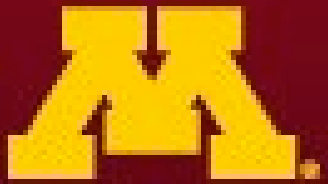


Peri-prosthetic Fractures: Distal femur

Andrew H. Schmidt, M.D.



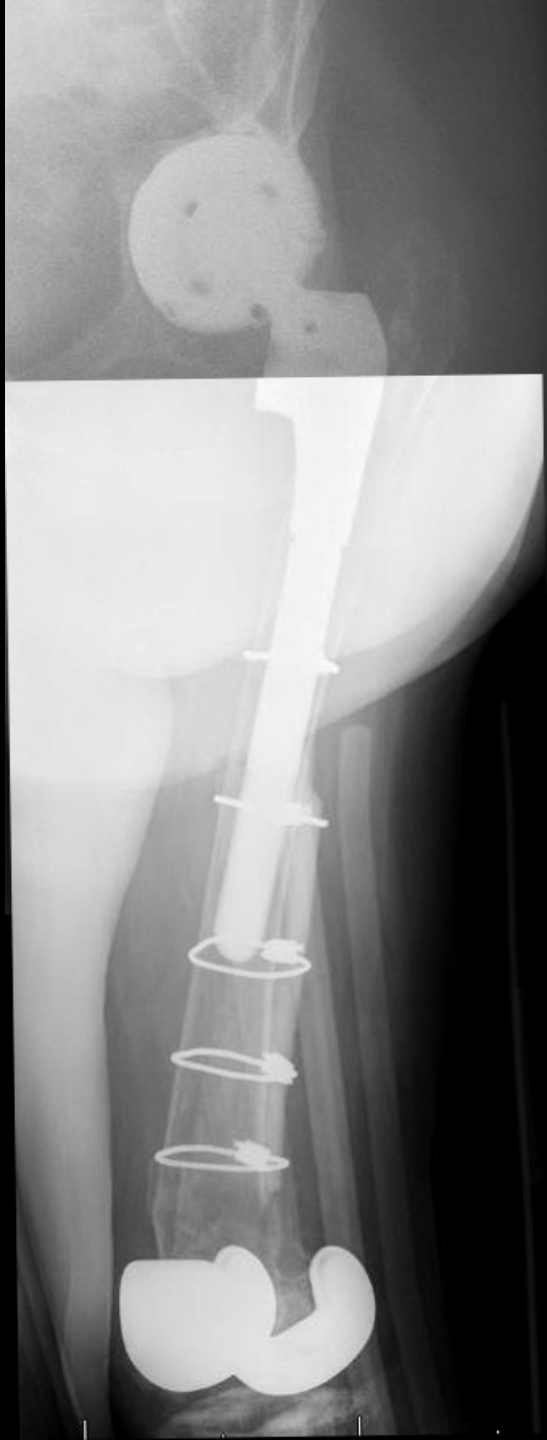
Goals of Treatment

- Fracture Union
- Maintain functioning prosthesis
- Avoid the inevitable next fracture.



There is a role for Nonop Management







Jesse I. Wolfstadt, MD, MSc,
FRCS C ©

Amit Atrey, MD, MSc,
FRCS C ©

Lauren L. Nowak, BSc, MSc,
PhD ©

Alexandra Stavrakis, MD

Luana T. Melo, BScPT, PhD

David Backstein, MD, MEd,
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Emil H. Schemitsch, MD,
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Aaron Nauth, MD, MSc, FRCS C

Amir Khoshbin, MD, MSc,
FRCS C ©

Research Article

A Comparison of Acute Complications and Mortality Between Geriatric Knee and Hip Fractures: A Matched Cohort Study

Conclusion: Geriatric knee fractures pose a similar risk of acute complications, mortality, and readmission compared with patients with HF. Future studies investigating strategies to decrease risk in this patient cohort are warranted.

What Fixation?

- Location of fracture
- Pattern of fracture
- Status of implant
 - Loose
 - Stable



3 Flavors

- About Stable Prosthesis
- Away From Prosthesis
- Failed Prosthesis



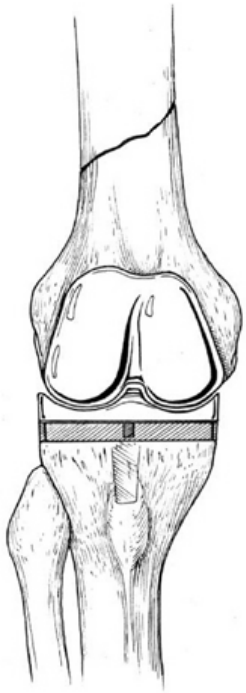
Supracondylar Fractures above TKA

- Type I: Undisplaced, prosthesis intact.
- Type II: Displaced, prosthesis intact.
- Type III: Prosthesis loose or failing.

Lewis PL, Rorabeck CH: Periprosthetic fractures.

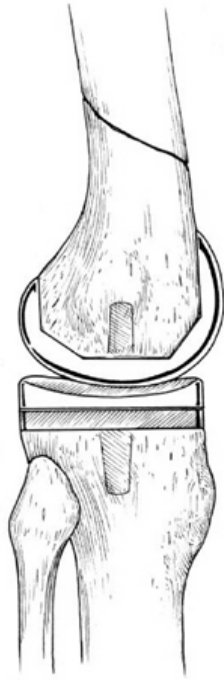
In Engh GA, Rorabeck CH (eds): Revision Total Knee Arthroplasty. Baltimore, Williams & Wilkins, 1997

Classification based on Location of Fx



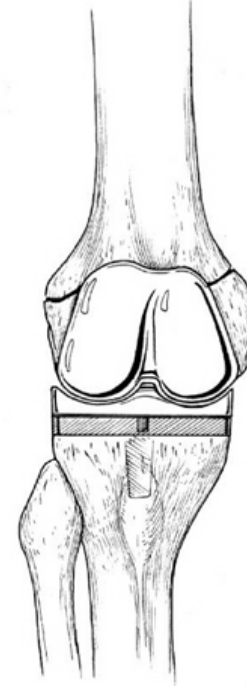
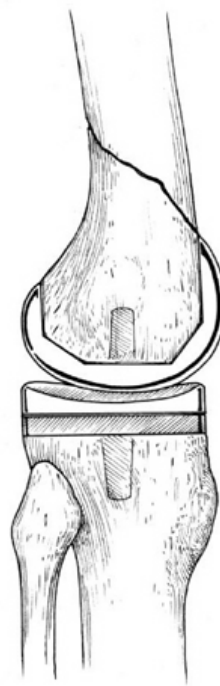
Type I

Fracture proximal to femoral knee component.



