



**Tibial Shaft
Tricks and New Techniques**

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Principles of nailing



KUNTSCHER CLOVER LEAF NAIL
FOR FEMUR (K-NAIL)

Objectives

- Indications
- Principles
- Techniques
- Avoiding Complications



Indications

- Diaphyseal fractures of long bones
- Some long bone metaphyseal fractures



Principles

- All modern nails are essentially the same
 - Stainless or titanium
 - Humerus, femur or tibia
- Diaphyseal fixation
- Load sharing
- Proximal and distal interlocking

Techniques

- Start point
- Open the canal
- Ream the canal
- Place the nail
- Lock the nail

Advantages of IM Nail

- Less malunion and shortening
- Earlier weight bearing
- Early ankle and knee motion
- Reduced time to union



-Shannon, J. Trauma 2002

Reamed vs. Nonreamed Nails

- Reamings (osteogenic)
- Larger Nails (& locking bolts)
 - Hardware failure rare w/ newer nail designs
- Damage to endosteal blood supply?
 - Clinically proven safe even in open fx

Finkemeier, et.al. JOT 2000
Forster, et.al. Injury Mar 2005
Bhandari, et.al., JOT 2000

Unreamed IM Nail

- Laboratory benefit of improved cortical perfusion
- Good results
 - 9% delayed union
 - 5% deep infection in Type III fractures



-Schemitsch, J. Trauma 1998
-Gaebler, JOT 2001

Reamed Tibial Nailing

- Good results in Open Fx
 - time to union 26wks
 - deep infection rate 3.5%
- Complications increased with Type IIIB fractures
 - time to union 50 weeks
 - infection rate 23%*



-Court-Brown JBJS 1991

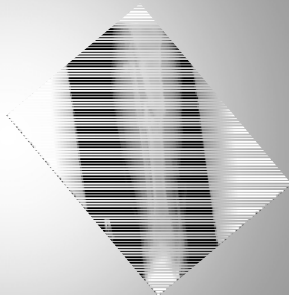
Reamed vs. Nonreamed Nails

	<u>Reamed</u>	<u>Non-Reamed</u>
# pts.	73	63
Nonunion	4%	11%
Malunion	4%	3%
Broken Bolts	3%	16%

Blachut JBJS 79A

Complications

- Infection 1-5%
- Union >90%
- Knee Pain 56%
 - w/ kneeling 90%
 - w/ running 56%
 - at rest 33%



Court-Brown, JOT 1996

Expanded Indications

- Proximal 1/3 fractures
 - Beware Valgus and Procurvatum
- Distal 1/3 fractures
 - Beware Varus or valgus
 - Beware of intraarticular extension

Proximal Tibia Fracture

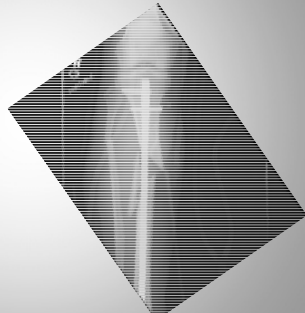
- Entry site is critical
- Reference
 - Lateral Tibial Spine



Too Low!
Procurvatum



Too Medial!
Valgus



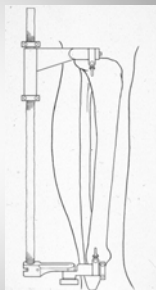
Semiextended Position

- Neutralize quadriceps pull on proximal fragment
- Medial parapatellar approach
 - subluxate patella laterally
- Use handheld awls to gently ream through the trochlear groove

Tornetta CORR '96

Hyperextended position

- Pulls patella proximally to allow straight starting angle
- Universal distractor



Beuhler JOT '97

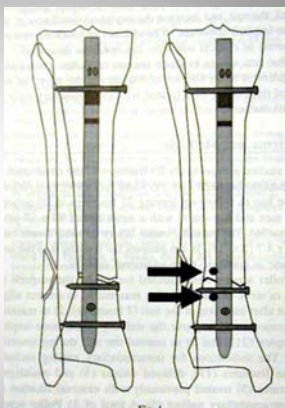
Blocking (Poller) Screws

- Functionally narrows IM canal
 - Increases strength and rigidity of fixation
 - Place on concave side of deformity
- 21 patients
 - All healed within 3-12 months
 - Mean alignment 1° valgus, 2° procurvatum

Krettek JBJS '99

Technique

- Screws placed on **concave** side of deformity
- Proximal or distal fractures



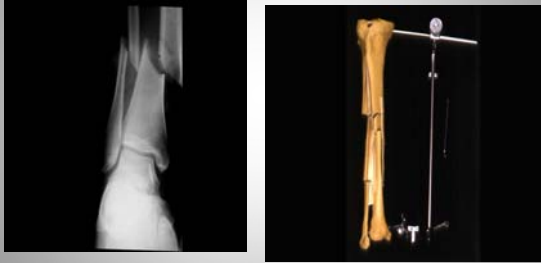


Distal Tibial Fractures

- Reduction before repair
- Distractor
- Fibula plate/nail
- Joy Stick
- Calcaneal Traction

