



Plating distal tibia fractures

Jan Erik Madsen

Ortopedisk avdeling

OUS, Ullevål



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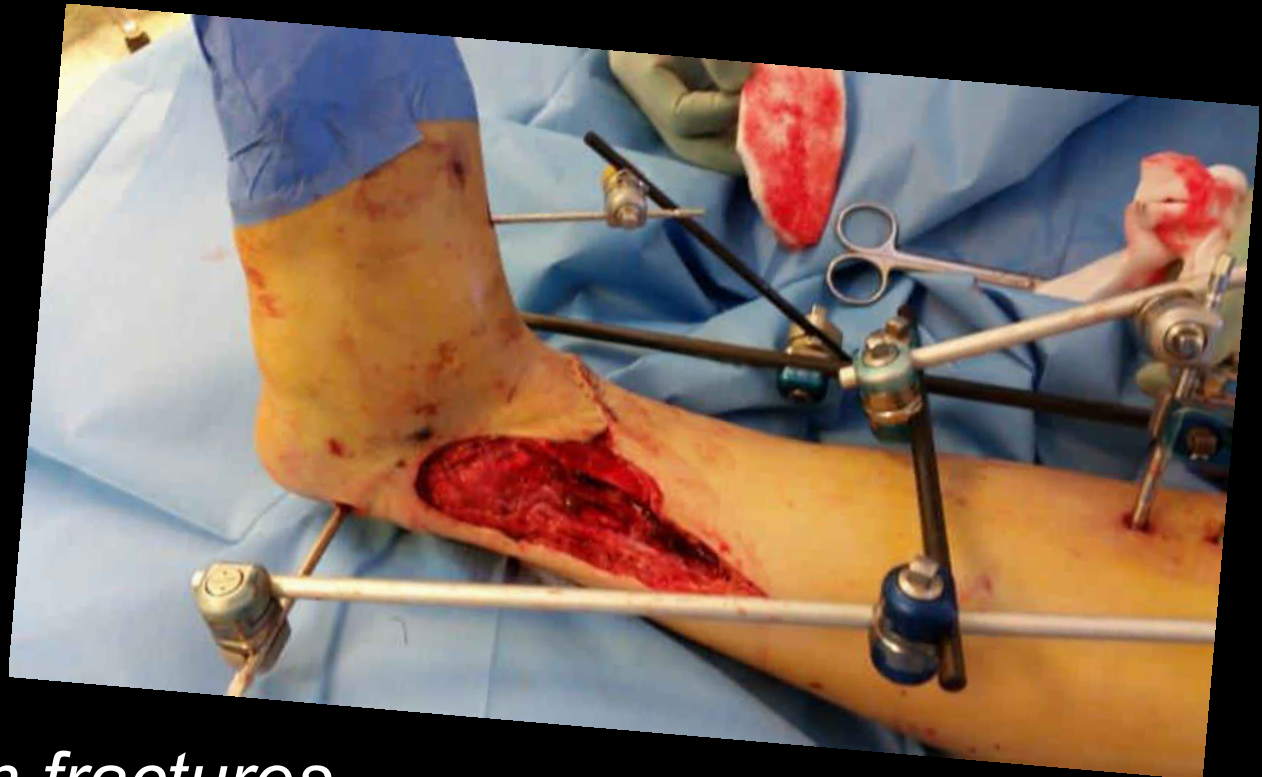
Ortopedisk avdeling

OUS, Ullevål

Objectives

- Plates versus nails
 - Loadbearing versus loadshearing in a slow healing environment
- Tips, tricks and pitfalls in distal tibia plating

*the soft tissue injury with the accidental
broken bone inside...*



10-30% open fractures

Plates or IMNs for distal tibia fxs?

Mao et al. *Journal of Orthopaedic Surgery and Research* (2015) 10:95
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RESEARCH ARTICLE

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Intramedullary nailing versus plating for distal tibia fractures without articular involvement: a meta-analysis



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Soft tissue complications favor IMNs

Study or Subgroup	IM nailing		Plating		Weight	Risk Ratio
	Events	Total	Events	Total		M-H, Fixed, 95% CI
1.2.1 RCT Subgroup						
Guo 2010	3	44	6	41	8.4%	0.47 [0.12, 1.74]
Im 2005	1	34	6	30	8.6%	0.15 [0.02, 1.15]
Li 2014	1	40	7	42	9.2%	0.15 [0.02, 1.17]
Mauffrey 2012	3	12	0	12	0.7%	7.00 [0.40, 122.44]
Subtotal (95% CI)		130		125	26.8%	0.42 [0.19, 0.91]

Total events 8 19
Heterogeneity: $\chi^2 = 5.70$, $df = 3$ ($P = 0.13$); $I^2 = 47\%$
Test for overall effect: $Z = 2.19$ ($P = 0.03$)