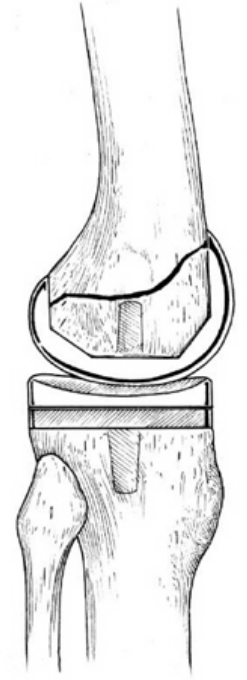
Type II

Fracture originating at the proximal aspect of the femoral knee component and extending proximally

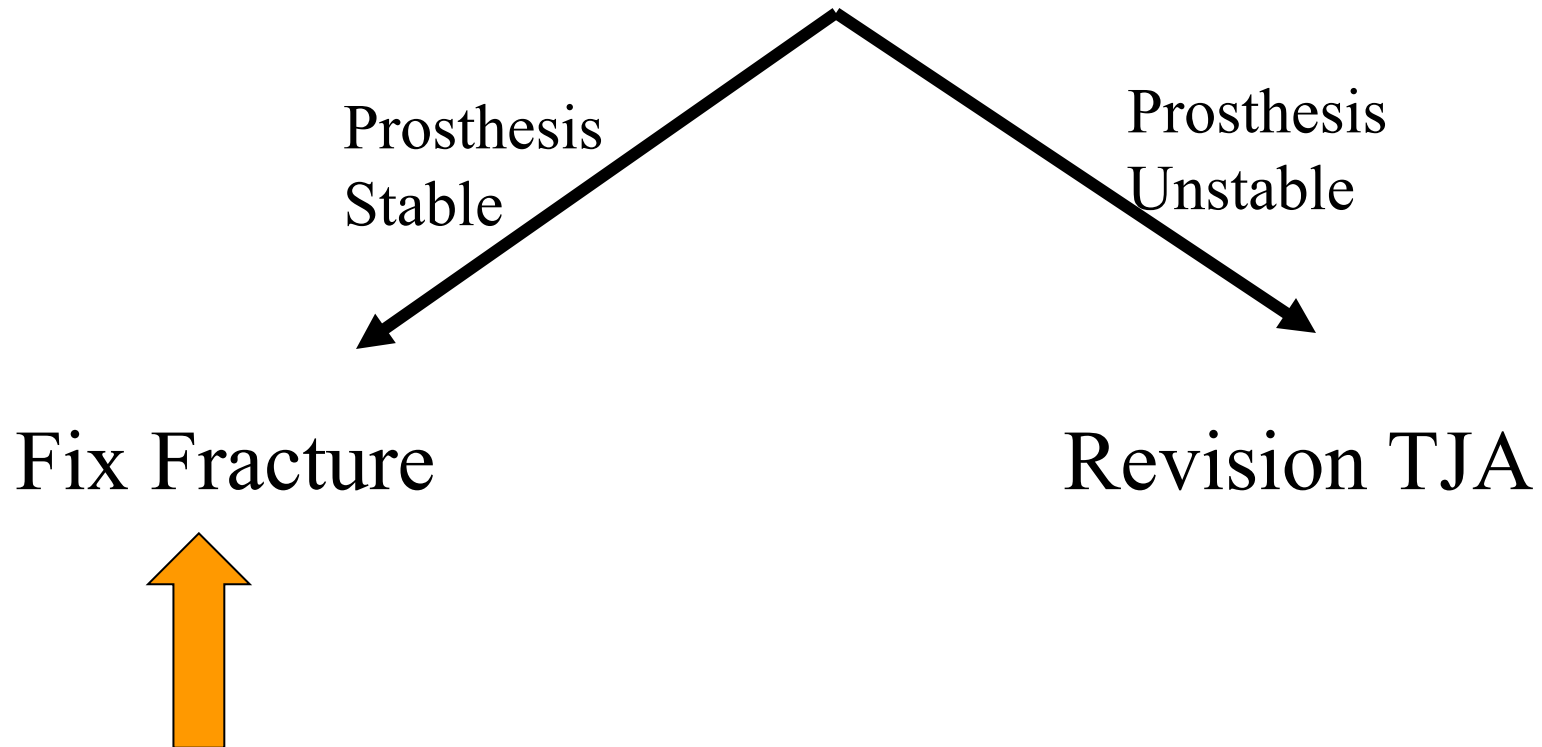


Type III

Any part of the fracture line is distal to the upper edge of the anterior flange of the femoral knee component.



General Treatment Algorithm



Options for ORIF

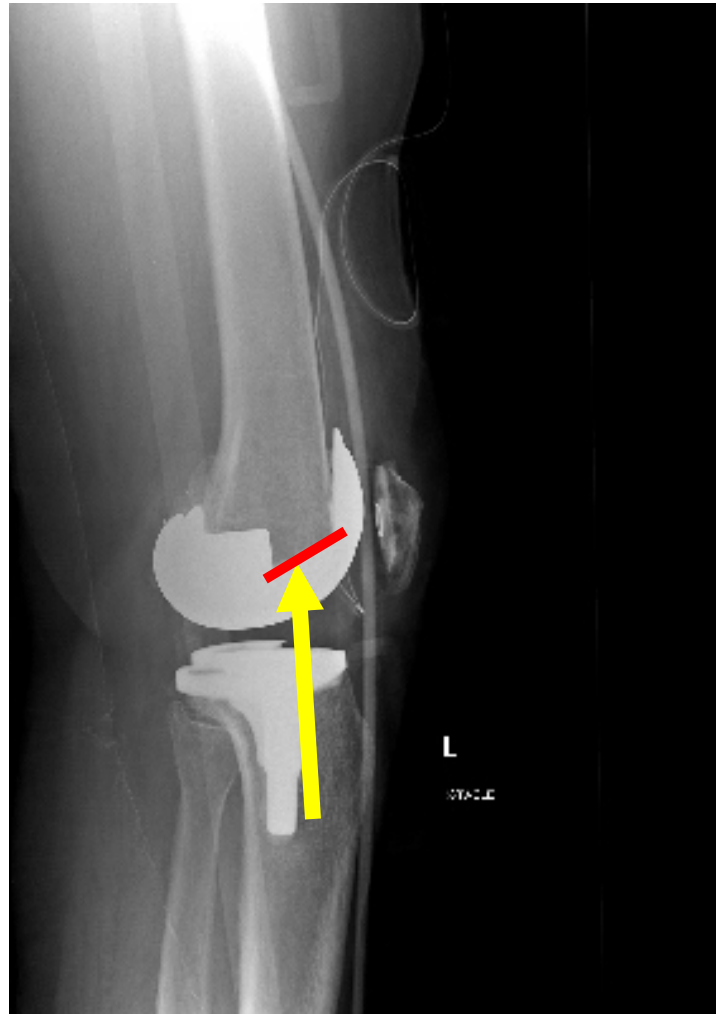
- Plate
 - Blade Plate
 - Dynamic Condylar Screw
 - Buttress Plate
 - Nonlocking
 - Locking
 - Periprosthetic Plates
 - Dual plates
 - IM Nail
 - Antegrade
 - Retrograde
 - Short
 - Long
-
- Nail Plate Combination

