Fractures of the Tibial Plafond:

Which can be treated early?

Saam Morshed, MD PhD MPH
Professor in Residence
University of California San Francisco

Orthopaedic Trauma Institute
UCSF + SAN FRANCISCO GENERAL HOSPITAL

NONE


GLOCK 23 AUSTRIA .40
Don’t do it

Thank you

I have no financial disclosures or conflicts of interest pertaining to the content of this presentation.

Learning Objectives

Evolution of staged treatment

What is safe to do acutely

Rational sequence of staged treatment

ORIF Good

Ruedi and Allgower *Injury* 1969,1973

84 Pilons

74% good to excellent function

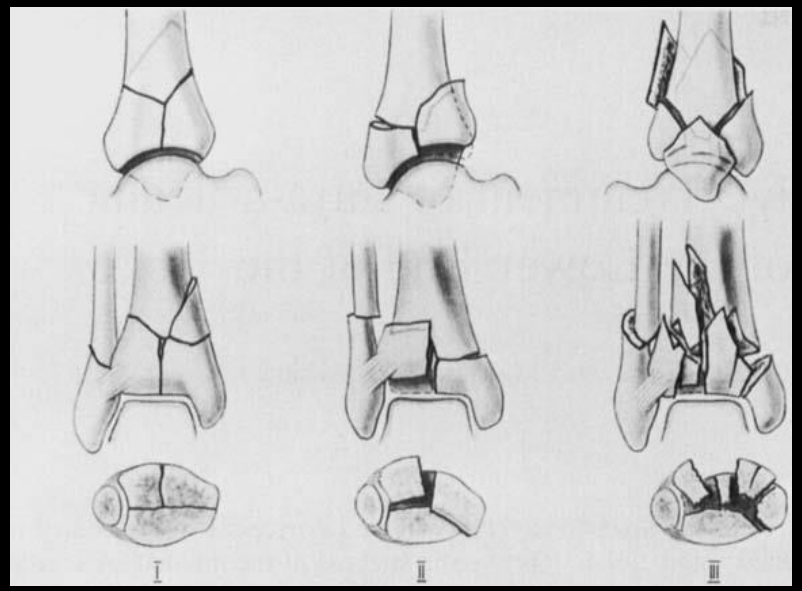
<5% Deep infection

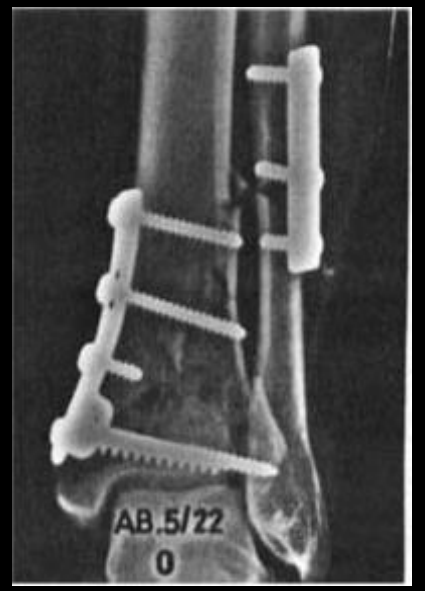
Heim and Naser Arch Orthop Unfall-Chir 1976

128 Pilon

90% good results

<5% Deep Infecton





>75% skiers with average age of 37 years

ORIF Bad

Teeny and Wiss *CORR* 1993

60 Pilons (30 Ruedi III)

50 % Poor results

Single stage surgery average 5 days post injury

TABLE 6. Complications

	Reudi I and II (%)	*Reudi III (%)*
Skin slough	17	37
Infection	0	37
Malunion	3	23
Nonunion	7	27
Reoperation	30	60
Fusion	10	26

Kellam and Waddell *JTrauma* 1979
Ovadia and Beals *JBJSAm* 1986

>75% high energy mechanisms

ORIF Bad

Teeny and Wiss *CORR* 1993

60 Pilons (30 Ruedi III)

50 % Poor results

Single stage surgery average 5 days post injury

TABLE 6. Complications

	Reudi I and II (%)	*Reudi III (%)*
Skin slough	17	37
Infection	0	37
Malunion	3	23
Nonunion	7	27
Reoperation	30	60
Fusion	10	26

Kellam and Waddell *JTrauma* 1979
Ovadia and Beals *JBJSAm* 1986

>75% high energy mechanisms

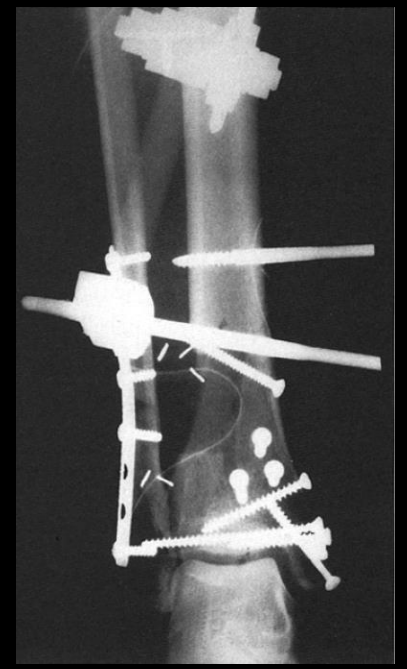
Wyrsch JBJS 1996

RCT of ORIF vs CR +/- LIF 39 patients

Single stage surgery average 5 days post injury

2-fold higher rate of deep wound dehiscence and infection
7 wound not closed primarily