1.2.2 Retrospective Subgroup

Chen 2008	0	25	2	21	3.6%	0.17 [0.01, 3.34]
Feng 2011	3	22	3	28	3.6%	1.27 [0.28, 5.70]
Guo 2014	4	30	0	30	0.7%	9.00 [0.51, 160.17]
Huang 2008	0	30	3	27	4.9%	0.13 [0.01, 2.39]
Huang 2012	0	26	2	26	3.4%	0.20 [0.01, 3.97]
Ke 2013	0	32	4	30	6.2%	0.10 [0.01, 1.86]
Li 2012	1	23	3	23	4.0%	0.33 [0.04, 2.97]
Ni 2010	3	32	8	25	12.1%	0.29 [0.09, 0.99]
Seyhan 2012	0	25	4	36	5.0%	0.16 [0.01, 2.81]
Tan 2012	0	48	3	48	4.7%	0.14 [0.01, 2.69]
Wang 2013	2	47	4	51	5.2%	0.54 [0.10, 2.83]
Yang 2012	0	17	1	15	2.1%	0.30 [0.01, 6.77]
Yao 2013	0	65	5	61	7.6%	0.09 [0.00, 1.51]
Yavuz 2014	0	21	3	34	3.6%	0.23 [0.01, 4.19]
Zhang 2007	0	27	4	24	6.4%	0.10 [0.01, 1.75]
Subtotal (95% CI)		470		479	73.2%	0.34 [0.21, 0.57]

Total events 13 49
Heterogeneity: $\chi^2 = 11.99$, $df = 14$ ($P = 0.61$); $I^2 = 0\%$
Test for overall effect: $Z = 4.14$ ($P < 0.0001$)

Total (95% CI) 600 604 100.0% 0.36 [0.24, 0.55]

Total events 21 68
Heterogeneity: $\chi^2 = 17.70$, $df = 18$ ($P = 0.48$); $I^2 = 0\%$
Test for overall effect: $Z = 4.68$ ($P < 0.00001$)
Test for subgroup differences: $\chi^2 = 0.19$, $df = 1$ ($P = 0.67$), $I^2 = 0\%$

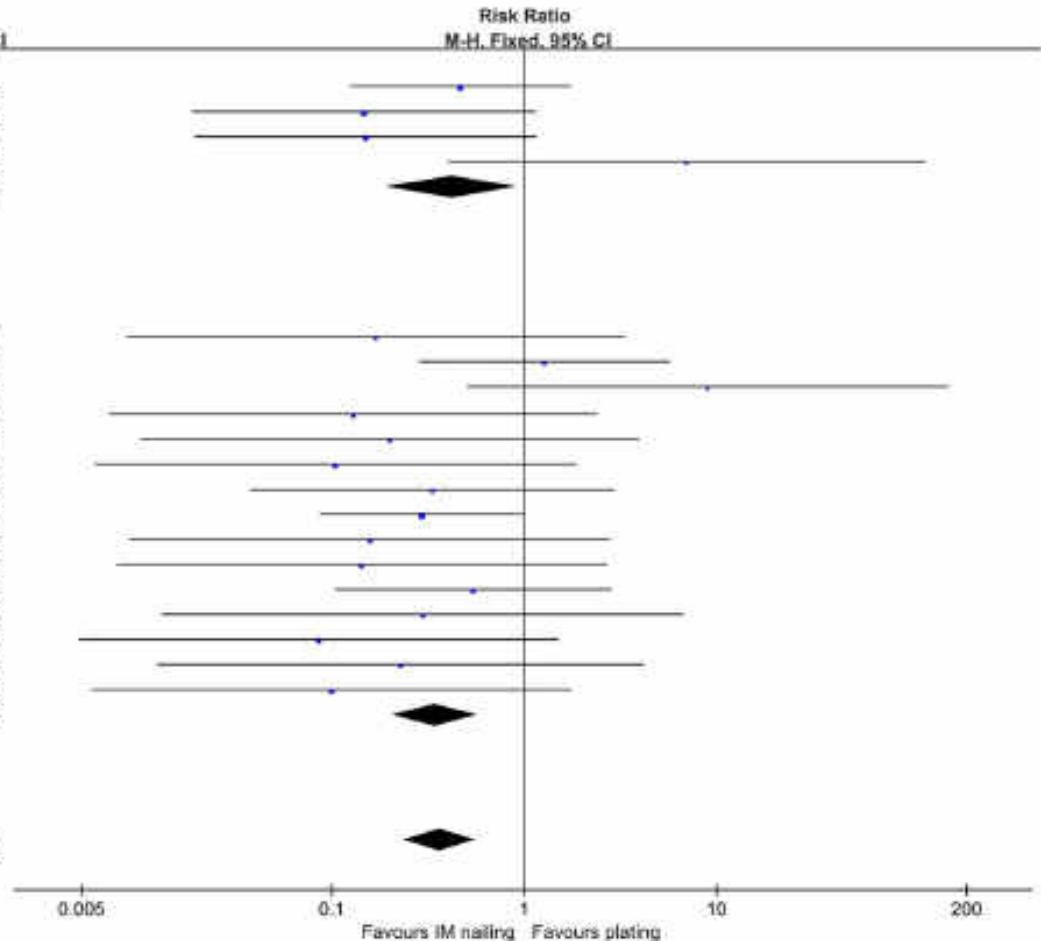


Fig. 3 Delayed wound healing and superficial infection: IM nailing versus plating