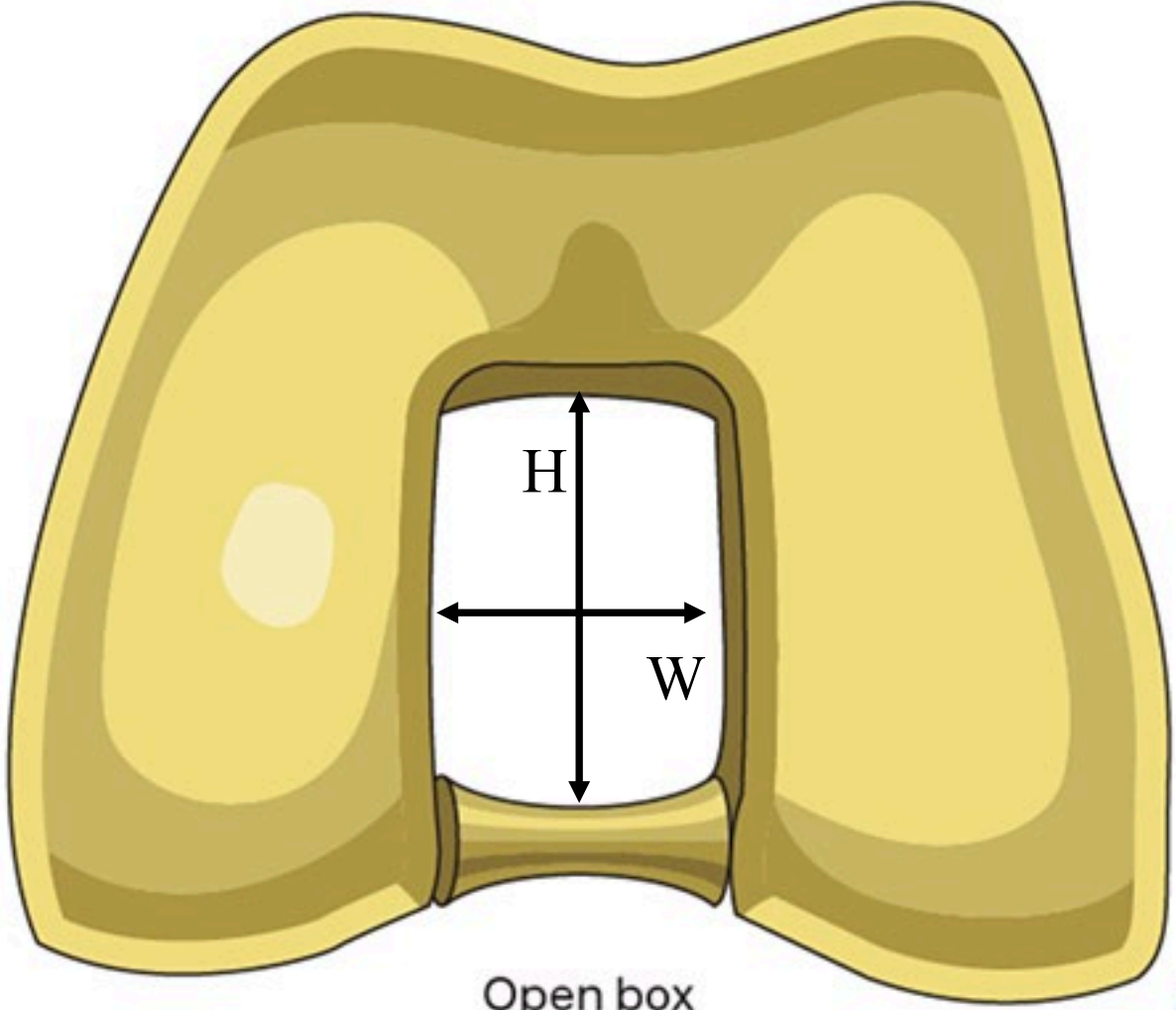
Choice of Implant

- Create a fixation construct that “protects” the entire femur
 - Hip stem above – must use long plate (long IM nail not possible, short IM nail alone poor choice)
 - Above TKA, plate or nail