→ 6 free flaps and 3 amputations



Staged Protocol for ORIF

Patterson & Cole, JOT, 1999

22 C3 Pilons

Average 24 days to ORIF

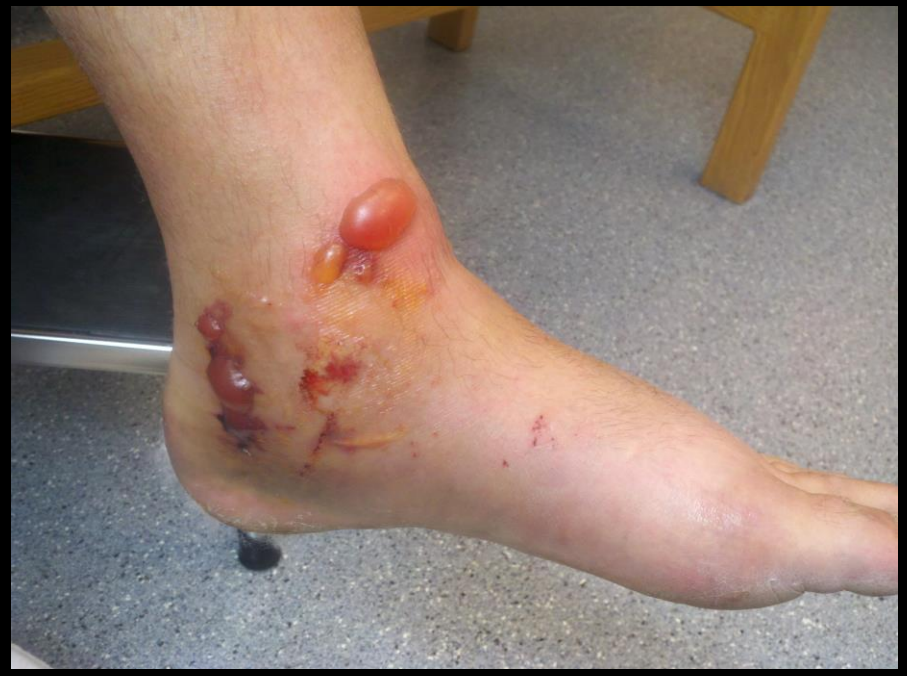
No Infections

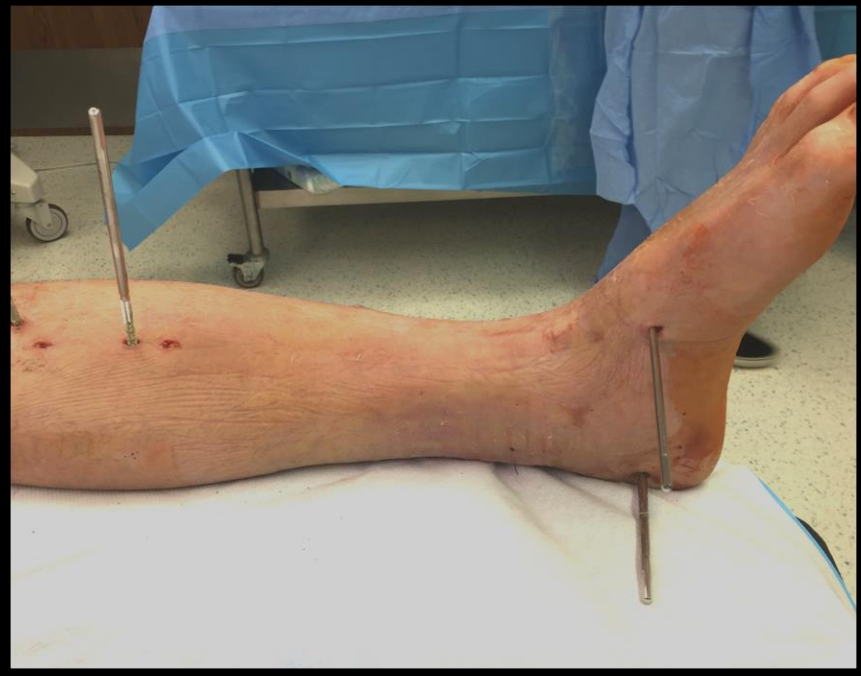
Sirkin et al, JOT, 1999

56 Pilons

Average 14 days to ORIF

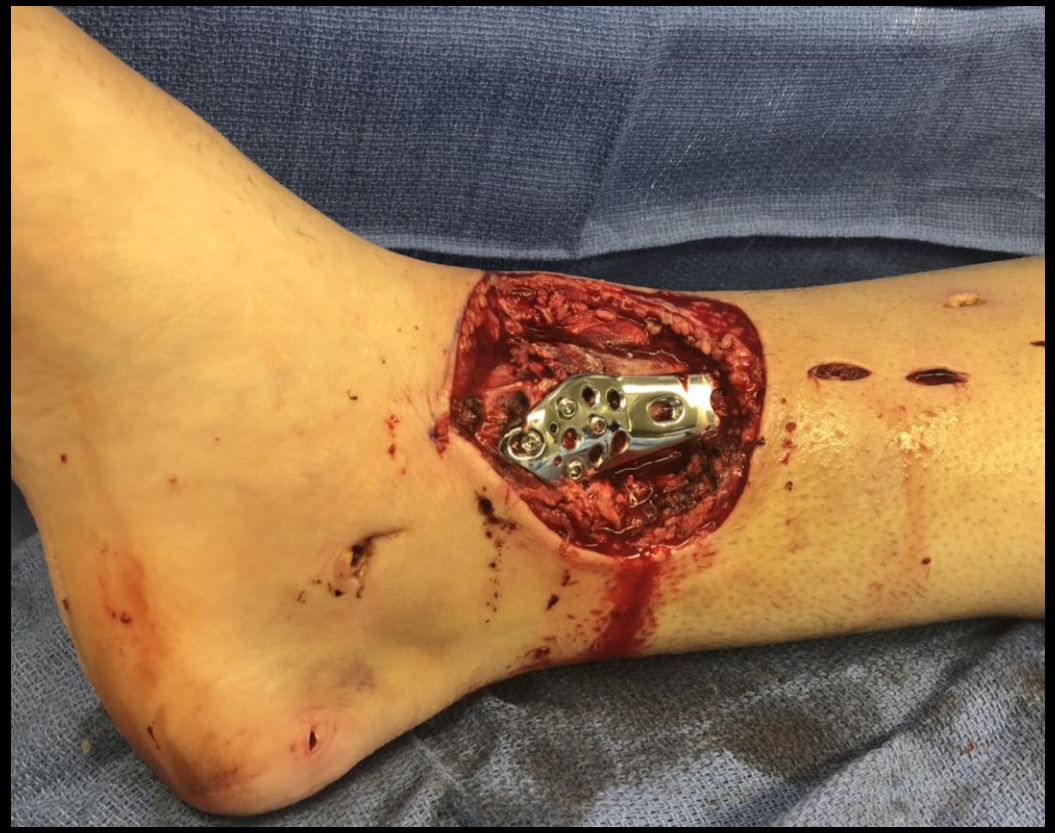
5.3% deep infections





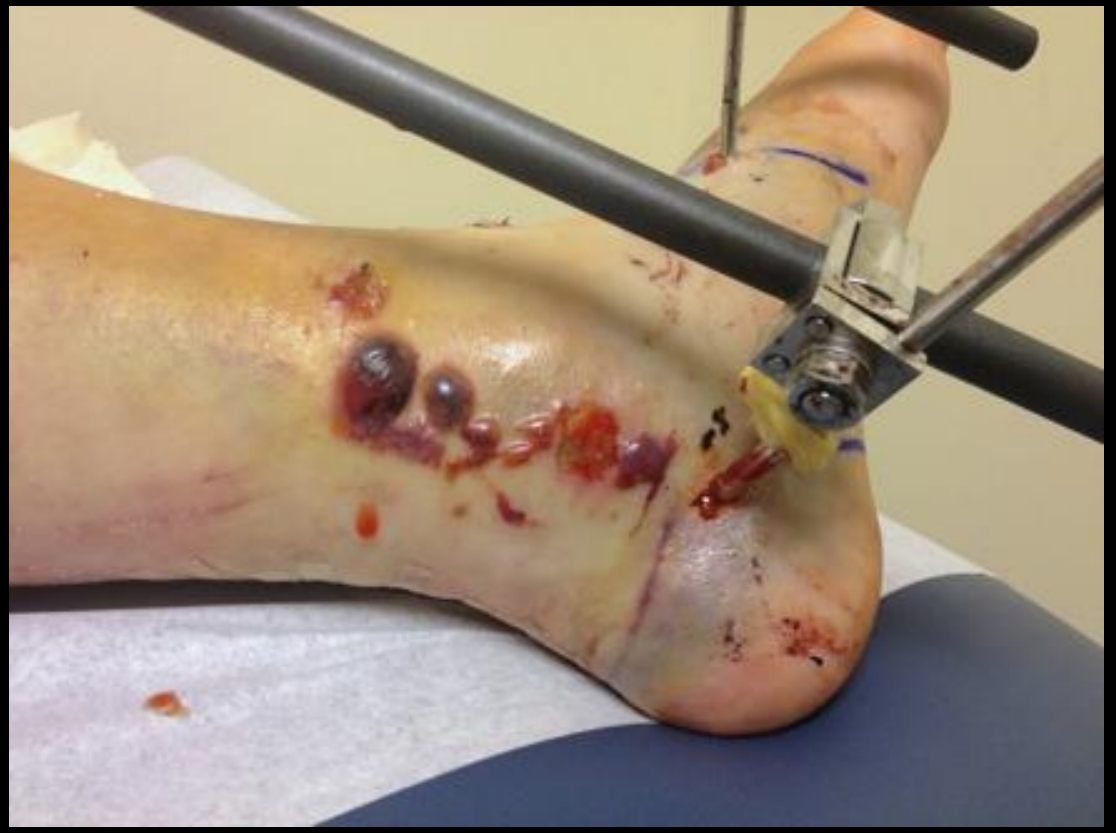
The Downside[s]

Premature Surgery



Limb Salvage

Delayed Surgery

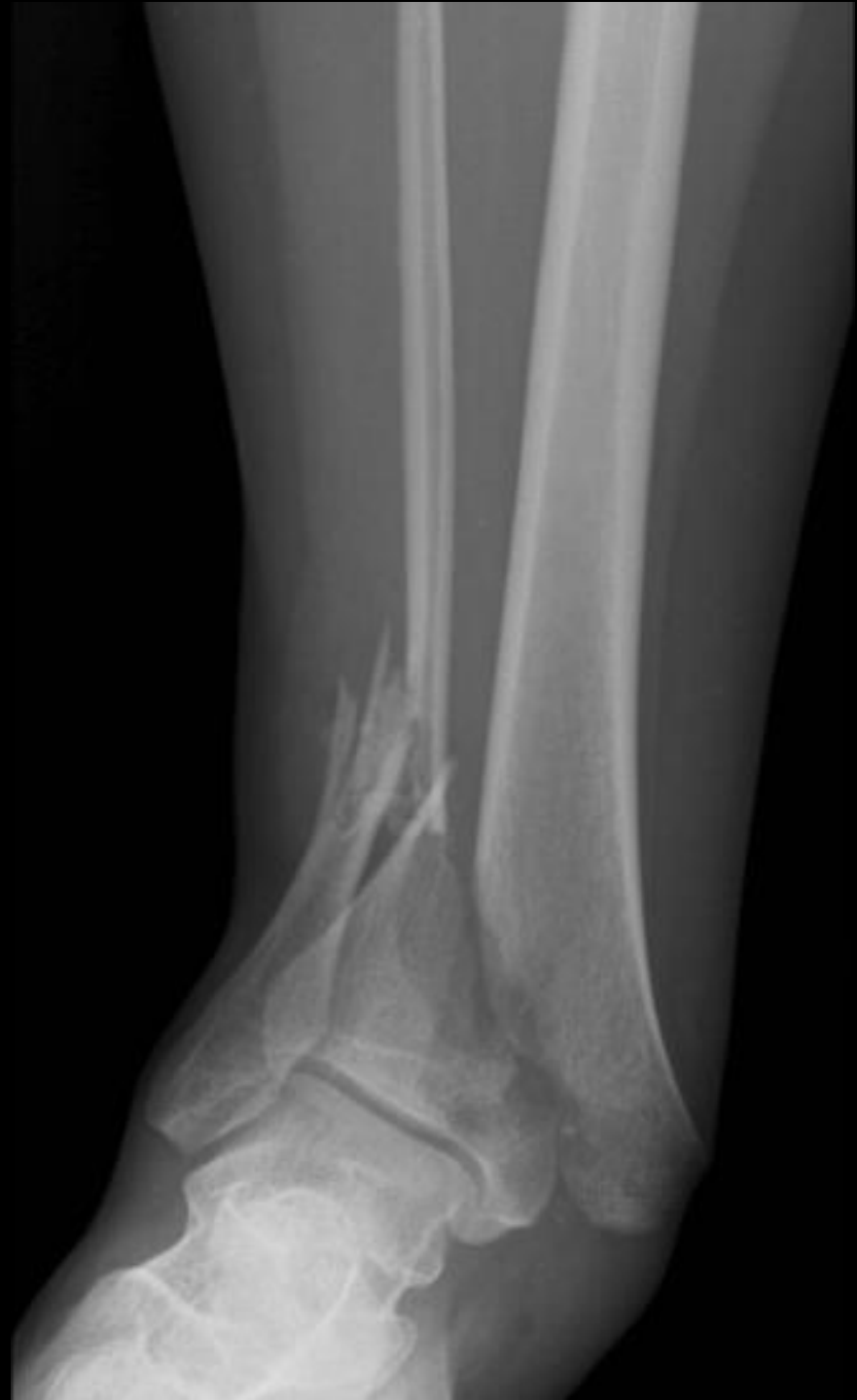


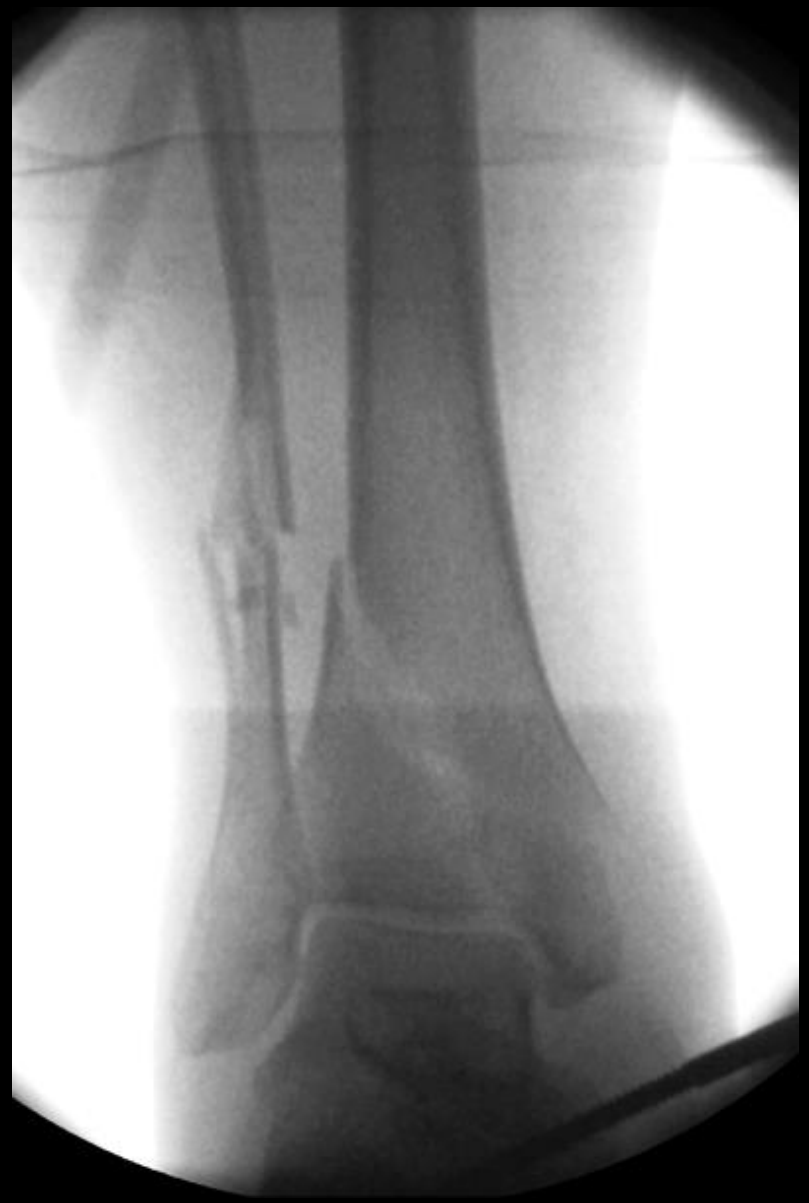
Time and Expense

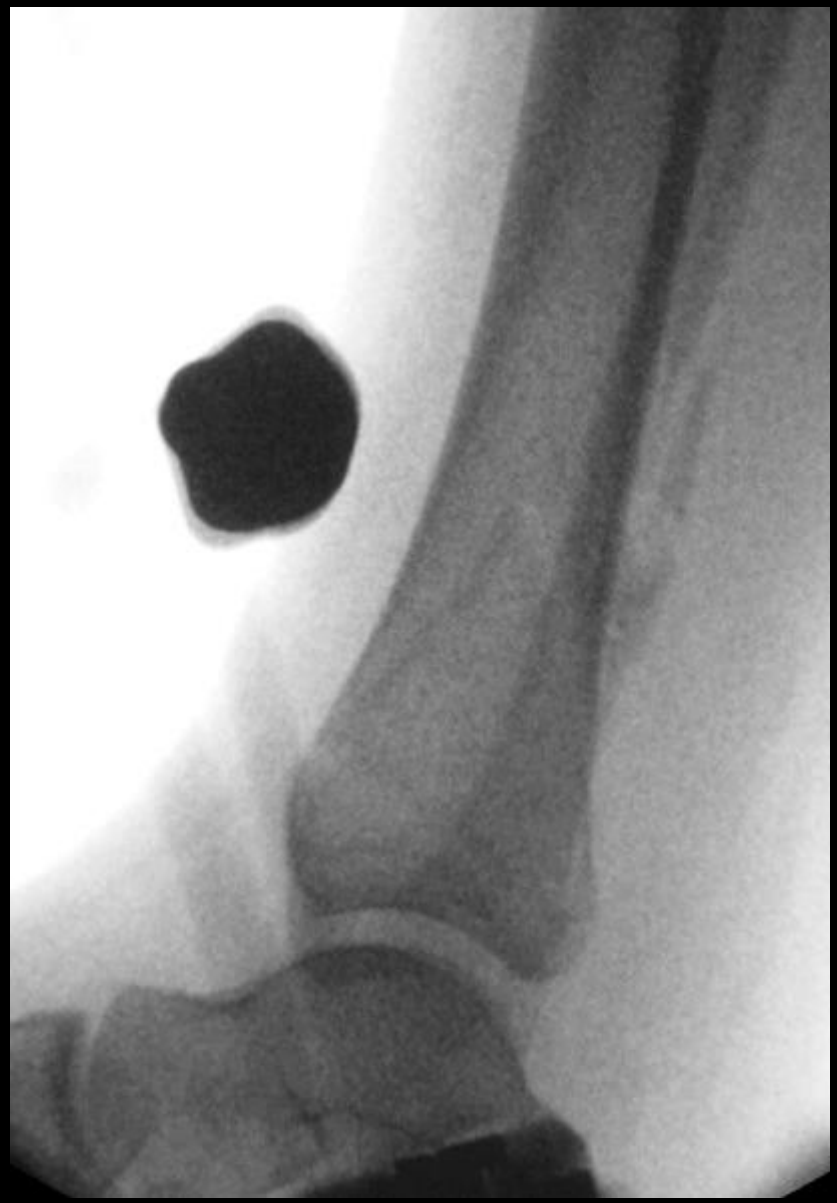
Staged Treatment Principles

Stage 1 – Indirect reduction and soft tissue stabilization

- Restoration of skeletal length and alignment
- Distraction across ankle joint
- Align talus beneath tibia







It is perfectly acceptable, and perhaps *preferable*, to stop here and call a friend

Open surgery of any kind may result in malreduction or compromise approaches required for definitive fixation!