Alignment favors plates

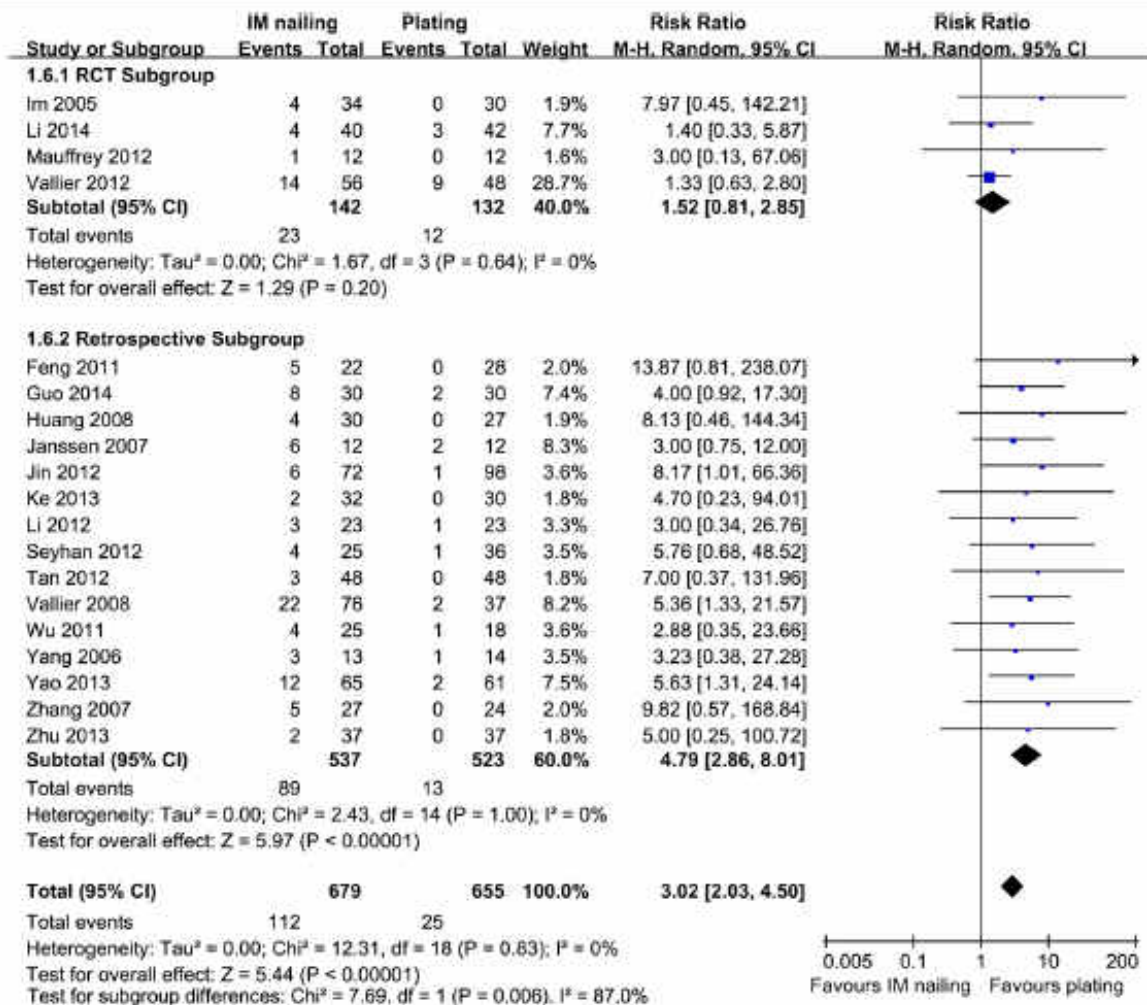


Fig. 4 Malunion: IM nailing versus plating

Knee pain favors plates