IM Nailing



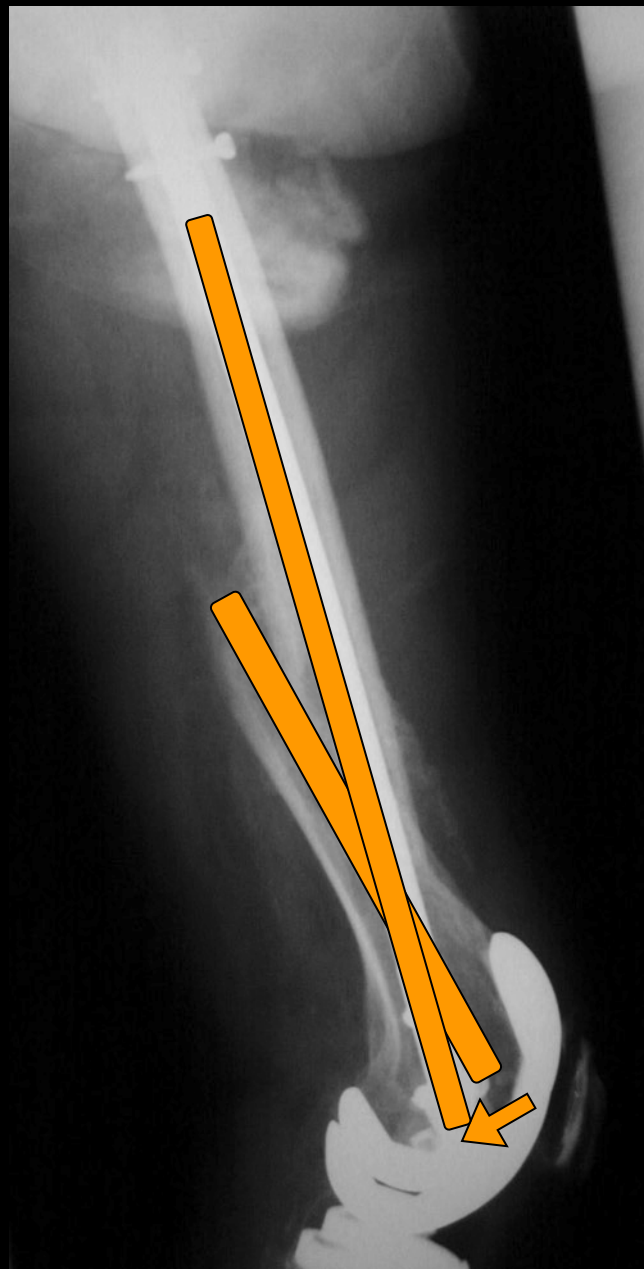


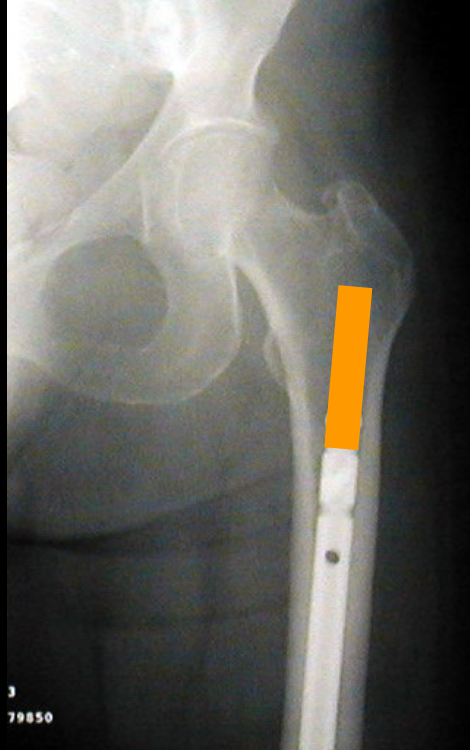
Open box

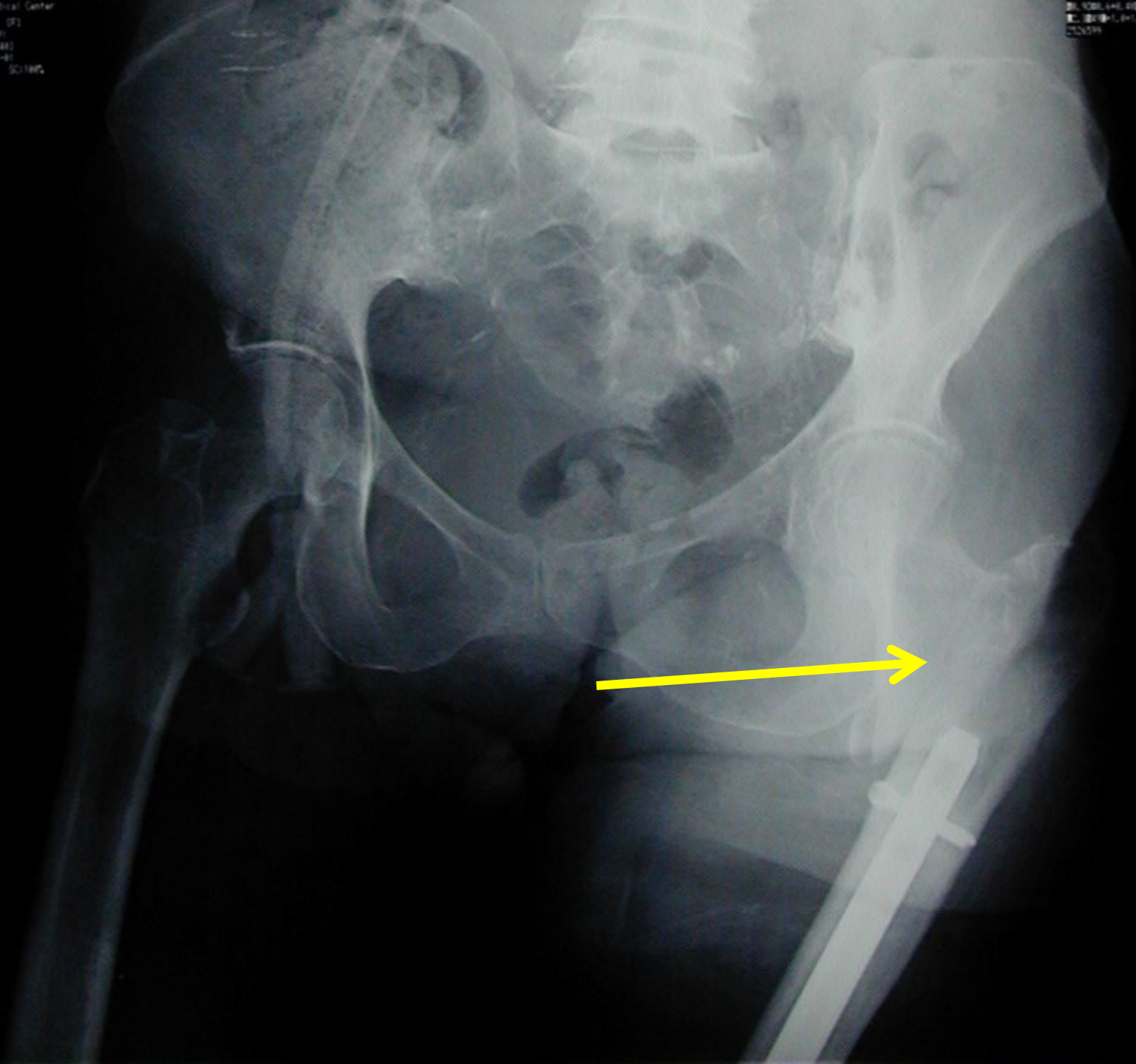
AO













Periprosthetic Supracondylar Femoral Fractures Above a Total Knee Replacement: An Updated Compatibility and Technique Guide for Fixation With a Retrograde Intramedullary Nail

*Daniel E. Gerow, DO,^a Hunter L. Ross, DO,^a Andrew Bodrogi, MD,^b Kory J. Johnson, DO,^c
and Terrence J. Endres, MD^c*

(J Orthop Trauma 2022;36:e92–e97)