Barei *Orthop Proc* 2011

Stage *1.5* - Fixation Strategy

Rotation of posterolateral fragment

Fix to posterolateral fragment

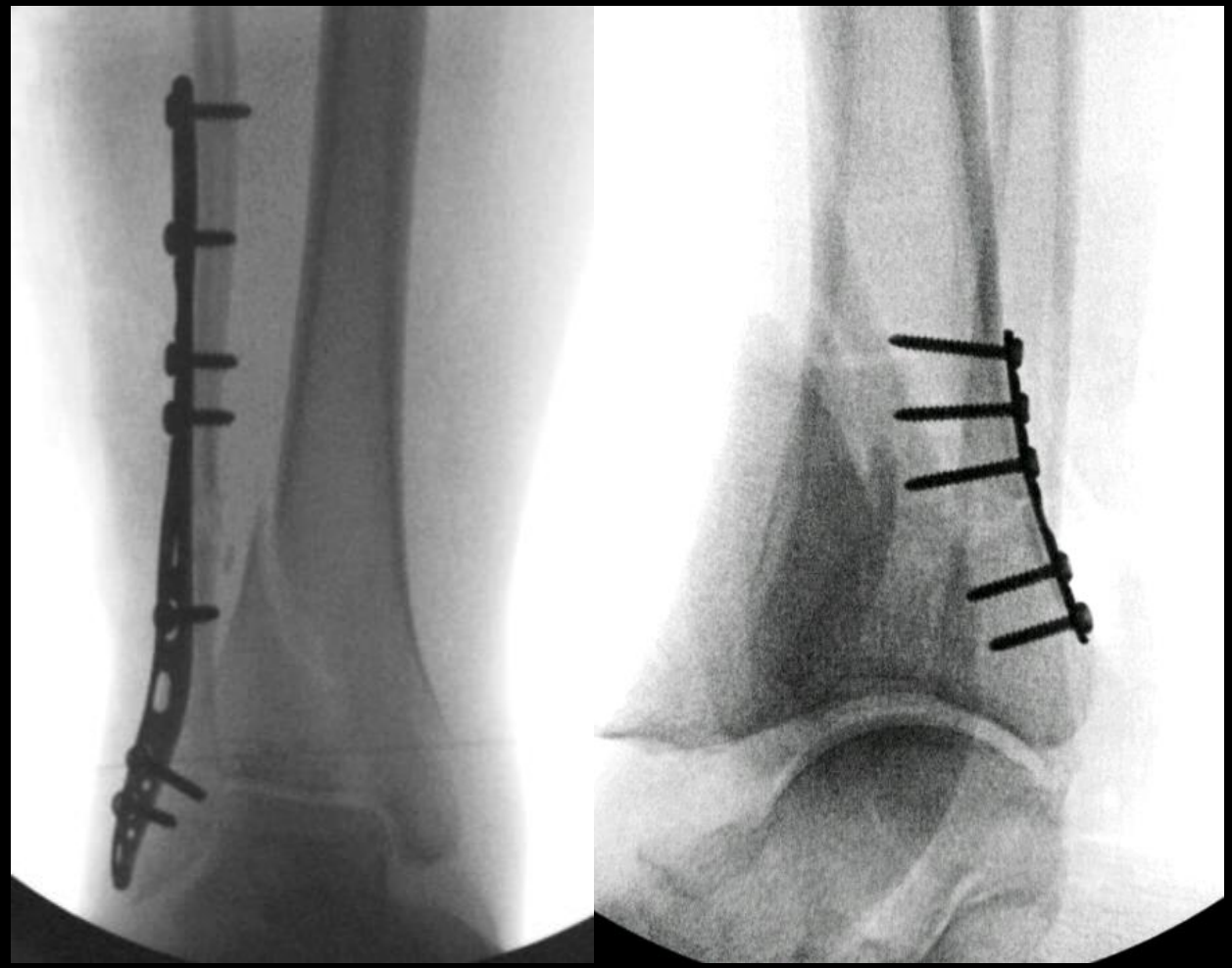
Medial to posterolateral

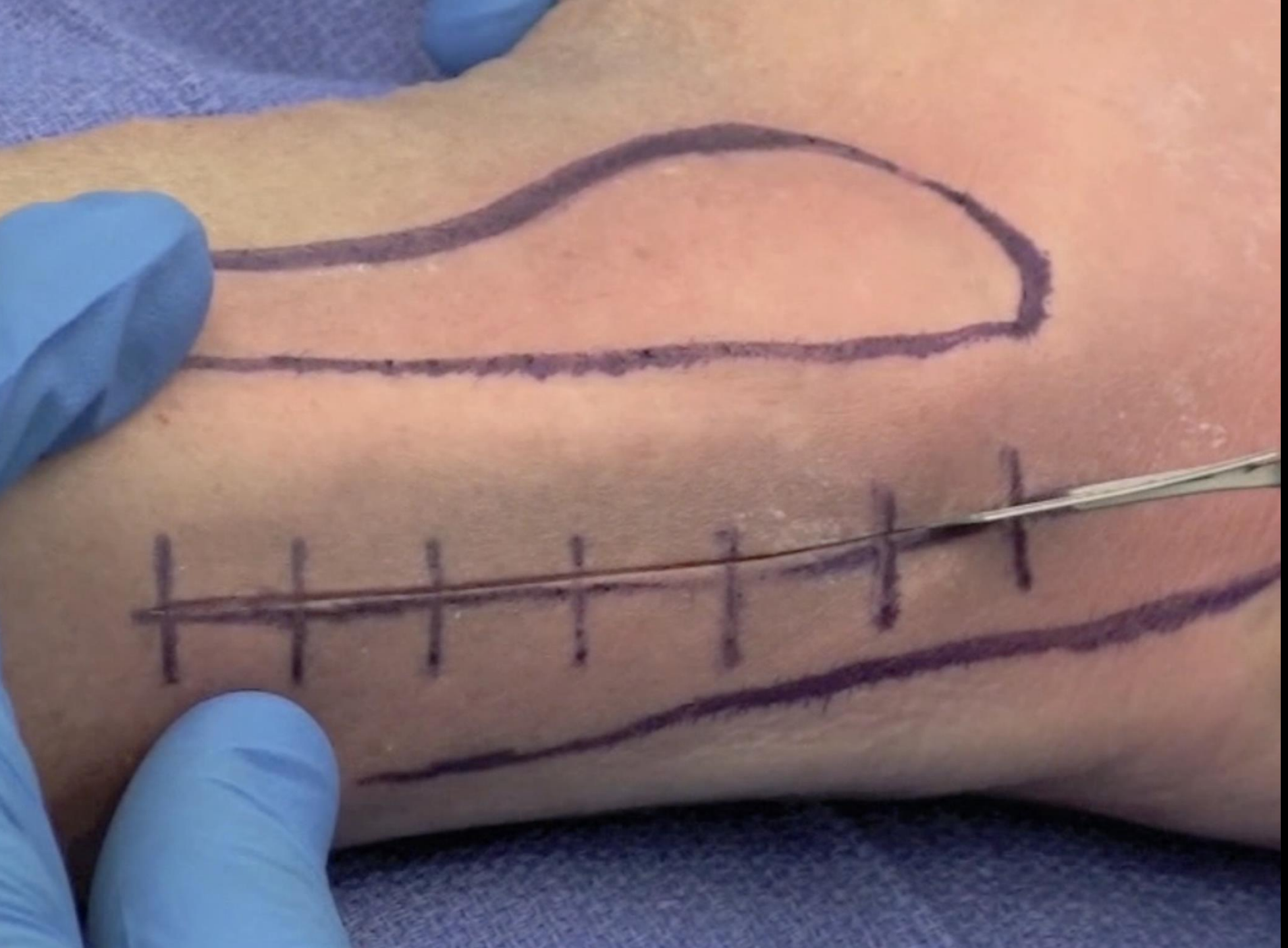
Central impaction

Anterolateral fragment

Secure articular segment

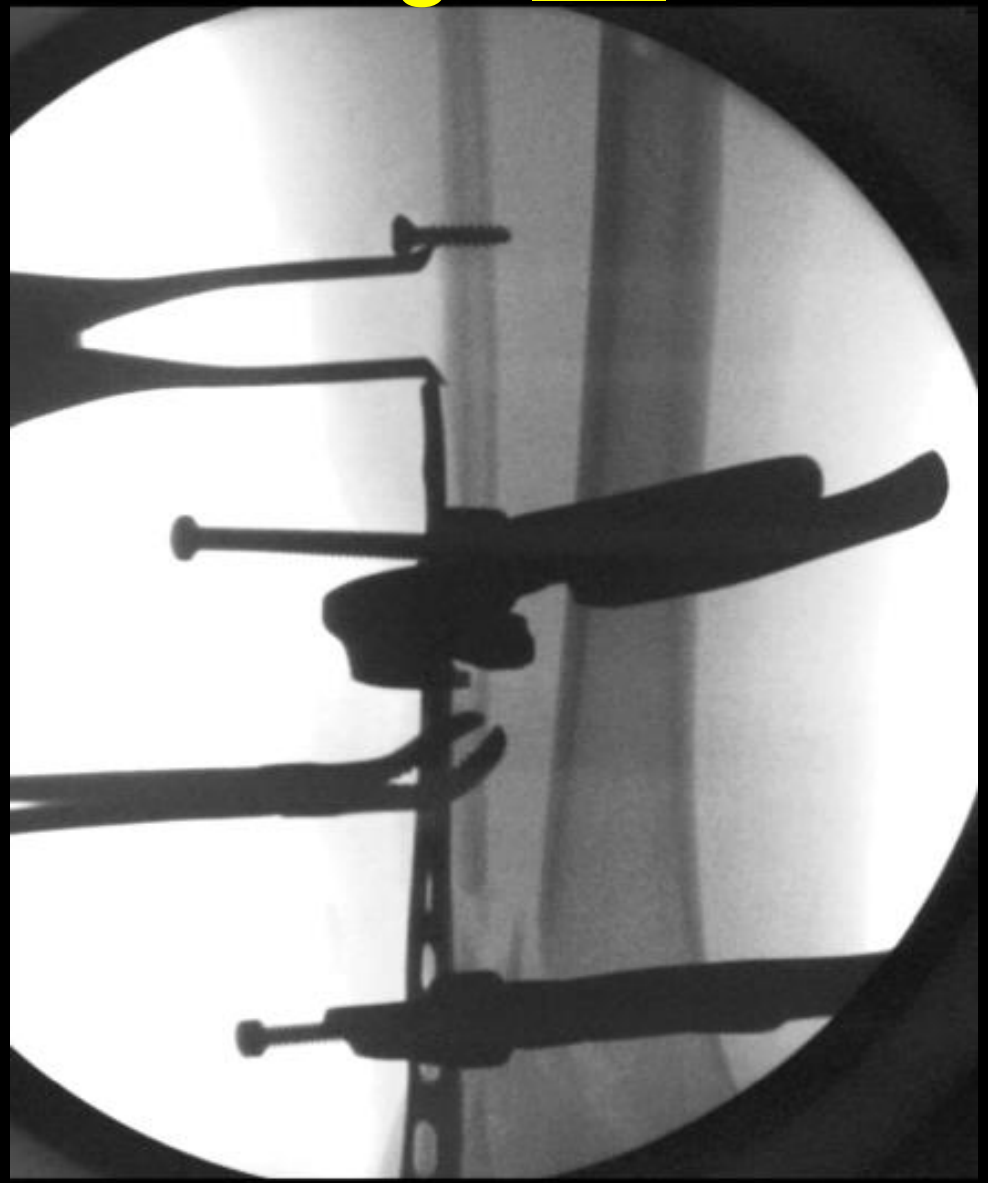
Span joint to diaphysis





Posterolateral skin typically ***less*** injured and ***may*** allow safe portal for acute ORIF

