellar IMN

Summary

Multiple techniques to obtain/maintain reduction during/after IMN

Adjunctive mini-plating is helpful for proximal/distal/segmental fx

May supplant the need for ex fix in some situations

Like all other techniques should be meticulous about soft tissue handling during the procedure

I have not experienced any issues with wound healing/ infection /nonunion/malunions/need for delayed hwr.

If anything it appears that I reliably achieve union faster and in a more anatomic position with adjunctive miniplating with retention

Thank you