Look up this article for current info re TKA component info

TABLE 1. TKA and Retrograde Femoral Nailing Compatibility

Manufacturer	Model	Size/Description	Intercondylar Distance, mm	Compatible?	Notch Too Far Posterior?
ARTHREX	iBalance PS	1–10	18	Yes	No
	iBalance CR				
CONFORMIS	iTotal CR		Custom to patient	N/A	N/A
	iTotal PS		Custom to patient	N/A	N/A
DEPUY	Attune CR				
	Attune PS	1–10	14.1–20.2	Yes	No
	LCS Complete	FEM POR small–large	12.903–20.371	Yes	No
	LCS Complete RPS	FEM CEM small–large RT	13.462–20.371	Yes	No
	LCS CR	Small+ to large+	15.7–21.9	Yes	No
	LCS PS		N/A	N/A	No
	AMK		20	Yes	No
	Coordinate		Closed box	No	No
	Townley knee		17	N/A	No
	PFC (Press Fit Condylar)		20	Yes	No
	Sigma CR	1.5 to 6	17.399–17.526	Yes	No
	Sigma CR 150	1.5 to 6, and 4N	17.399	Yes	No
	Sigma CS, PS and lugged	1.5 to 6, and 4N	11.557	No	No
	Sigma TC3	1.5 to 5	11.557	No	No
	Sigma PS RPF Hi-flex		Closed box	No	
	Insall-Burstein PS		15	Yes	No
	Total Condylar 1		15	N/A	No
Total Condylar 2		18	N/A	No	
Cyntor		25	N/A	No	
Duofix (cementless)					
Trumatch PSI		See respective femoral component			

Plate Fixation

- Pre-contoured, fixed-angle locking periarticular plates are the current standard when plates used.
- Multiple locked distal screws in metaphysis
- Plate the entire femur to avoid another fracture.
- Variable angle locking screws of some benefit around TKA.