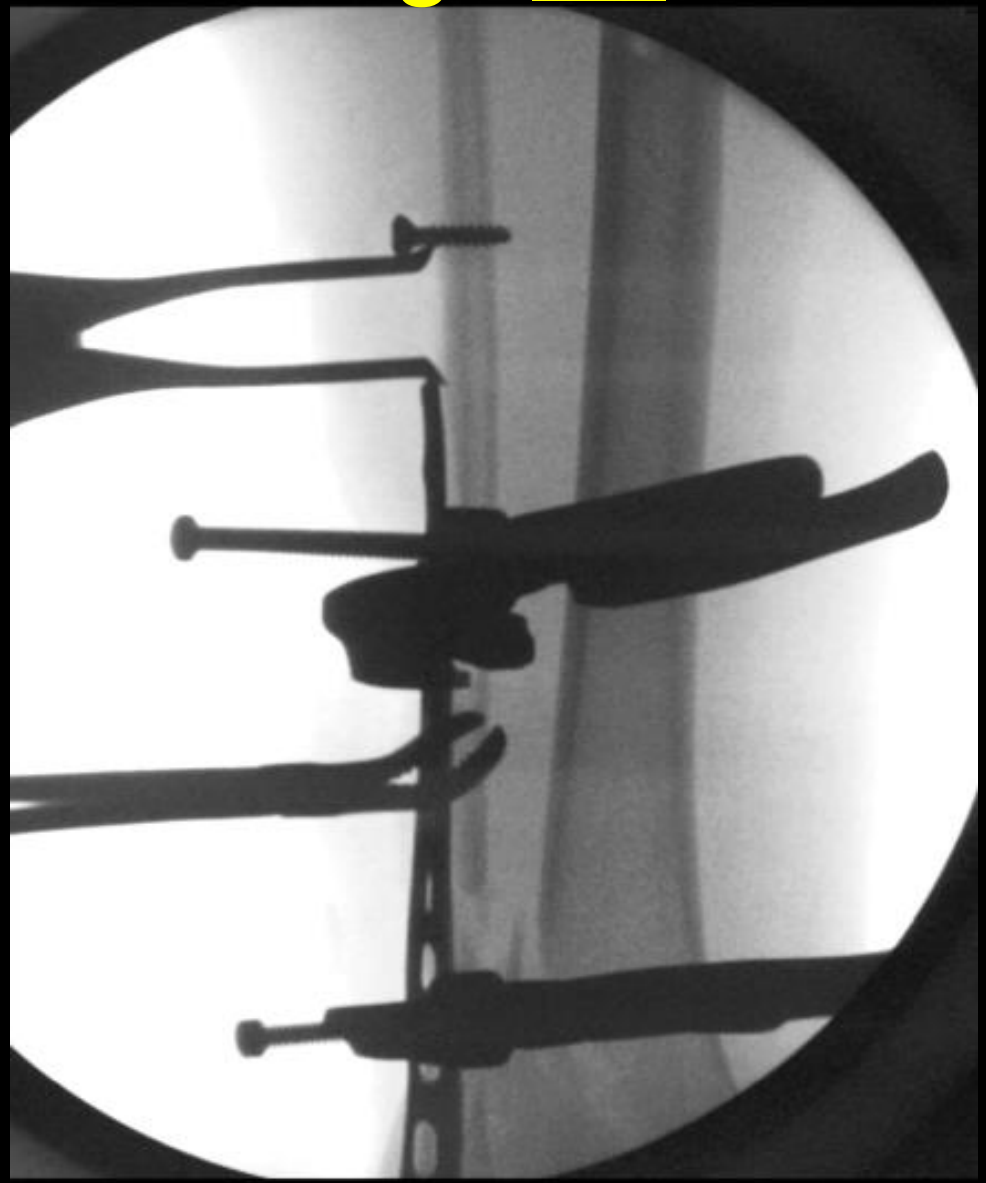
Stage *1.5* – Fix the fibula? *Acutely?*



Consider:

- **Who will do definitive ORIF?**

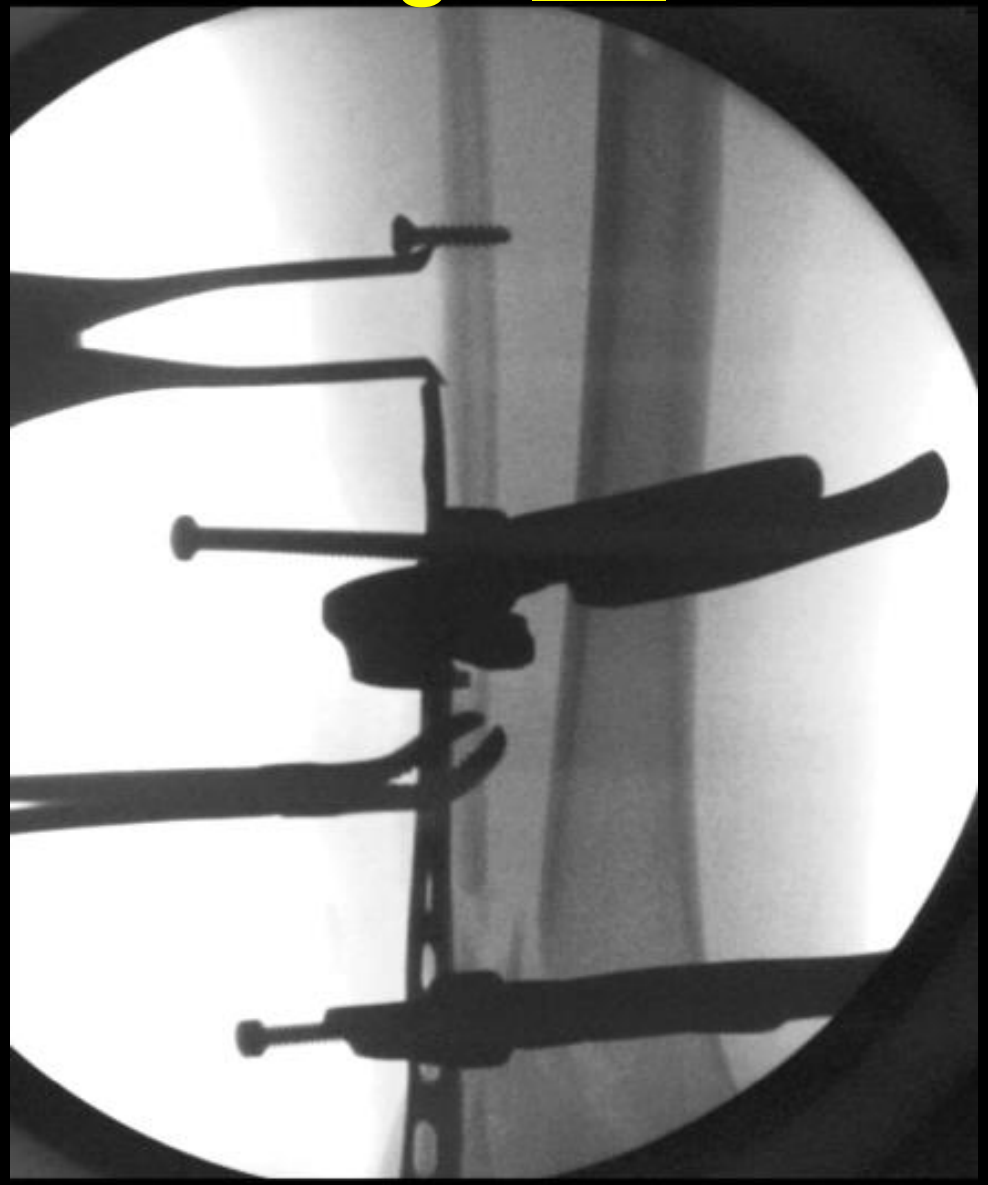
Stage *1.5* – Fix the fibula? *Acutely?*



Consider:

- **Who will do definitive ORIF?**
- **Can I achieve anatomic reduction?**

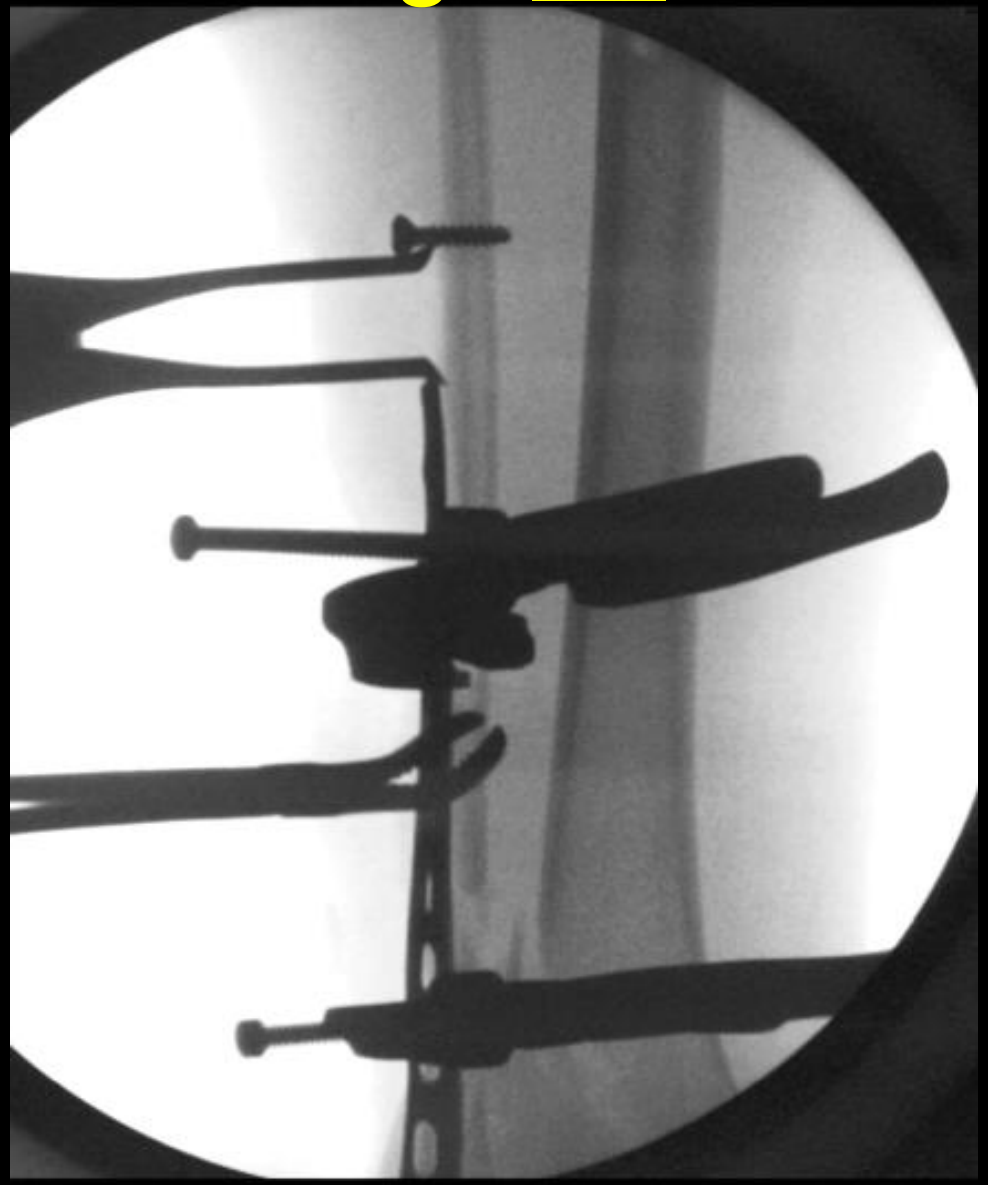
Stage *1.5* – Fix the fibula? *Acutely?*



Consider:

