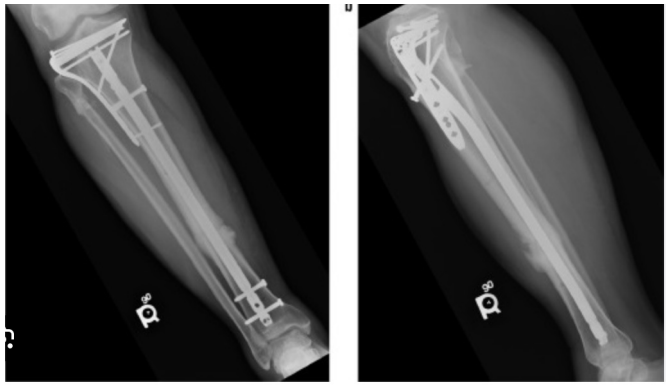
GELENKPUNKT
SPORTS AND JOINT SURGERY INNSBRUCK

Tibiaplateau fracture with extension to the shaft



Christian Fink
Tobias Schwäblein

FIFA MEDICAL CENTRE OF EXCELLENCE

ESSKA

Teaching Center

UMIT
the health & life sciences university

Introduction

- mostly complex injuries resulting from high impact trauma
- combined tibia plateau and shaft component (extension to shaft) on ipsilateral side are rare!
- 3.2% of all tibial shaft fractures and 8.4% of all tibial plateau fractures (Kubiak, E et al. 2008)

- fixation strategy based on fracture morphology, location and soft tissue affection

Conservative?

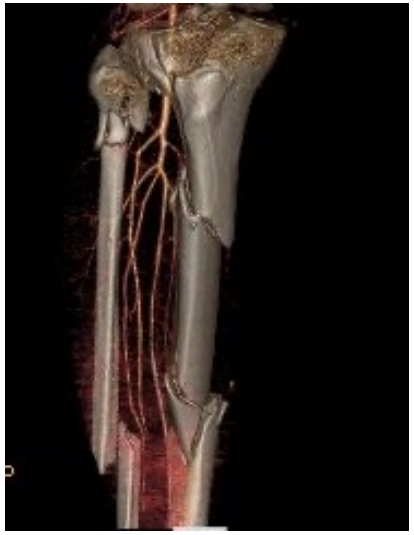
Hybrid fixation?

Intramedullary nail fixation?

Plate fixation?

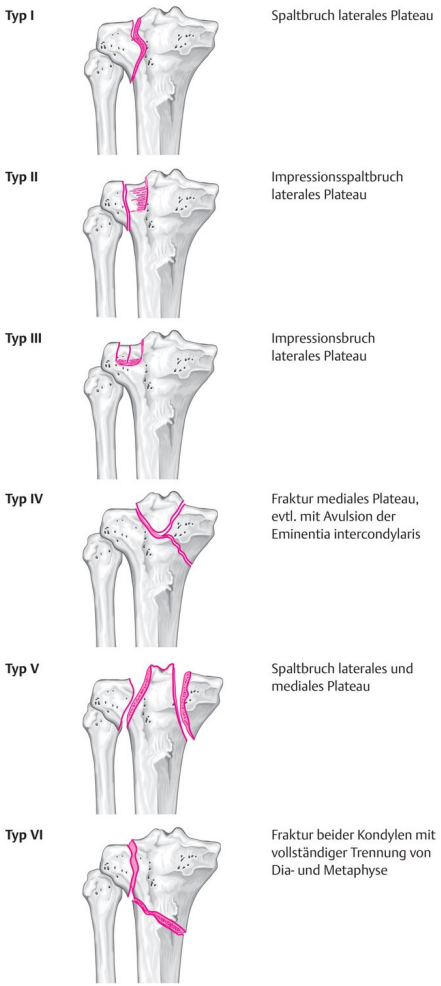
Temporary external fixation?