Portable

X-Table

R



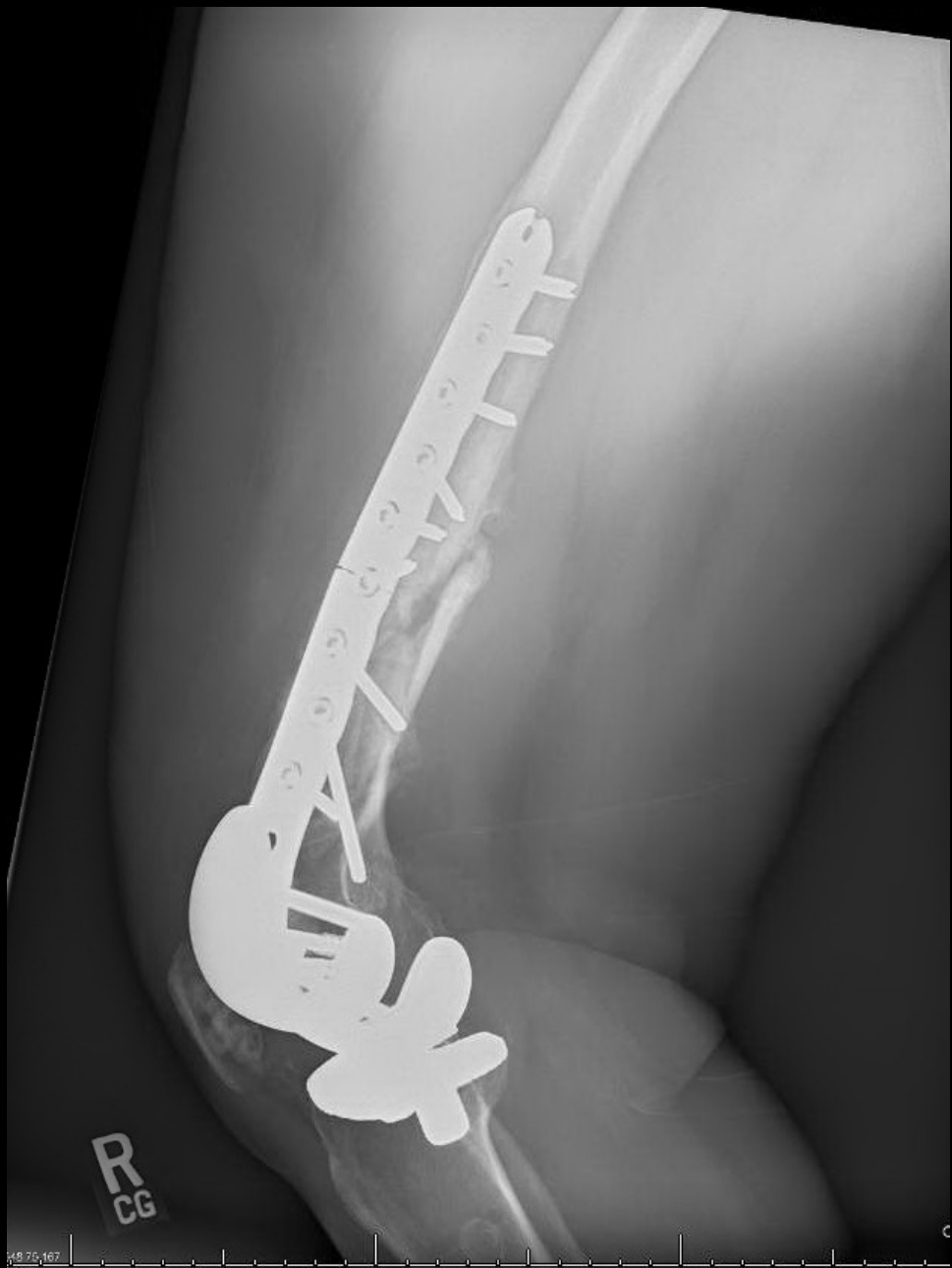
Portable

R



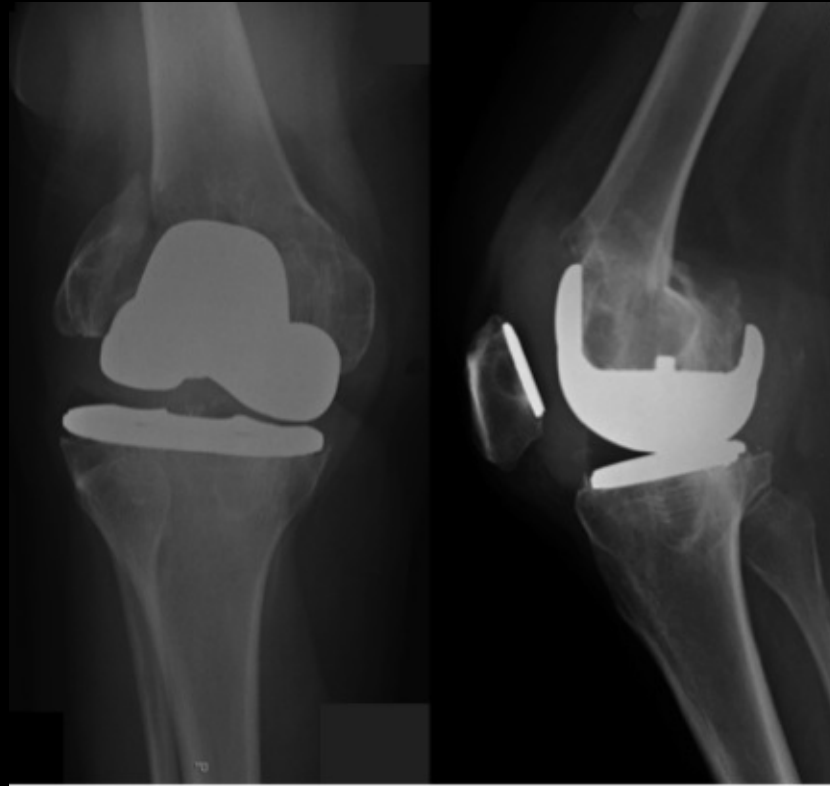
X.







What about fractures like this?





Are extreme distal periprosthetic supracondylar fractures of the femur too distal to fix using a lateral locked plate?

J Bone Joint Surg [Br]
2010;92-B:527-34.

P. N. Streubel,
M. J. Gardner,
S. Morshed,
C. A. Collinge,
B. Gallagher,
W. M. Ricci

From Washington
University School of
Medicine, St Louis,
Missouri

■ P. N. Streubel, MD, Research Fellow
■ M. J. Gardner, MD, Assistant Professor
■ B. Gallagher, MD, Resident
■ W. M. Ricci, MD, Professor, Chief
Orthopaedic Trauma Service,
Department of Orthopaedic Surgery
Washington University School

Table III. Results

	Group A (n = 28)	Group B (n = 33)	p-value
Complications (%)			
Deep infection	2 (7)	2 (6)	1.00 [†]
Delayed healing	5 (18)	2 (6)	0.23 [†]
Nonunion	3 (11)	5 (15)	0.72 [†]
Aseptic	2 (7)	4 (12)	0.81 [†]
Septic	1 (4)	1 (3)	
Atrophic	2 (7)	4 (12)	0.81 [†]
Hypertrophic	1 (4)	1 (3)	
Construct failure	4 (14)	3 (9)	0.51 [§]
Proximal	2 (7)	1 (3)	
Working length	1 (4)	0 (0)	
Distal	1 (4)	2 (6)	
Peri-implant fracture	1 (4)	0 (0)	0.46 [†]
Mean additional procedures (range)	0.21 (0 to 3)	0.24 (0 to 5)	0.87 [¶]
Additional procedures (%)			
Nonunion repair	2 (7)	4 (12)	0.68 [†]
I & D* infection	2 (7)	2 (6)	1.00 [†]
Amputation	1 (4)	0 (0)	0.46 [†]
Mean coronal alignment (°) (range)	84.8 (78 to 100)	85 (72 to 95)	0.87**
Mean sagittal alignment [†] (°) (range)	0.6 (-15 to 15)	0.6 (-12 to 12)	0.48**
Mean change coronal (°) (range)	0.5 (-2 to 4)	0.1 (-3 to 2)	0.06**
Mean change sagittal (°) (range)	0 (-2 to 0)	-0.6 (-4 to 9)	0.38**

Dual Plate Fixation of Periprosthetic Distal Femur Fractures

Nicholas A. Andring, MD, Shannon M. Kaupp, MD, Kaitlin A. Henry, BS, Kathryn C. Helmig, MD, Sharon Babcock, MD, Jason J. Halvorson, MD, Holly T. Pilson, MD, and Eben A. Carroll, MD

Single (n=34) vs. dual locked plating (n=38)

Dual plates allowed earlier WB

No nonunions or malunions in DP group, but
difference not statistically significant

0 vs 5% nonunion

0 vs 10% malunion

Dual Plate Fixation of Periprosthetic Distal Femur Fractures

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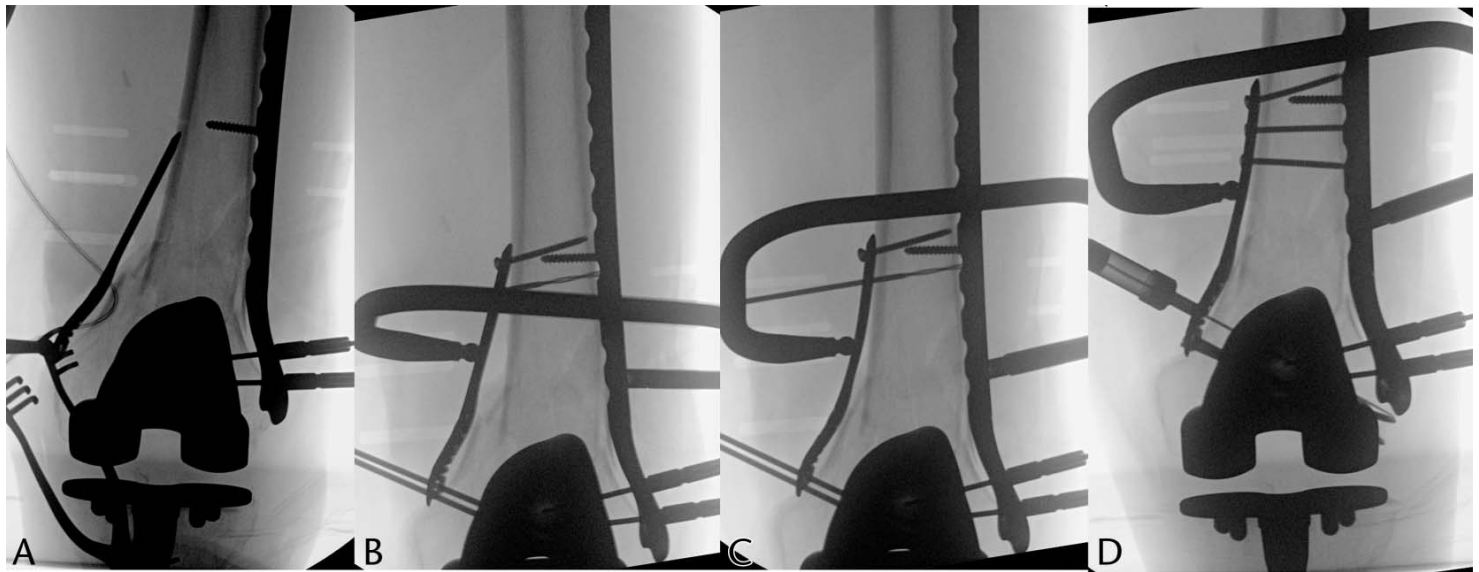


FIGURE 2. (A–D) Sequential fluoroscopic images of the coronal reduction using DP fixation to prevent deformity.