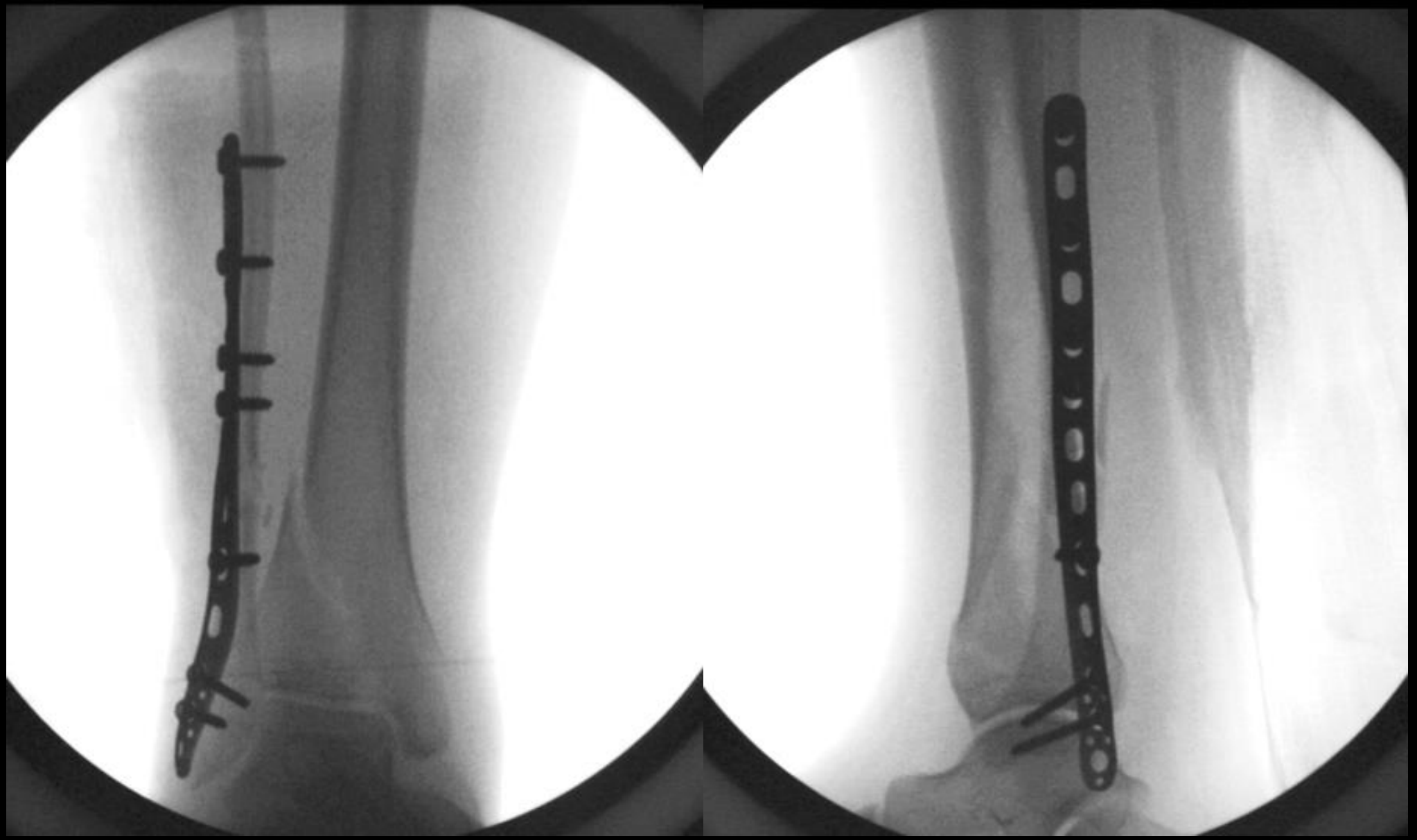
- **Who will do definitive ORIF?**
- **Can I achieve anatomic reduction?**
- **Will fibular approach affect other required approaches?**

Stage *1.5* – Fix the fibula? *Acutely?*

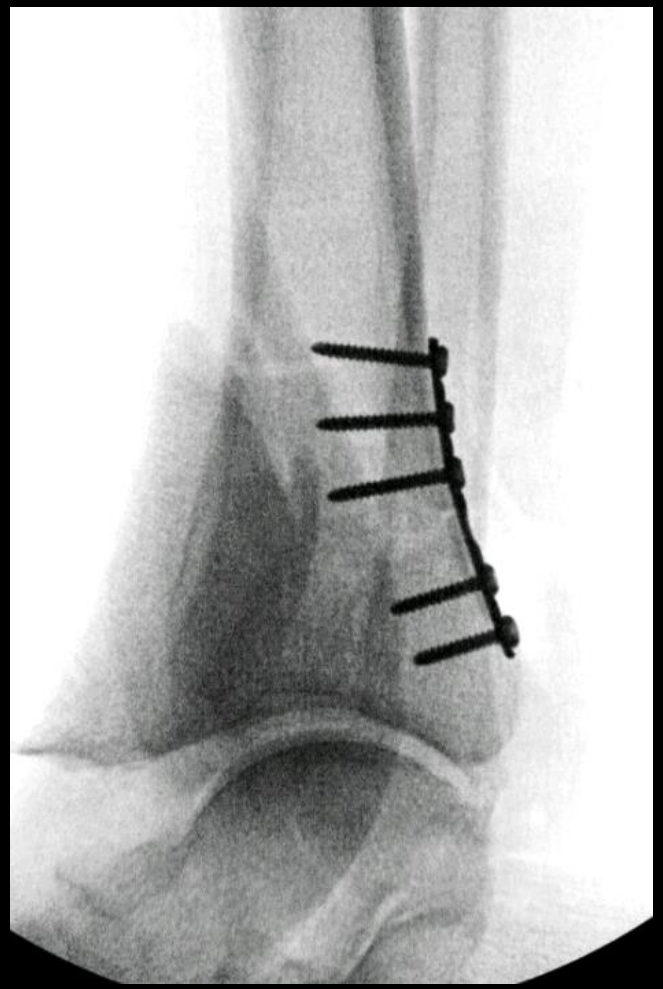


Consider:

- **Who will do definitive ORIF?**
- **Can I achieve anatomic reduction?**
- **Will fibular approach affect other required approaches?**
- **How will fixation affect visualization of plafond during definitive ORIF?**



Stage *1.5* - Fix the posterolateral fragment? *Acutely?*

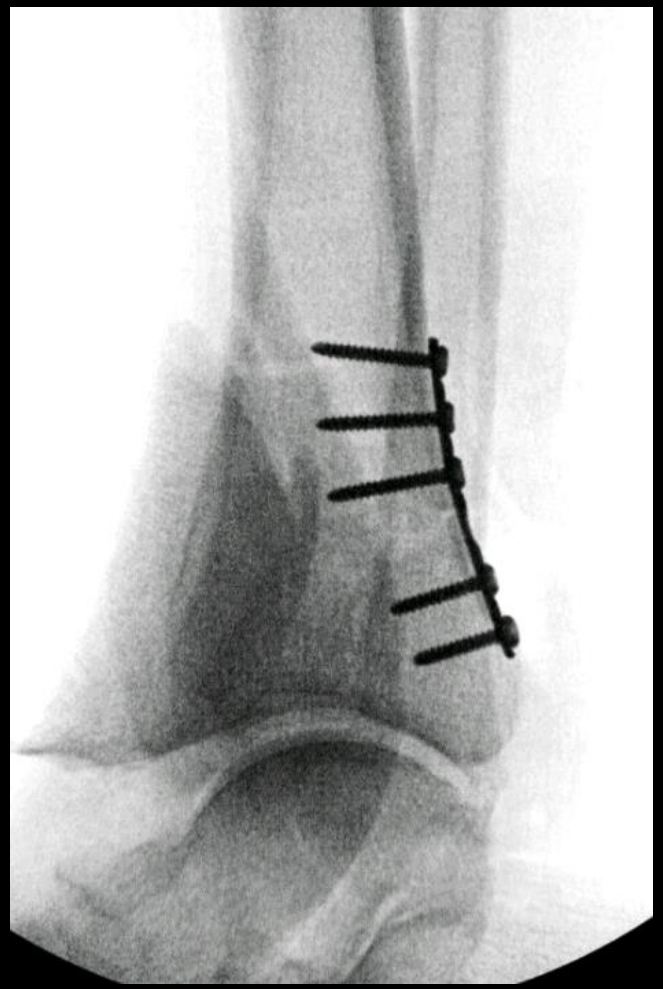


Ketz and Sanders *JOT* 2012

Consider:

- **Condition of posterolateral skin?**

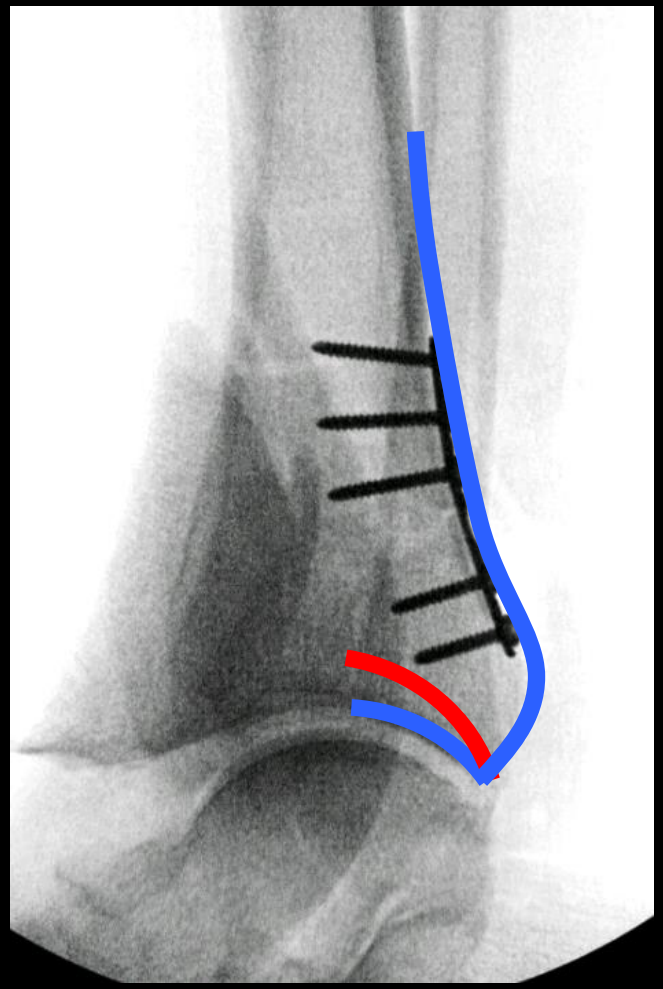
Stage *1.5* - Fix the posterolateral fragment? *Acutely?*



Consider:

- **Condition of posterolateral skin?**
- **You cannot see the joint!**

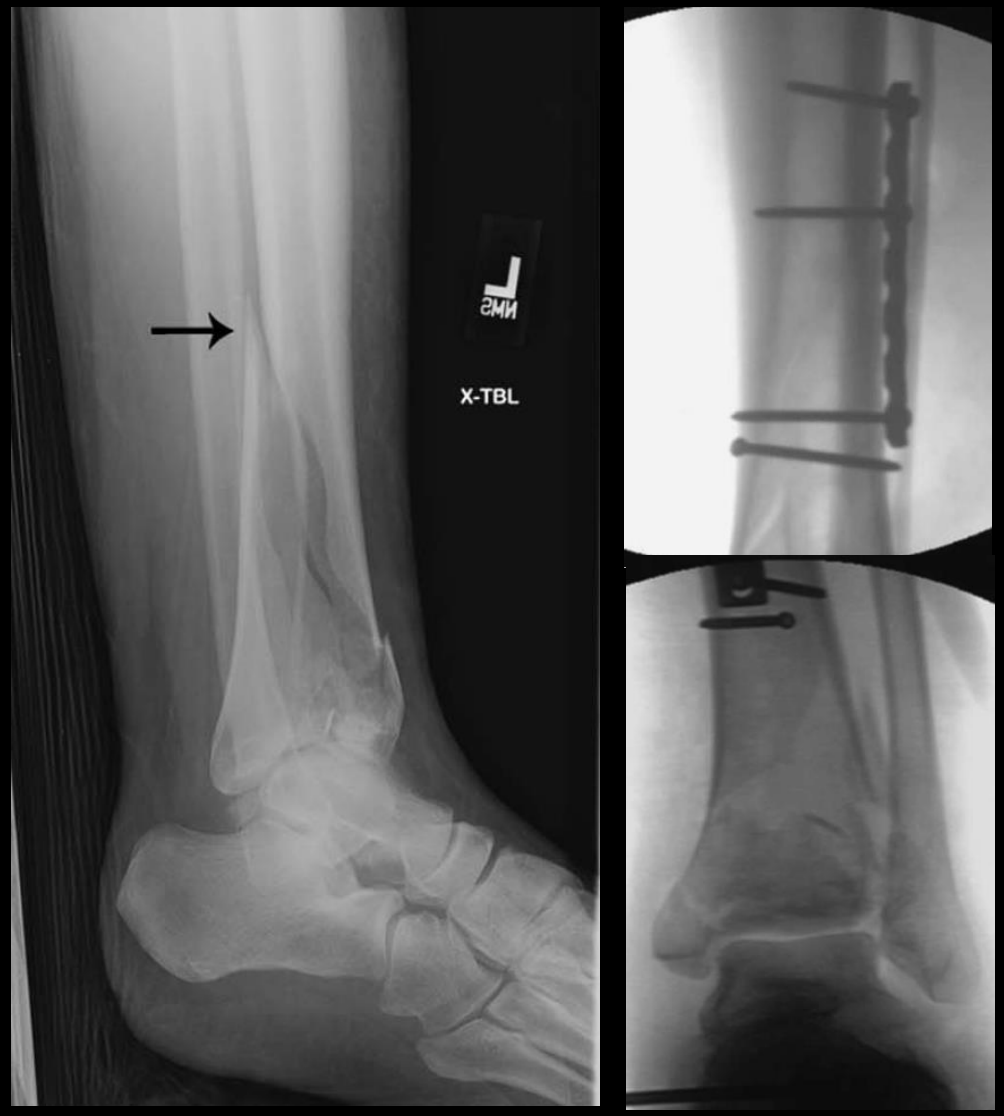
Stage *1.5* - Fix the posterolateral fragment? *Acutely?*