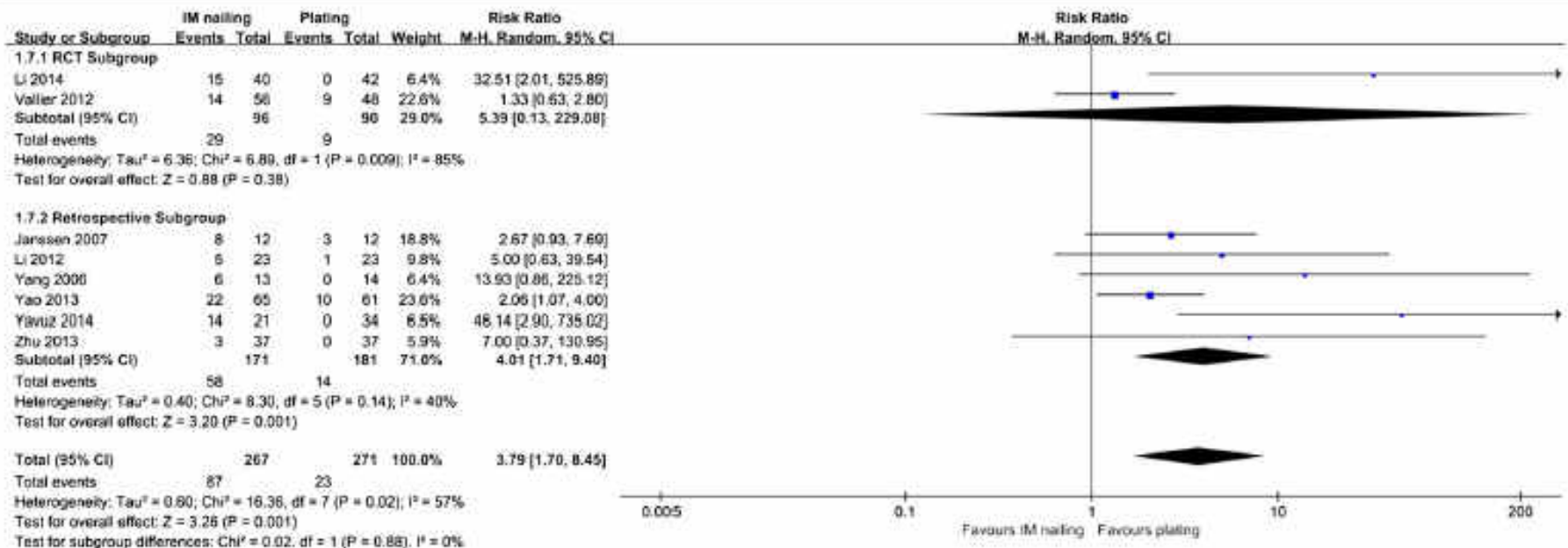
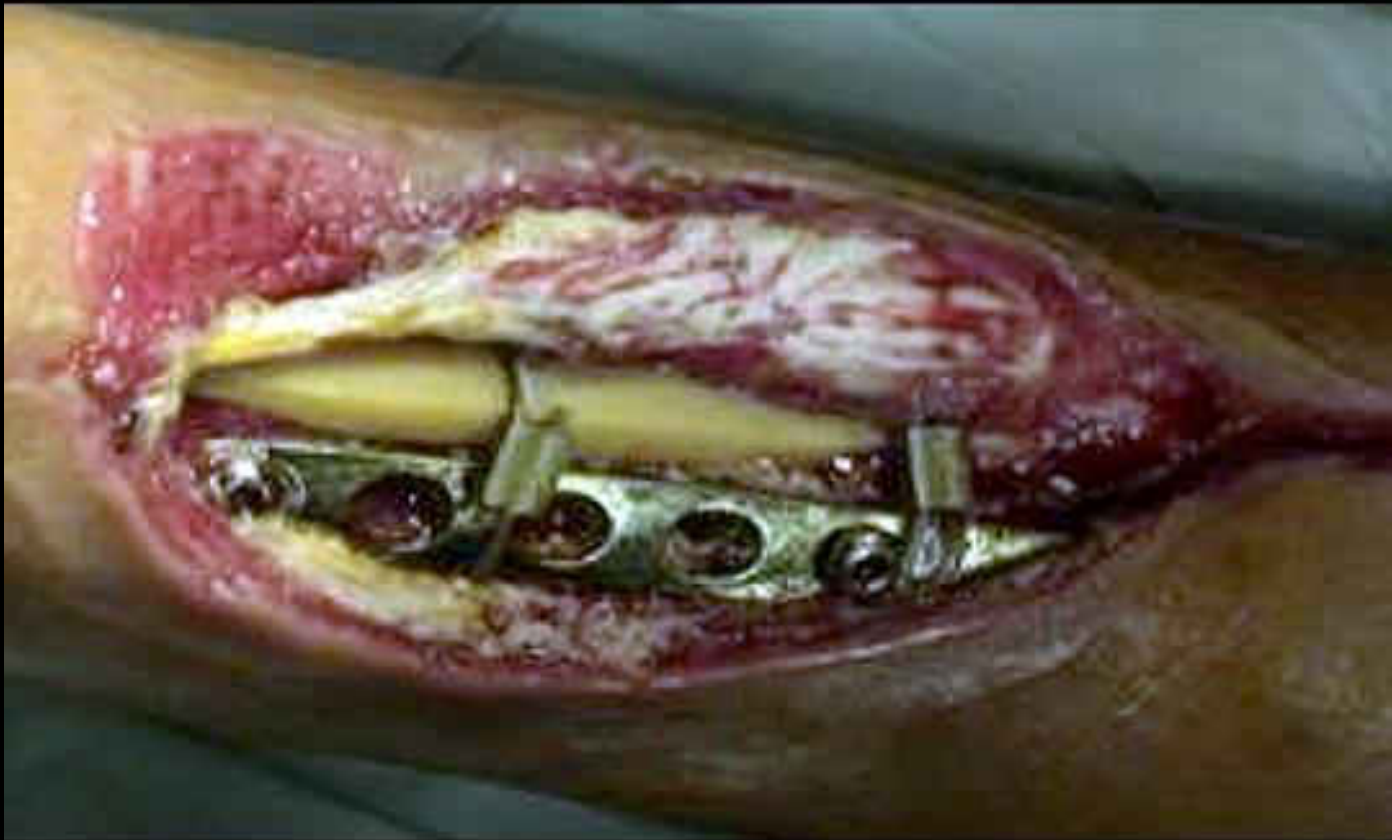


Fig. 5 Knee pain: IM nailing versus plating

Compication rates low, but....