Dual Plate Fixation of Periprosthetic Distal Femur Fractures

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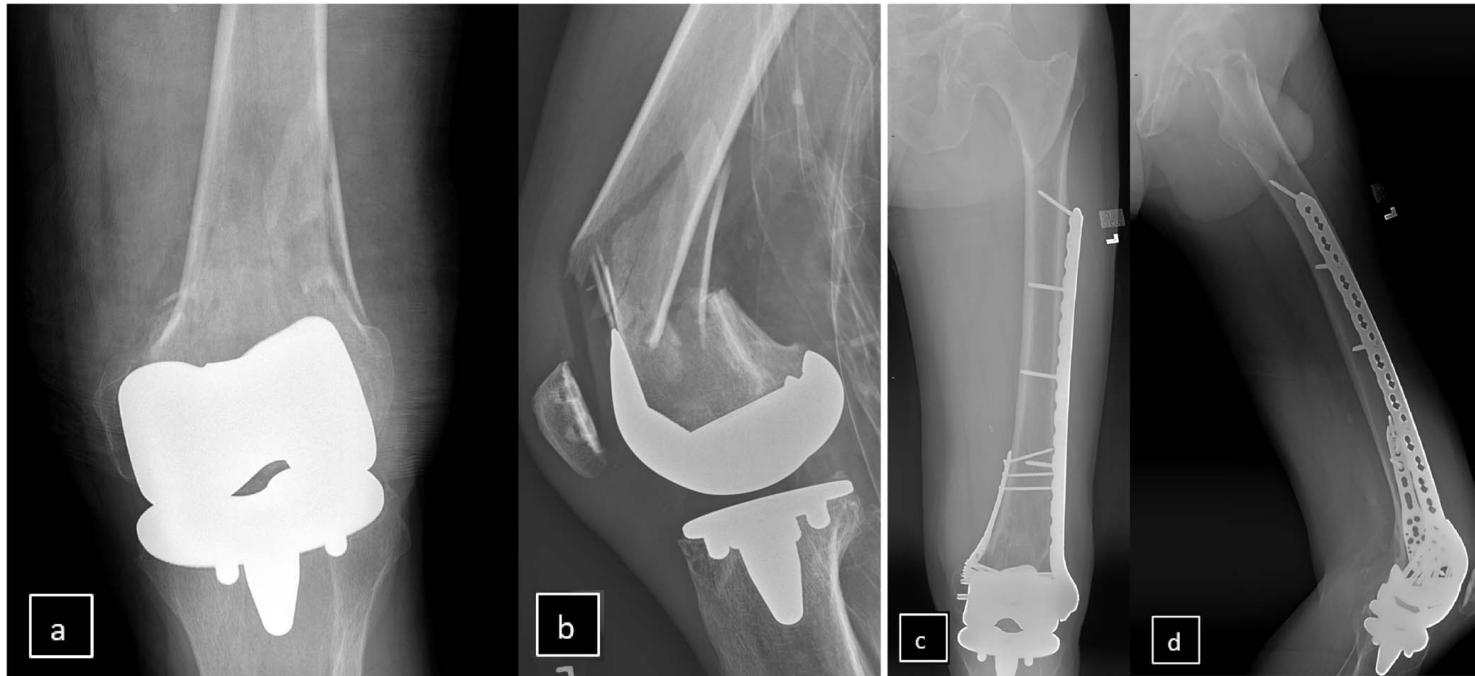


FIGURE 1. (A and B) Injury films of a DPPF followed by figures (C and D) postoperatively after undergoing DP fixation.

Nail Plate Combination

(J Orthop Trauma 2019;33:e64–e68)

Nail Plate Combination Technique for Native and Periprosthetic Distal Femur Fractures

Frank A. Liporace, MD and Richard S. Yoon, MD

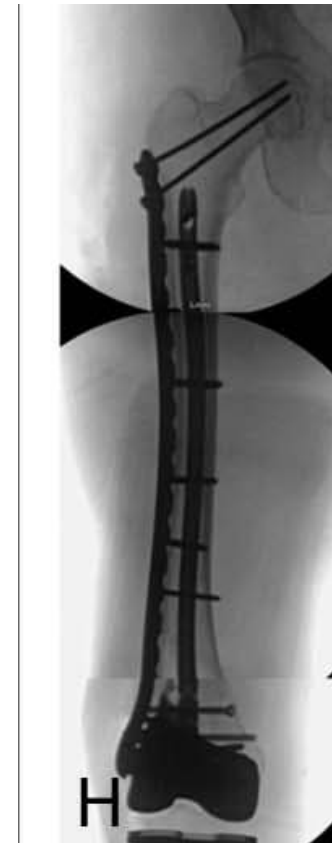


(J Orthop Trauma 2019;33:e64–e68)

Nail Plate Combination Technique for Native and Periprosthetic Distal Femur Fractures

Frank A. Liporace, MD and Richard S. Yoon, MD

- Rationale: the nail moves the weight-bearing axis medially so that it aligns with the anatomical axis of the femur
- The combined construct benefits from the added stability provided by the linked lateral locked-plate



Nail and Plate Combination Fixation for Periprosthetic and Interprosthetic Fractures

*Richard S. Yoon, MD, Jay N. Patel, DO, and Frank A. Liporace, MD
(J Orthop Trauma 2019;33:S18–S20)*

Nail Plate Combination Technique for Native and Periprosthetic Distal Femur Fractures

*Frank A. Liporace, MD and Richard S. Yoon, MD
(J Orthop Trauma 2019;33:e64–e68)*

Rationale:

- By combining both IMN and plate fixation in the distal femur, energy is more evenly distributed between the bone and the implants.
- The rIMN moves the neutral, weight-bearing axis medially, along the anatomical axis of the femur with added stability provided by the laterally locked plate.
- Linking the nail and the plate distally while spanning the entire length of the femur, potentially allows for smoother transition of forces allowing for stable, early weight bearing.