Consider:

- **Condition of posterolateral skin?**
- **You cannot see the joint!**
- **Is fixation flexible enough to allow subtle sagittal plane corrections when joint is seen directly?**

Acute “C to B” Conversions

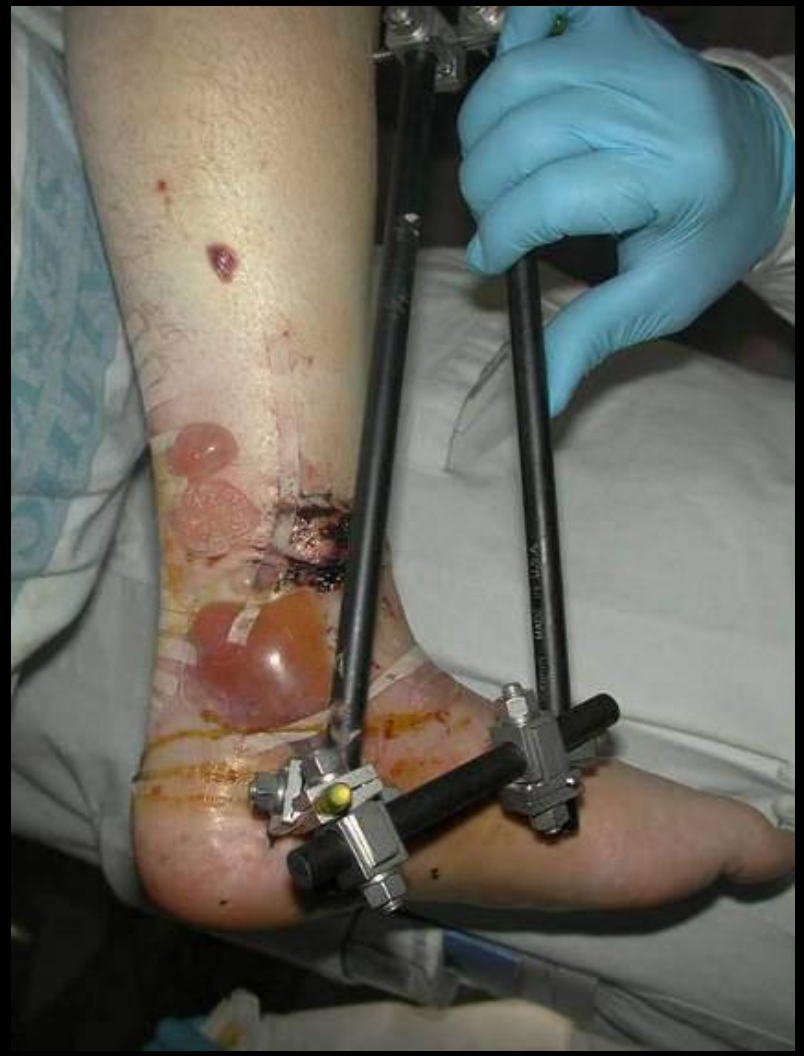


Dunbar *JOT* 2008

Consider:

- **Why now?**
  - **Difficult indirect reduction**
  - **Open wound**
- **What is the condition of soft tissues?**
- **Can I achieve an anatomic reduction?**
- **Will other required approaches be affected?**

What do I do with fracture blisters?



<u>Treat them!</u>

- **Lance with scalpel at dependent corner and allow blistered skin to become natural dressing**
- **Application of silver sulfadiazine (SS) ointment**
- **Daily gauze dressing changes with reapplication of SS until dry**
- **Expect re-epithelialization in 1-2 weeks**

Strauss *JOT* 2006

Stage 2 - Fixation Strategy

Rotation of posterolateral fragment

Fix to posterolateral fragment

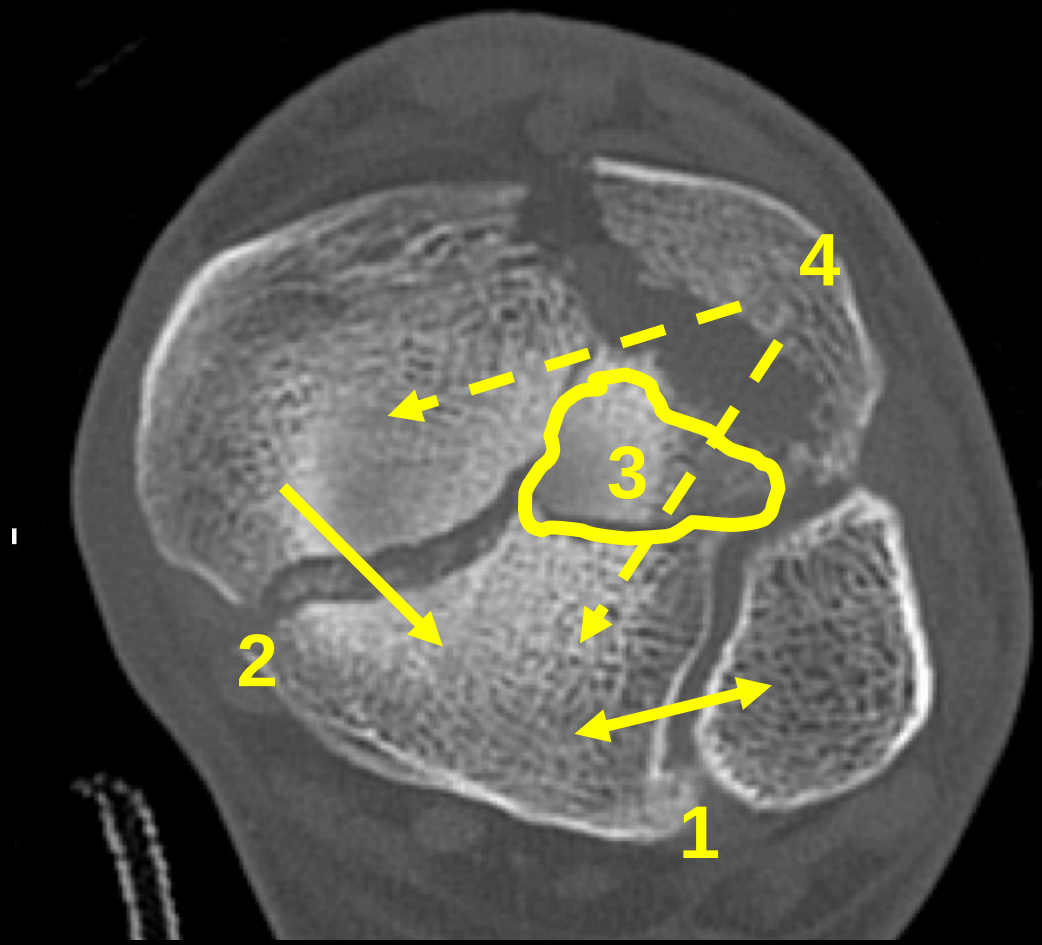
Medial to posterolateral

Central impaction

Anterolateral fragment

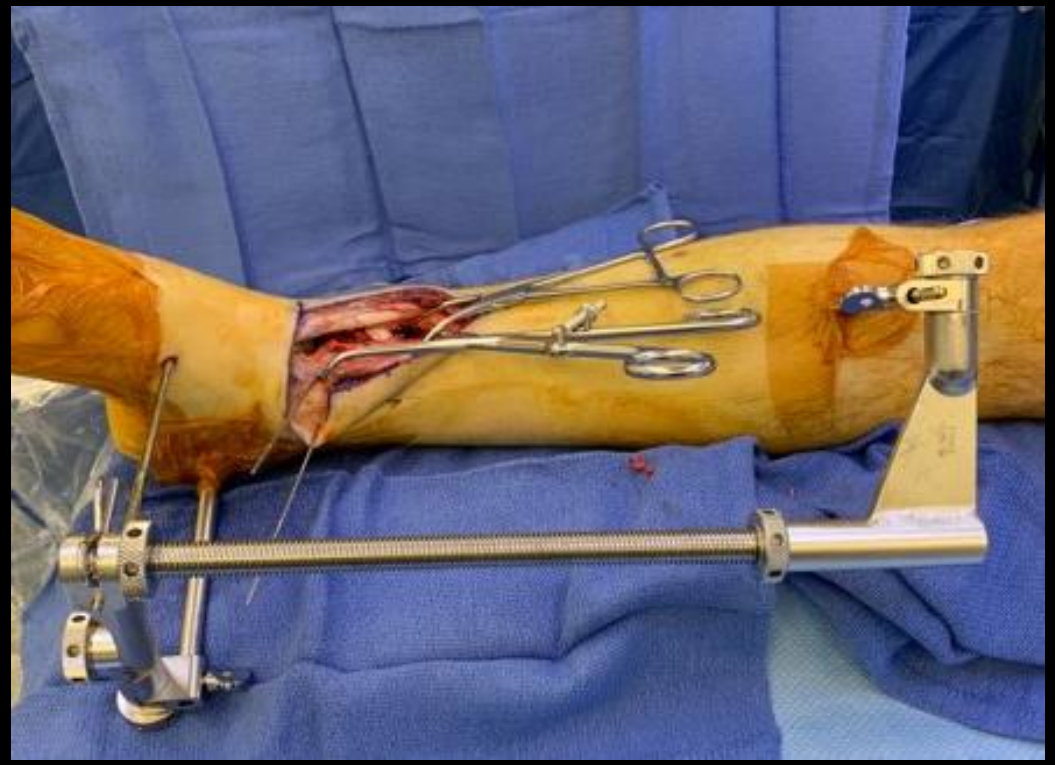
Secure articular segment

Span joint to diaphysis

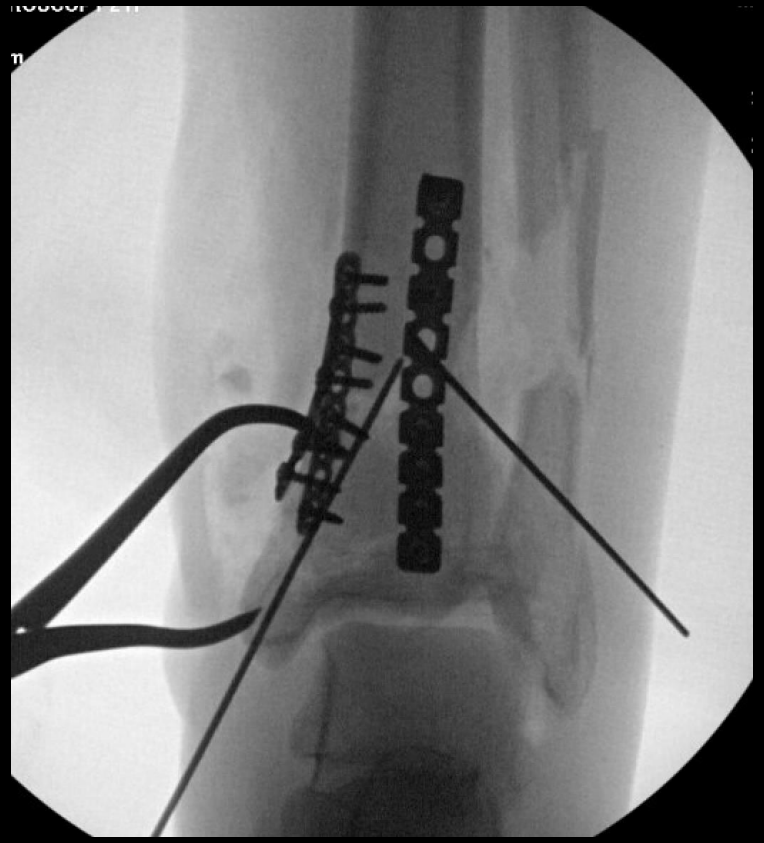


Articular Reduction

NB: Indirect aids are *vital* !!!



After setting the PL fragment, build to it!