General considerations



- basic diagnostic tool > X ray ap. and lat. of knee AND adjacent joints
- soft tissue and pre-op neurovascular status assesment
- CT-Scan for exact fracture pattern recommended, CT - Angio is „gold standard“ if vessels might be compromissed
- defect size for bone graft?
- MRI additional intraarticular injury
- temporary external fixation, > 50 % open fractures and >70% accompanying injury! (Kubiak et al. 2008)
- **Cave:** no spinal anesthesia if compartment is suspect!

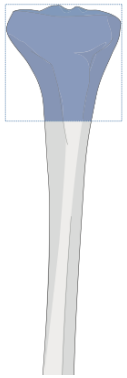
Classification



Schatzker

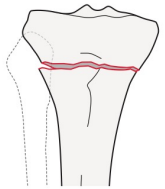
41

Location: Proximal end segment 41

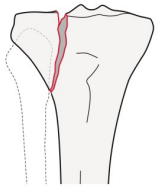


Types:

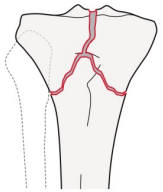
Tibia, proximal end segment, **extraarticular fracture** 41A



Tibia, proximal end segment, **partial articular fracture** 41B



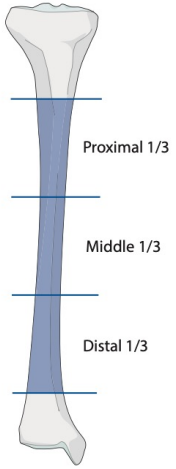
Tibia, proximal end segment **complete articular fracture** 41C



AO - proximal tibia

42

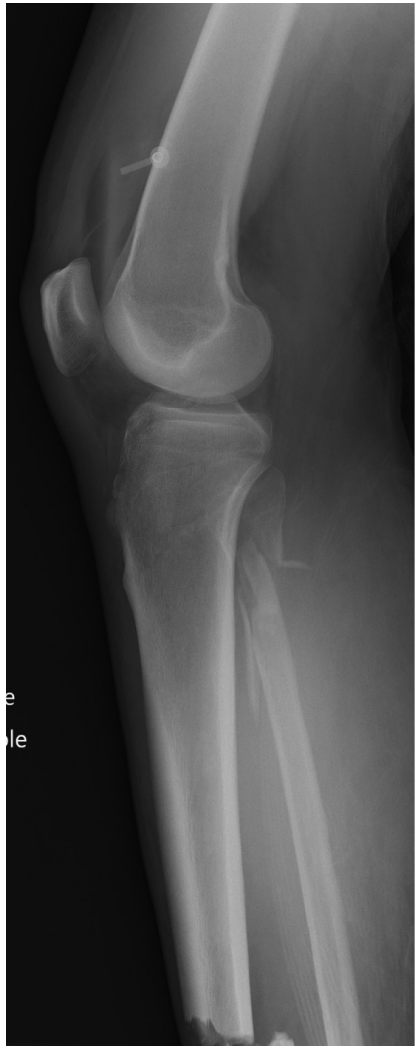
Location: Tibia, **diaphyseal segment** 42

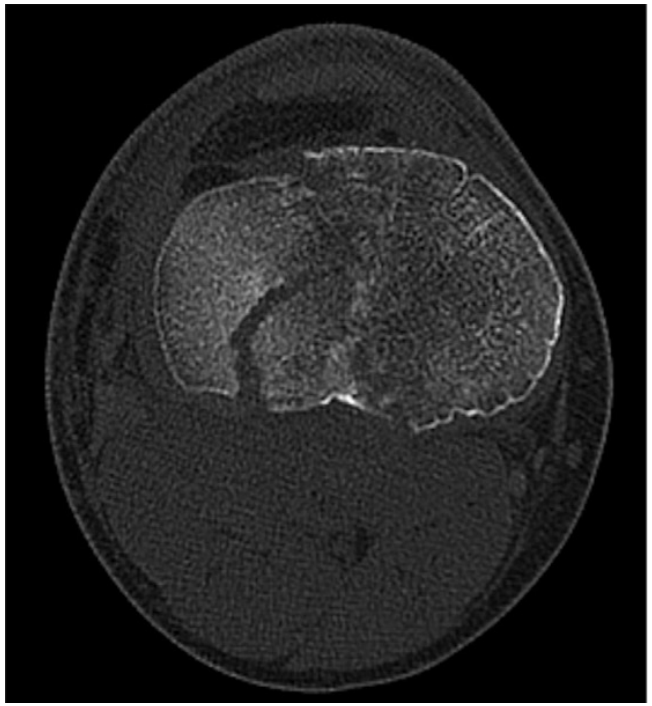


AO - midshaft tibia

Etc.