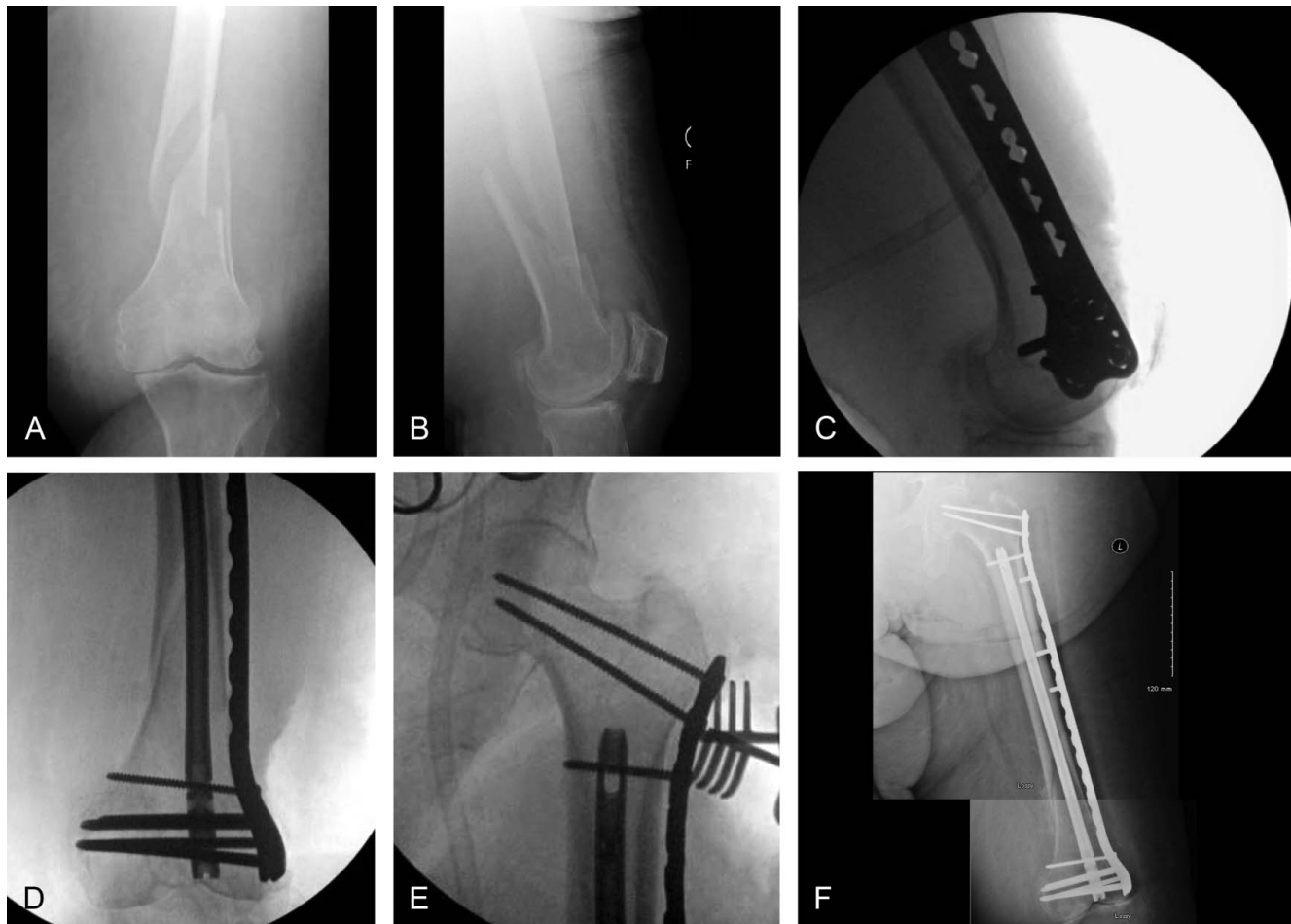


FIGURE 2. A–F, Patient is a morbidly obese 65-year-old woman, s/p twisting injury while getting out of bed and fell. A–B, AP and lateral radiographs revealed a distal femur, metaphyseal fracture with shaft extension in osteoporotic bone. Keeping in mind the pre-existing knee osteoarthritis, a midline, lateral parapatellar approach was used in preparation for potential future TKA. Similar to the previous case, a step-wise approach was performed to place the nail, pick, prepare, and plate the plate, (C–D) link the system distally and provide balanced, spanning fixation with (E) proximal prophylactic fixation. This patient was made immediately weight bearing as tolerated and continued to ambulate and heal, with bridging callus already seen at the (F) 6-week follow-up time point. The patient continued to do well and is now ambulating at home with a cane at 1-year follow-up.

Nail Plate Combination Fixation Versus Lateral Locked Plating for Distal Femur Fractures: A Multicenter Experience

Brendan Y. Shi, MD,^a Dane J. Brodke, MD,^a Nathan O'Hara, PhD, MHA,^b Sai Devana, MD,^a Adolfo Hernandez, BS,^a Cynthia Burke, BS,^b Jayesh Gupta, BS,^b Natasha McKibben, BS,^b Robert O'Toole, MD,^b John Morellato, MD,^c Hunter Gillon, MD,^c Murphy Walters, MD,^c Colby Barber, MD,^d Paul Perdue, MD,^d Graham Dekeyser, MD,^e Lillia Steffenson, MD,^e Lucas Marchand, MD,^e Stephen Shymon, MD,^f Marshall James Fairres, MD,^f Loren Black, MD,^g Zachary Working, MD,^g Erika Roddy, MD,^h Ashraf El Naga, MD,^h Matthew Hogue, MD,ⁱ Trevor Gulbrandsen, MD,ⁱ Omar Atassi, MD,^j Thomas Mitchell, MD,^j and Christopher Lee, MD^a

- 33 nail-plate compared to 876 lateral locked plates
- 13% periprosthetic fractures
- Matched 30 patients in each group based on propensity score for all variables associated with treatment and reoperation for any reason
- Reoperated 3% nail-plate group vs 23 % lateral plate
- Varus collapse 0% vs 10%

Key Concepts:

Periprosthetic Fractures

Demand Your Best Work

- Patient Evaluation
- Pre-op Planning
- Expert Surgery
- Appropriate Rehab

Plating Pitfalls.

- Plate too short
- Plate construct too stiff – Don't fill every screw hole, use long plate / few screws

Role of Nailing

- Has typically been limited, but increasing with newer generation nails with more interlocking options.
- Not for fractures below THA – would use a long plate

Consider the plate/nail
construct for fractures that are
comminuted or in patients
with poor bone quality

Thank You