The tips, tricks and pitfalls....



- Soft tissue considerations
 - Timing of final fixation
 - Percutaneous or open surgery?
- Choice of implants?
 - Locking plates?
 - Medial or lateral?
- Fix the fibula?

Timing of final ORIF



Staged protocols

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A Staged Protocol for Soft Tissue Management in the Treatment of Complex Pilon Fractures

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Ortho



Open versus MIPO- techniques?



Collinge et al, JOT 2007

Fracture reduction imperative!

Open versus MIPPO- techniques?



Jeong, AOFAS 2015

Open versus MIPO- techniques?

Meticulous soft tissue handling and proper fracture reduction is imperative whether open or mipo techniques are used

Vallier et al, 2012

Are locking plates beneficial?



- Increased delayed/ nonunion rates; constructs too stiff?

Collinge, JOT 2007

Mauffrey, JBJS 2012

Bottlang, JBJS 2016

- Risks mitigated by longer plates, fewer locking screws and far distal locking

Vallier, JOT 2012

Are locking plates beneficial?

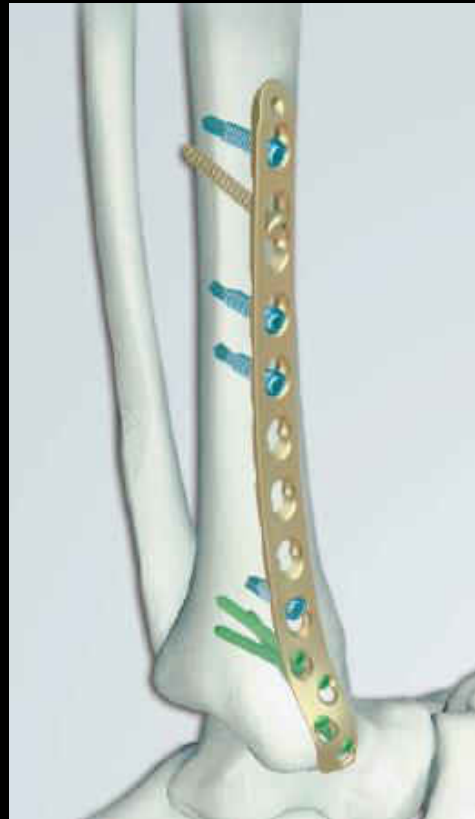


- Greater implant prominence leads to increased reop rates
 - Infections
 - Implant removals

Kent 2015, Sathiyakumar 2014

Are locking plates beneficial?

- Choose low profile implants



Medial or lateral plates?



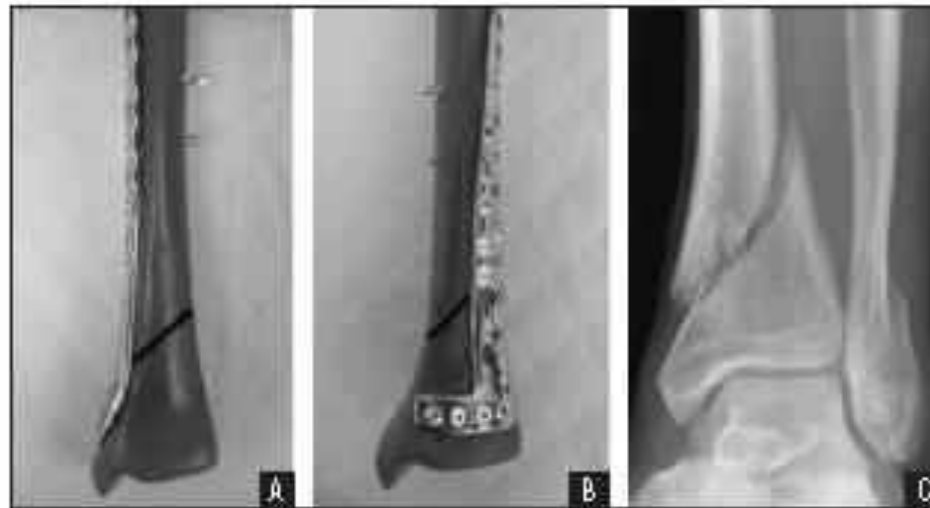
Anterolateral Versus Medial Plating of Distal Extra Articular Bicortical