Typical radiograph findings





Paul W. Perdue. Treatment of Combined Tibial Plateau and Shaft Fractures 2018. Oper. Tech Orthop. 28:164-174

Treatment goals

- problems: infrequency injury pattern > no clear recommendation
  "bifocal fractures" (Keating et al 1994)

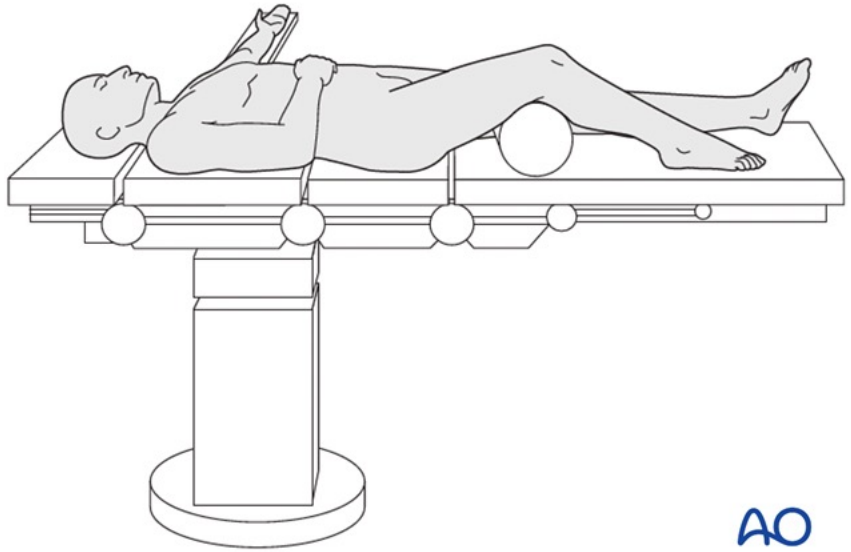
- no „one fits all" fixation

- **first** restoration of articular surface and proper inclination of plateau
- **second** stabilization of the shaft > length, axis, rotation

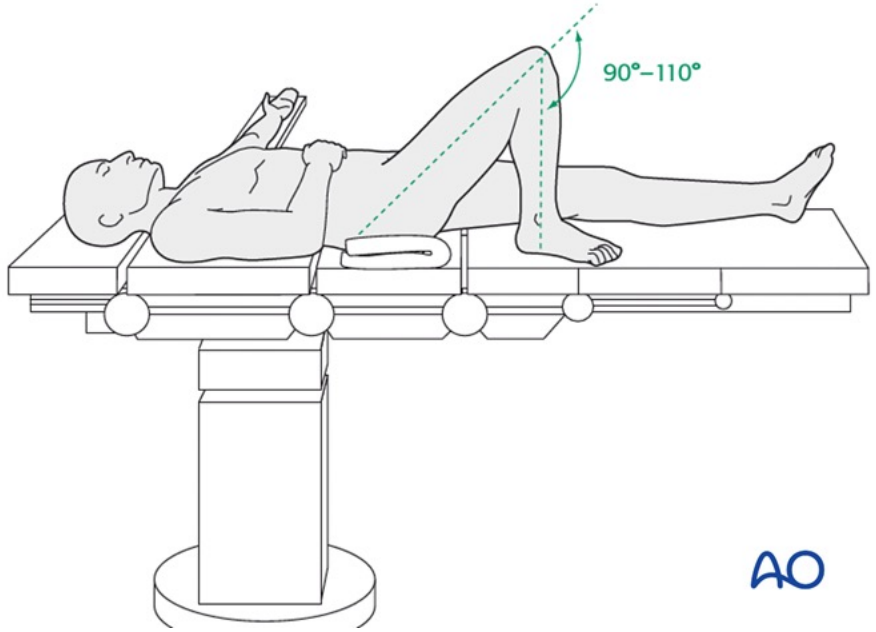
(articular) plate + intramedullary nail

minimally invasive plate osteosynthesis (MIPO)

OT Setting



standard supine for
plate fix.