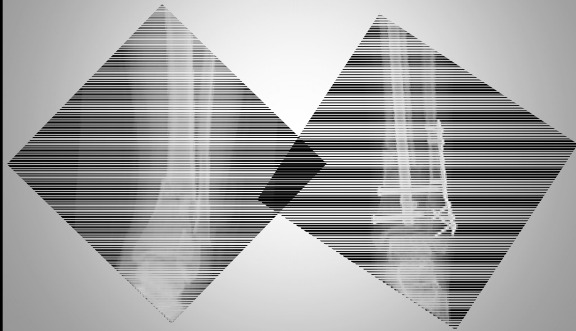


Universal Distractor Reduction

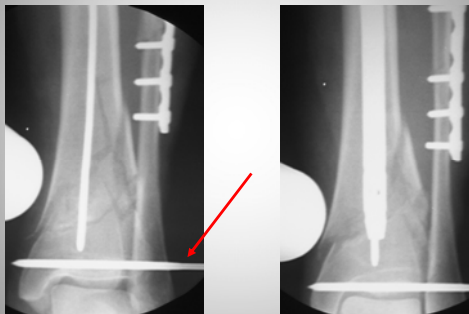


Beuhler JOT '97

Plate Fibula



Distal Tibial Joystick



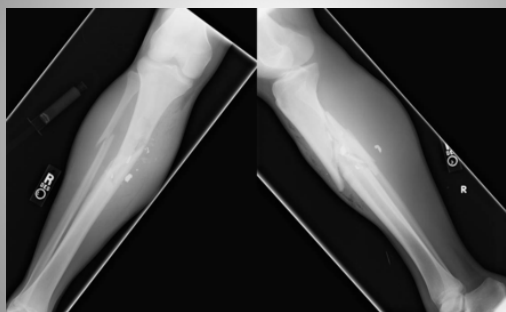
Outcomes of IM Nailing

- 859 closed tibia fractures
- 92.5% union rate
- 18.5 weeks to union
- 1.9% infection rate
- 4.4% aseptic nonunion

- "Reamed intramedullary nailing will probably continue to be the best method of treating tibial diaphyseal fractures."

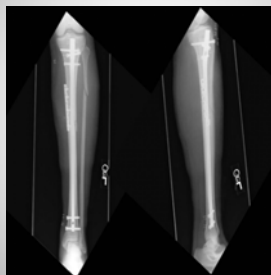
Court-Brown JOT '04

Problematic Fracture

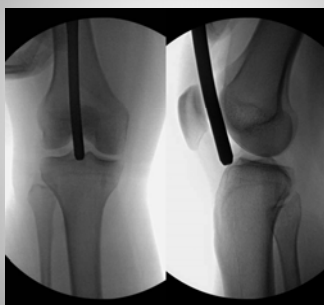


Surgical Techniques for Complex Proximal Tibial Fractures
Jason A. Lowe, MD; Nirmal Tejwani, MD; Brad Yoo, MD; Philip Wolinsky, MD
J Bone Joint Surg Am, 2011 Aug 17; 93 (16): 1548-1559

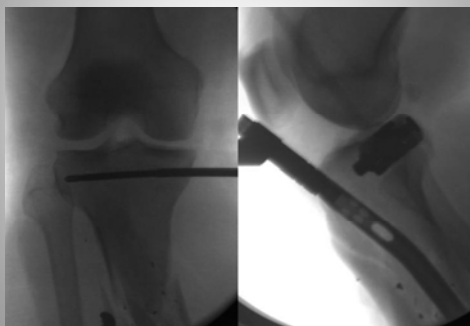
Unicortical Plating



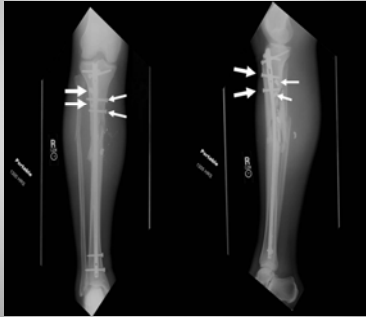
Suprapatellar nailing



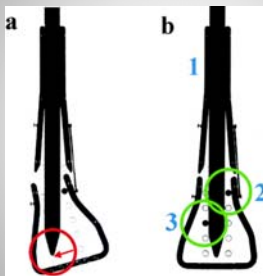
Supplemental Schanz Pin



Poller screws







Percutaneous clamp



Universal Distractor



- Prevent Complications by:
 - Careful pre-op planning
 - Attention to detail
 - Understanding of mechanical limits of fixation
 - Team work

DJ3445A

Summary

- All nails are the same
- Careful attention to detail generally results in excellent outcomes