JOSEPH M. P

.. BISHOP, MD

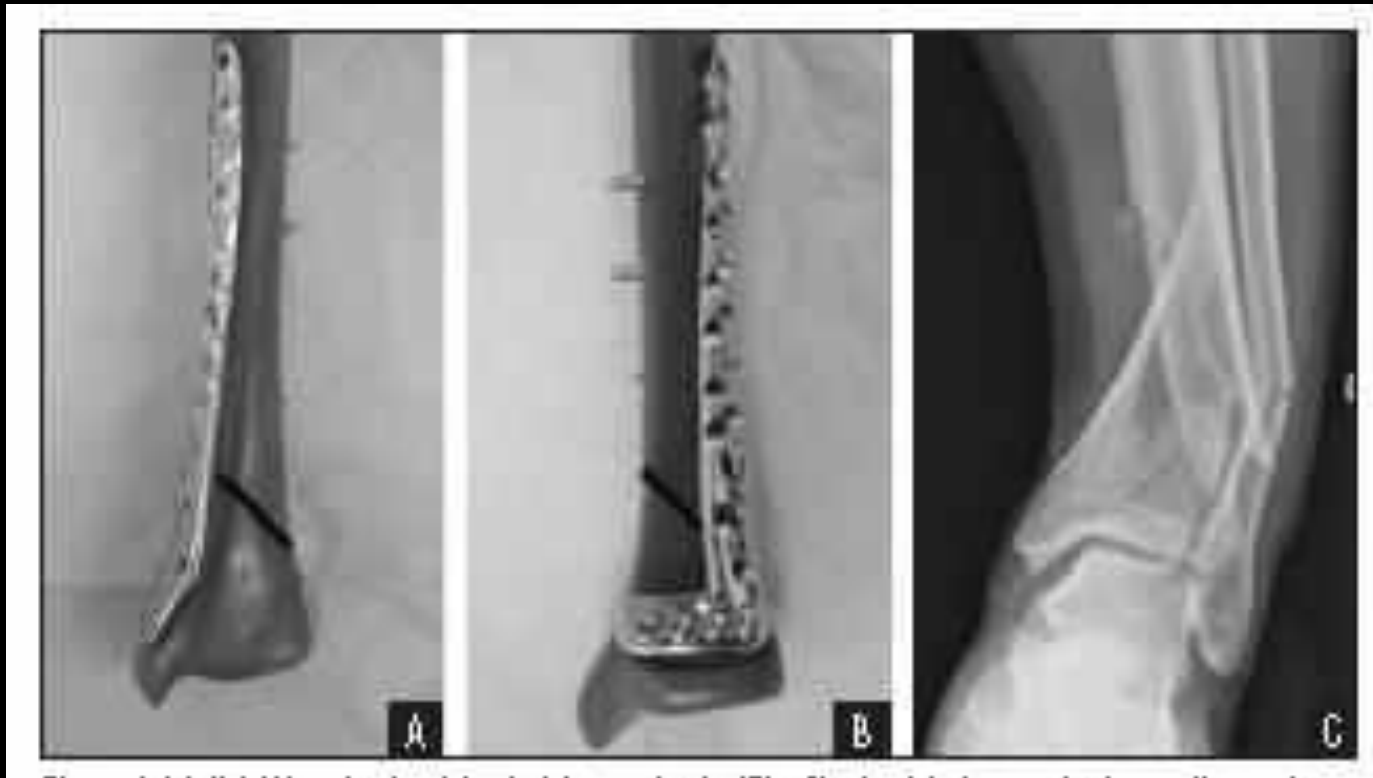


Figure 1: Medial (A) and anterolateral plate constructs (B) with simulated varus fracture patterns alongside an anteroposterior plain radiographic example of a varus injury (C). The black line denotes the osteotomy site.



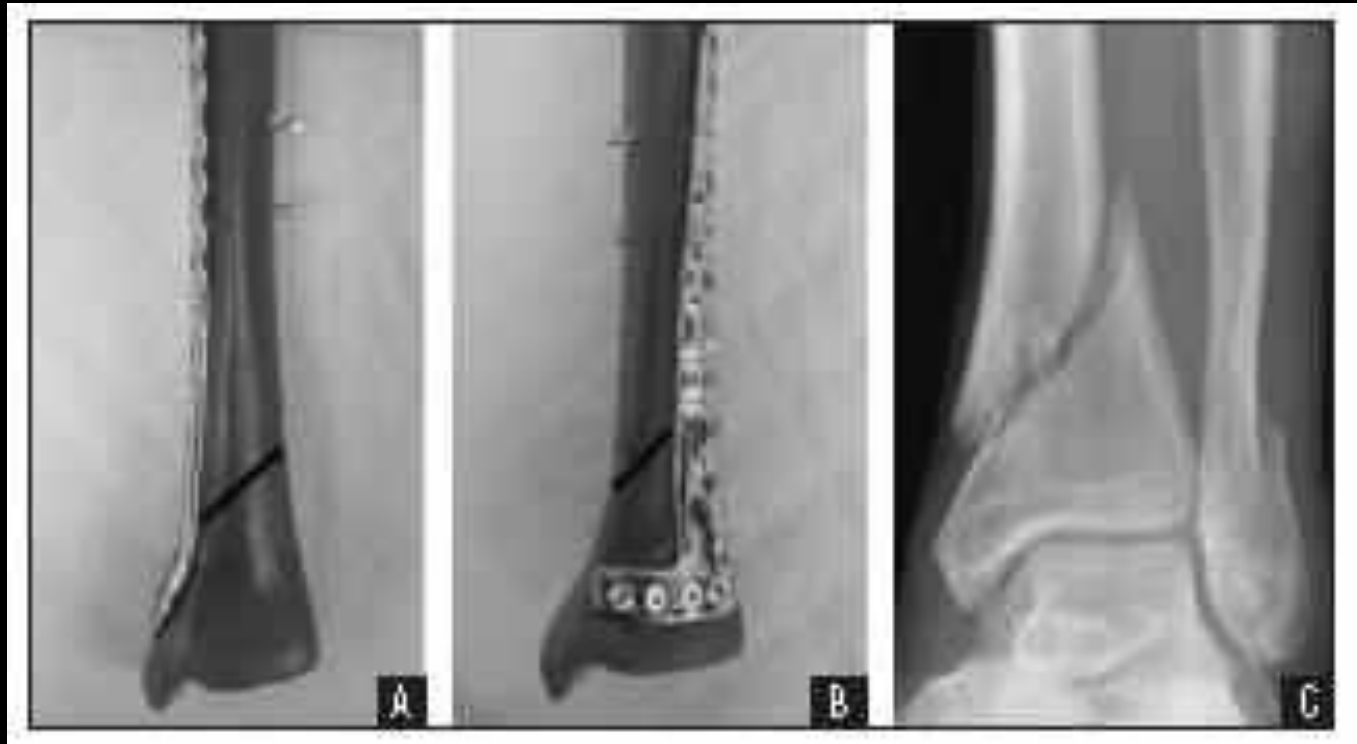
Medial or lateral plates?