Stage 2 - Fixation Strategy

Rotation of posterolateral fragment

Fix to posterolateral fragment

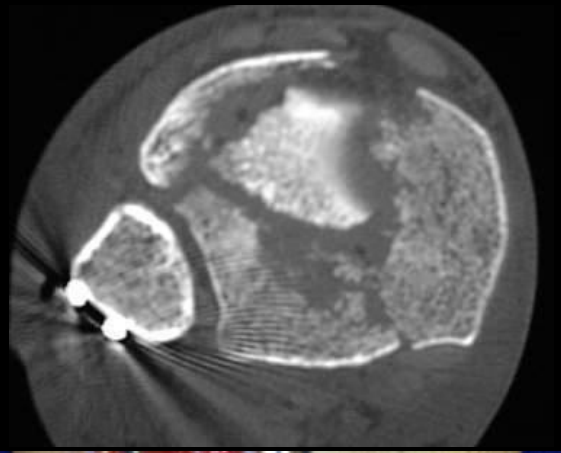
Medial to posterolateral

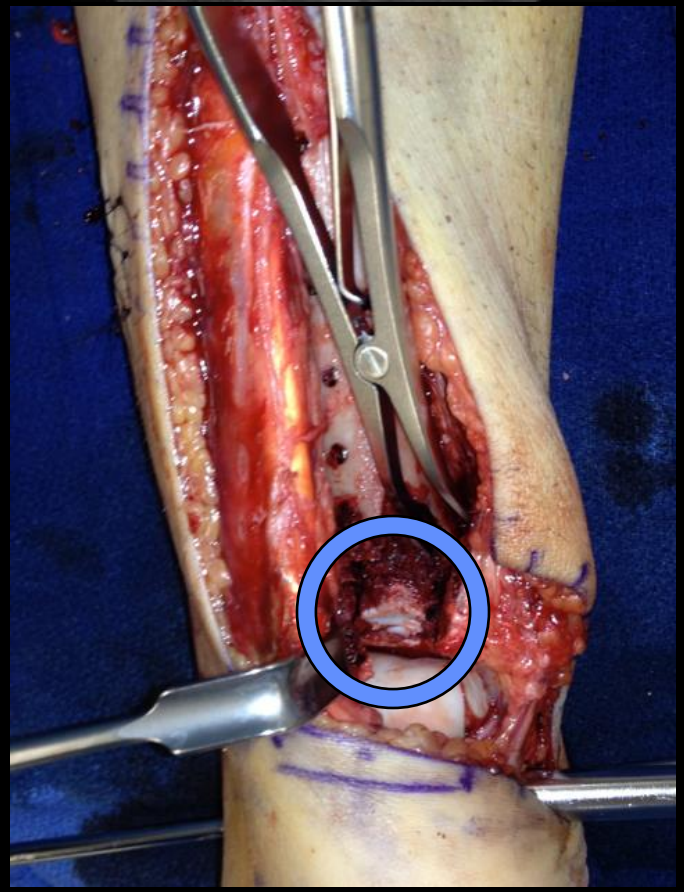
Central impaction

Anterolateral fragment

Secure articular segment

Span joint to diaphysis





Stage 2 - Fixation Strategy

Rotation of posterolateral fragment

Fix to posterolateral fragment

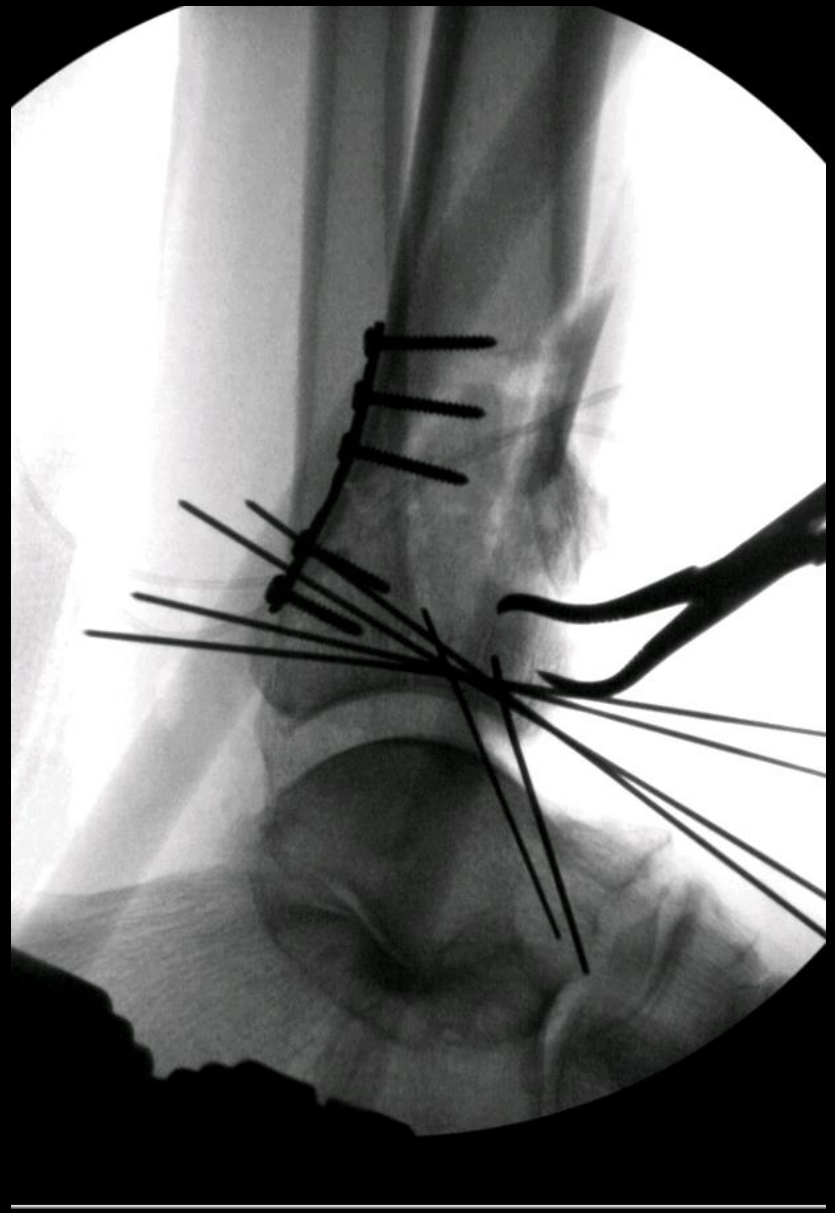
Medial to posterolateral

Central impaction

Anterolateral fragment

Secure articular segment

Span joint to diaphysis



Stage 2 - Fixation Strategy

Rotation of posterolateral fragment

Fix to posterolateral fragment

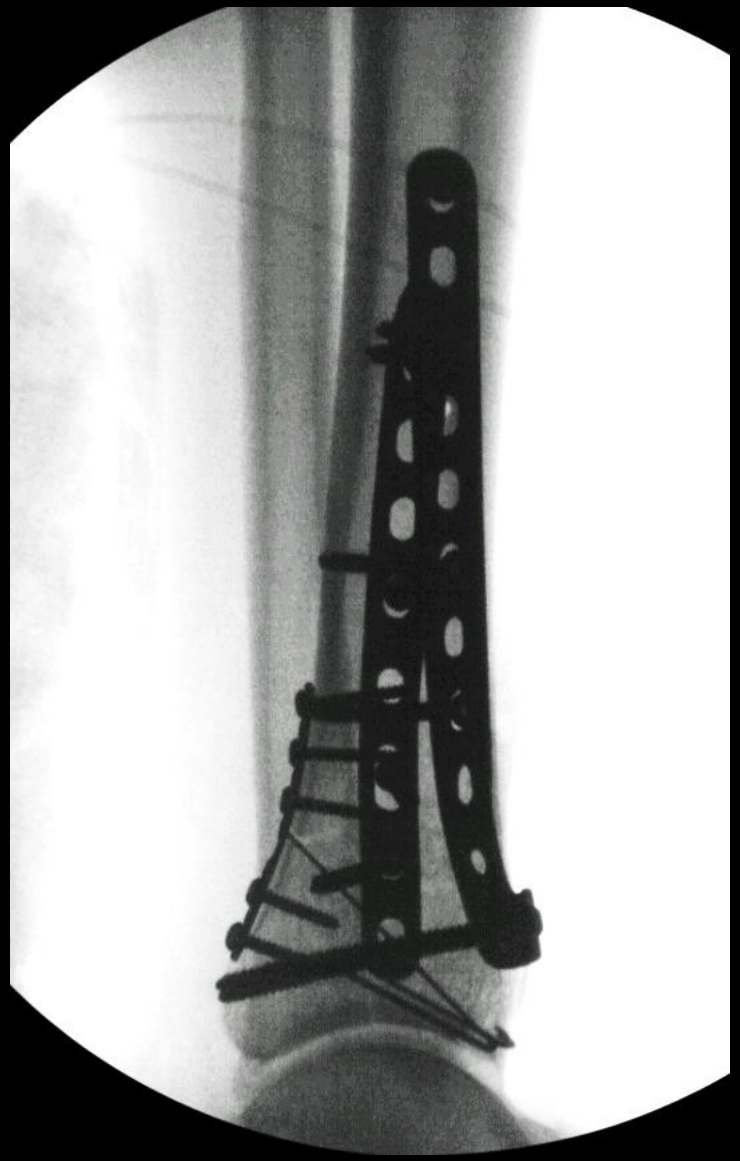
Medial to posterolateral

Central impaction

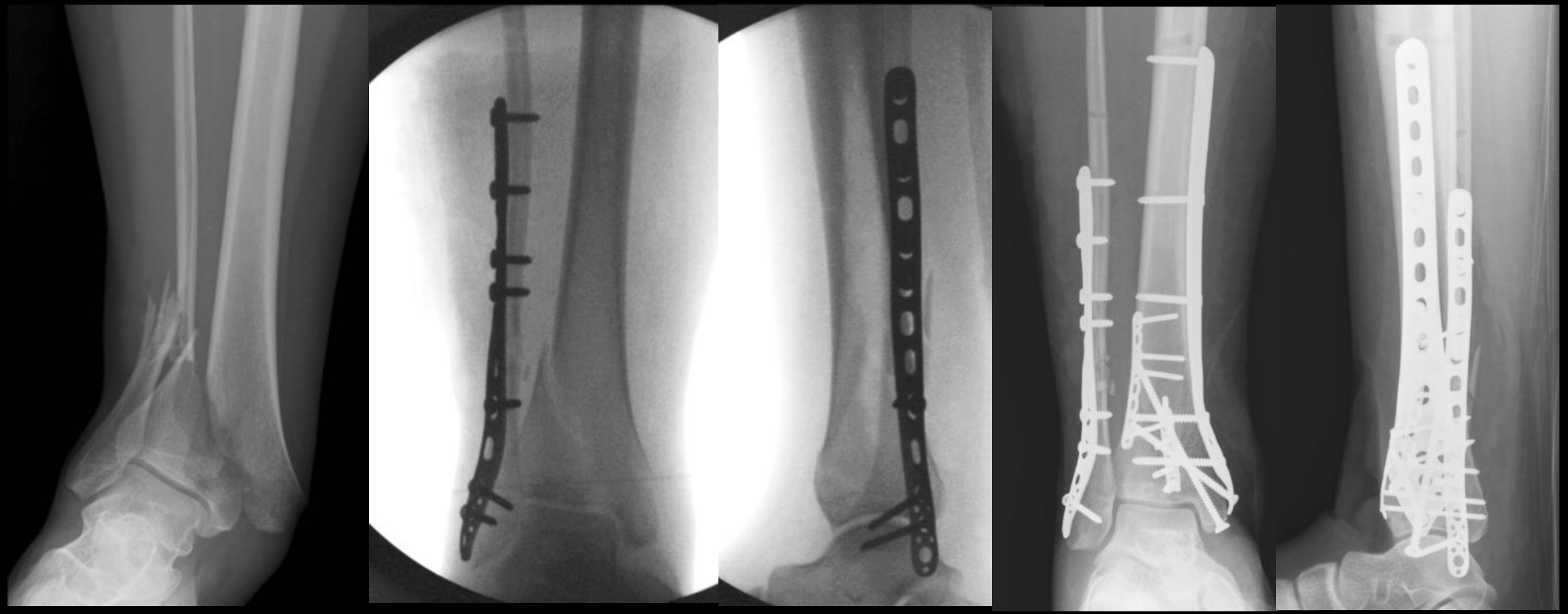
Anterolateral fragment

Secure articular segment

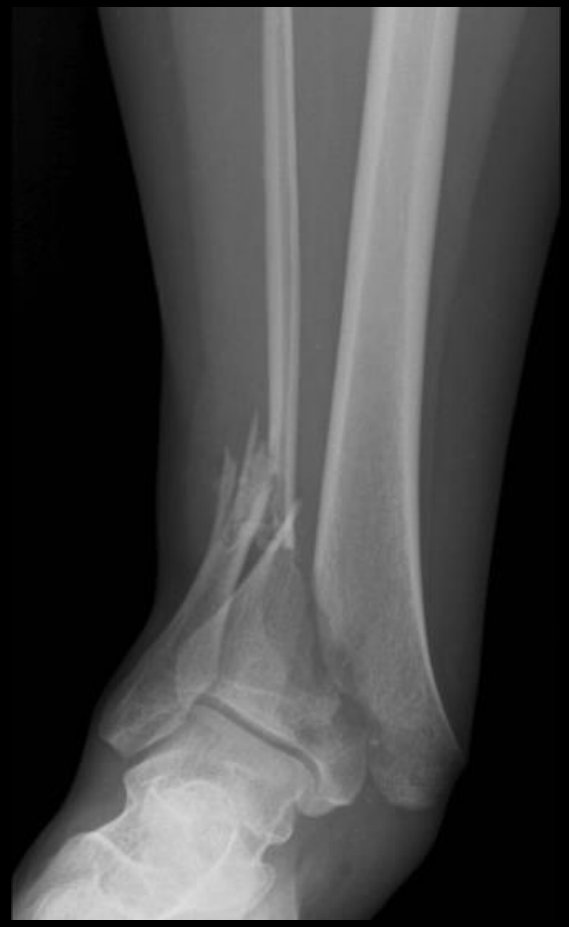
Span joint to diaphysis

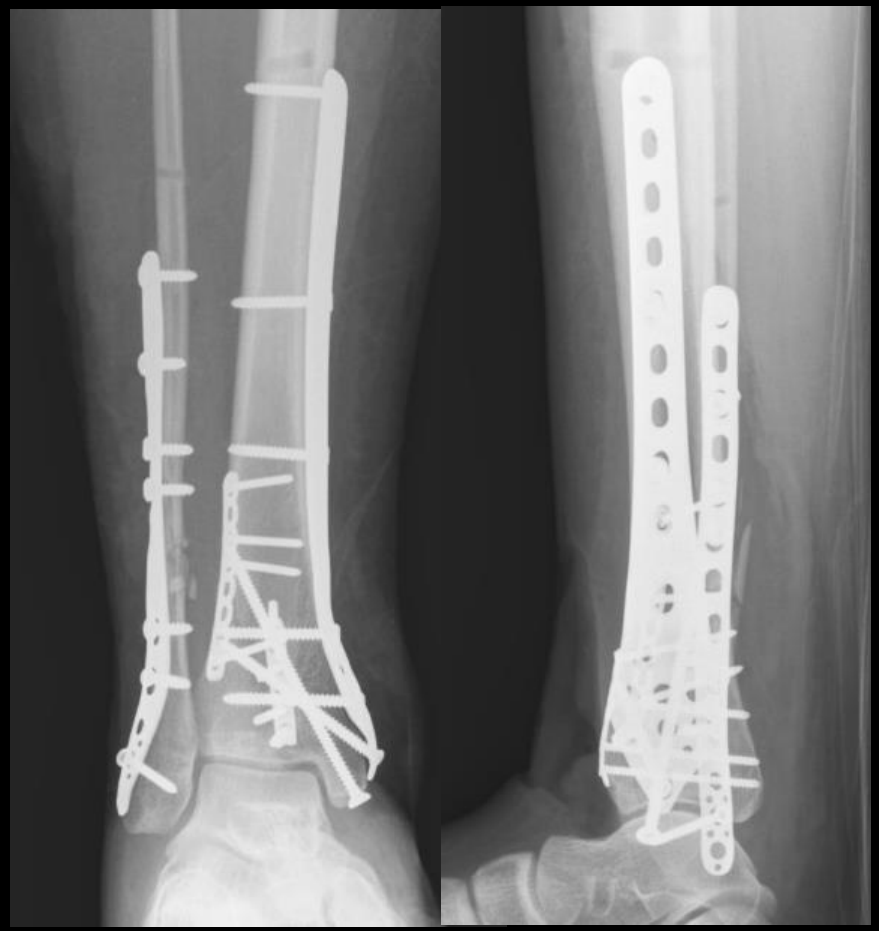


Staged ORIF should be your default tactic

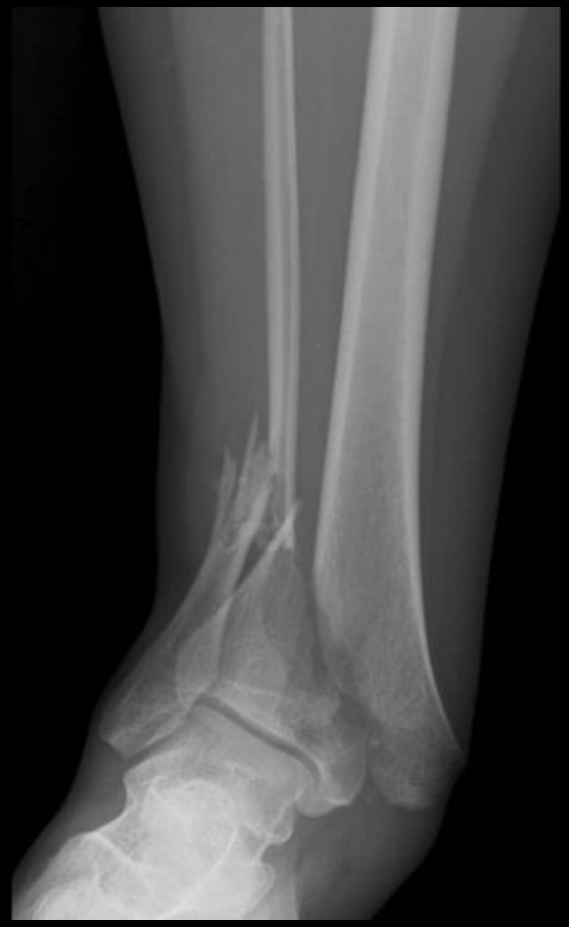