- Biomechanical advantages of medial plate in varus fractures

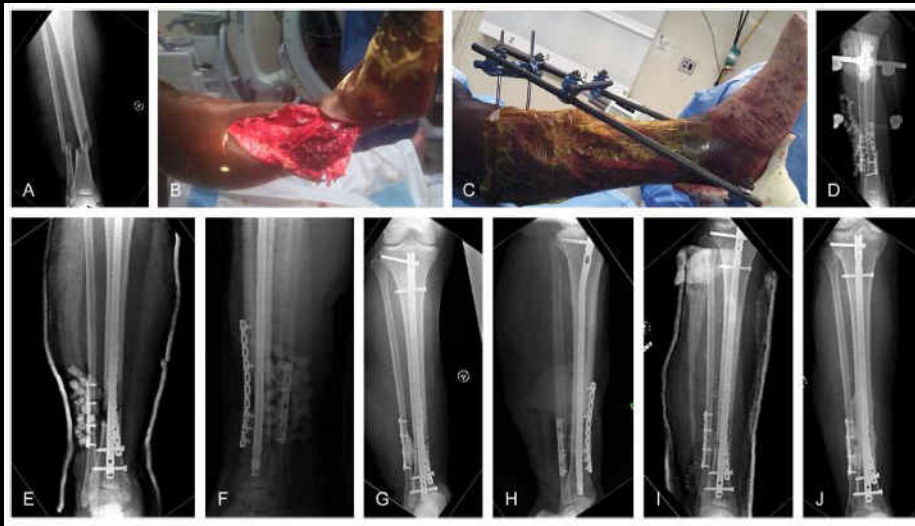


Medial or lateral plates?

- No differences in valgus pattern fractures



Plates as an adjunct to IMN



Yoon & Liporace, JOT 2016



- Male 53
- Fell from roof 3 m
- NV intact



70s/HE 10.6mm/rot
0.531:1/0.62sp

This is a 3D CT reconstruction of a human forearm. The radius and ulna are clearly visible. The radius shows a clear, comminuted fracture in its distal third. The ulna appears intact. The carpal bones are visible at the base of the forearm. The image is set against a black background.



70s/HE 10.6mm/rot
0.531:1/0.62sp

70s/HE 10.6mm/rot
0.531:1/0.62sp
0.0





A 3D CT reconstruction of a distal radius and ulna. The radius is on the left, and the ulna is on the right. A clear fracture line is visible in the distal radius, extending from the articular surface. The ulna is positioned posteriorly and appears relatively intact. The carpal bones are visible at the base of the radius.

70s/HE 10.6mm/rot
0.531:1/0.62sp




A 3D CT reconstruction of a distal radius fracture. The radius is shown in a light beige color, and the ulna is shown in a slightly darker beige. The fracture is a comminuted, intra-articular fracture of the distal radius, with a large fragment displaced proximally and laterally. The ulna appears intact. The carpal bones are visible at the base of the radius. The background is black.


70s/HE 10.6mm/rot
0.531:1/0.62sp
0.0



70s/HE 10.6mm/rot
0.531:1/0.62sp




70s/HE 10.6mm/rot
0.531:1/0.62sp



70s/HE 10.6mm/rot
0.531:1/0.62sp

This is a 3D CT reconstruction of a human leg, specifically the distal femur and proximal tibia. A clear, comminuted fracture is visible in the proximal tibia. The bone is rendered in a light tan color against a black background. A dashed line is drawn along the length of the tibia, likely indicating the axis of rotation or a measurement line. The text in the bottom left corner provides technical data related to the scan or reconstruction.



70s/HE 10.6mm/rot
0.531:1/0.62sp

70s/HE 10.6mm/rot
0.531:1/0.62sp
0.0



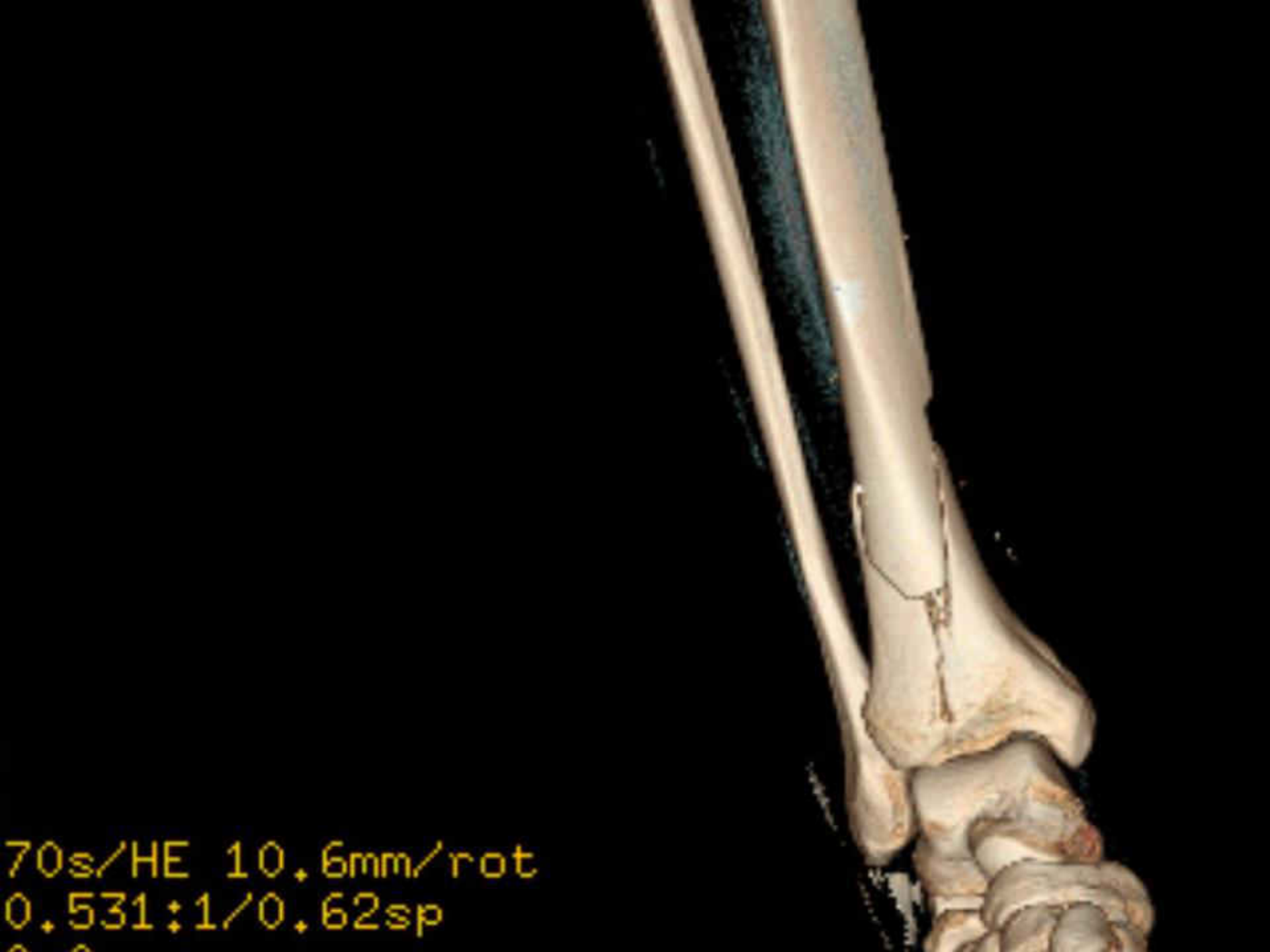
70s/HE 10.6mm/rot
0.531:1/0.62sp
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70s/HE 10.6mm/rot
0.531:1/0.62sp

This is a 3D medical reconstruction of a human leg, specifically the lower portion including the tibia, fibula, and ankle. A clear, comminuted fracture is visible on the anterior aspect of the tibia, approximately one-third of the way down from the knee. The bone fragments are displaced. The surrounding soft tissue and the bones of the foot are also visible. The image is set against a black background.



70s/HE 10.6mm/rot
0.531:1/0.62sp

This is a 3D CT reconstruction of the bones of a human forearm and hand. The radius and ulna of the forearm are clearly visible, along with the carpal, metacarpal, and phalangeal bones of the hand. The bones are rendered in a light beige color against a black background. A small, dark, linear artifact is visible on the ulna. The text in the bottom left corner provides technical parameters related to the scan.

- ORIF for reduction purposes
- Suprapatellar IMN





- Healed at 1 year

Fix the fibula - or not?



- Three- column principle?

Fix the fibula - or not?



- No evidence in the literature
- Biomechanical considerations promote fibular fixation
- Before or after fixing the tibia?

Summary

- Plating of distal tibia fractures leads to higher risk of delayed unions and soft tissue complications compared to nailing
- Gentle soft tissue handling and adequate fracture reduction is imperative to avoid complications
- Low profile implants preferable:
 - Simple fractures use standard implants
 - For bridging – use a locked plate with long working length
- Fixing the fibula is optional