Is acute ORIF ever indicated?

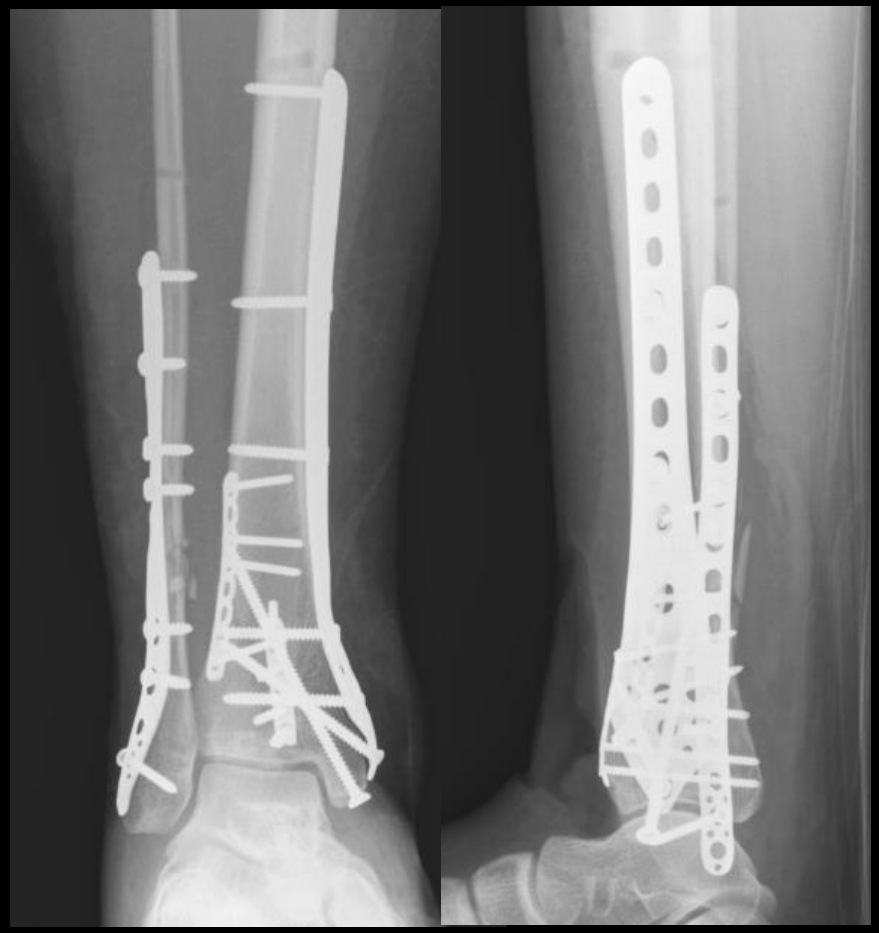




Is acute ORIF ever indicated?

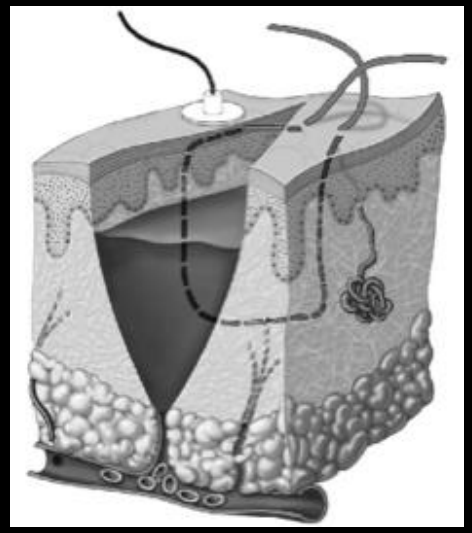


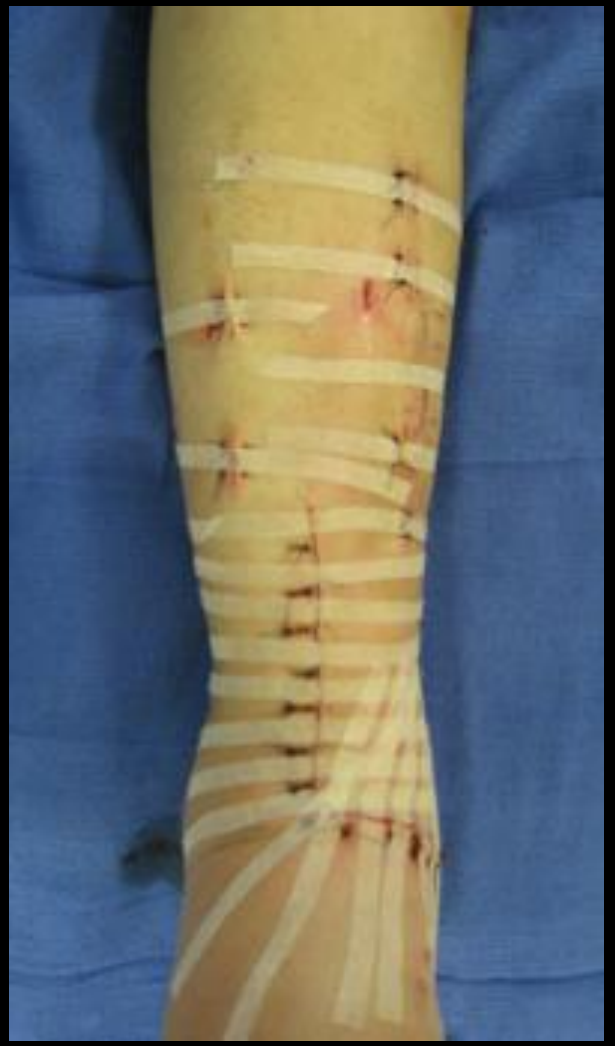
White *JOT* 2010
-95 43C pilons
-88% <48 hours
-7% deep SSI requiring debridement



Wound Spacing and Closure

- Less than 7cm of separation OK
- Allgower Modification of the Donati Stitch with full length steri-strips





Howard *JOT* 2008
Taylor *Plast Reconstr Surg* 1998
Dietz *World J Surg* 2006
Sagi *JOT* 2008

Remember

Staged treatment key to safe ORIF because it *respects soft tissues*

Remember

Staged treatment key to safe ORIF because it *respects soft tissues*

External fixation, fibular ORIF and C to B conversion *may* be safely done acutely

Remember

Staged treatment key to safe ORIF because it *respects soft tissues*

External fixation, fibular ORIF and C to B conversion *may* be safely done acutely

Use rational sequence of indirect and direct reduction tactics for success

Good luck!

Saam.Morshed@ucsf.edu