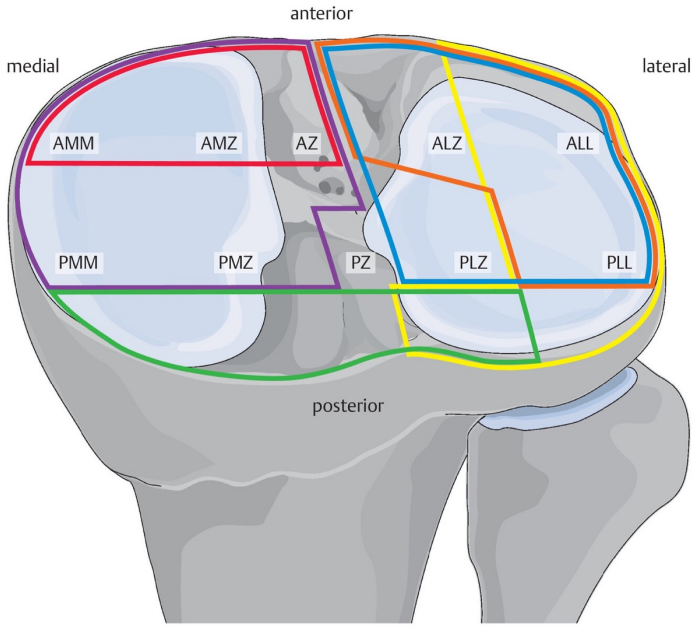


standard supine for
intramed. nailing

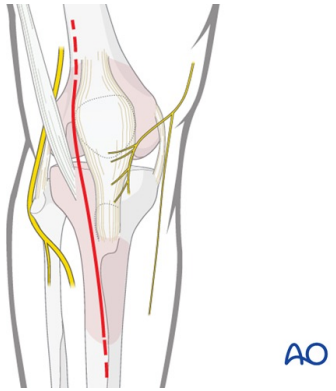
Note: additional leg holder allows variable flexion angle
in lateral plateau fractures > pillow under buttocks

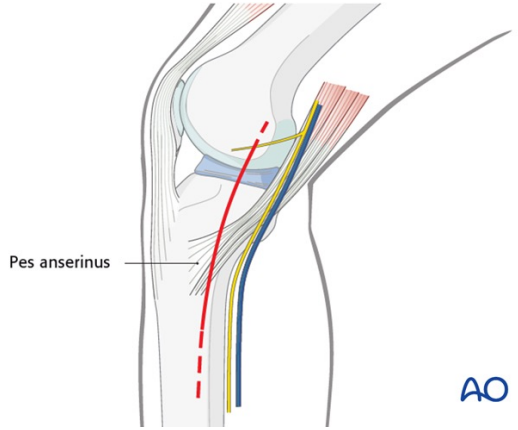
Approach

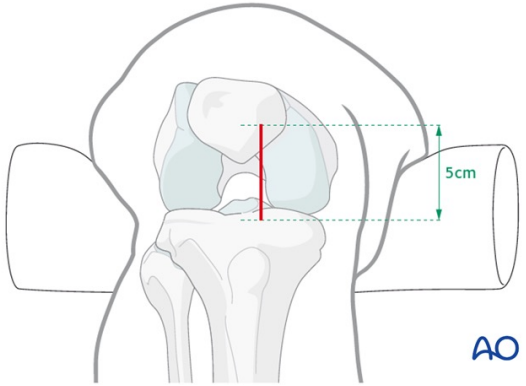
- Which fixation fits which injury component?



Anteromedial (supine position)
Posteromedial (prone position)
Anterolateral (supine position)
Modified posterolateral (prone position)
Extended lateral (supine position)
Extended medial (supine position)



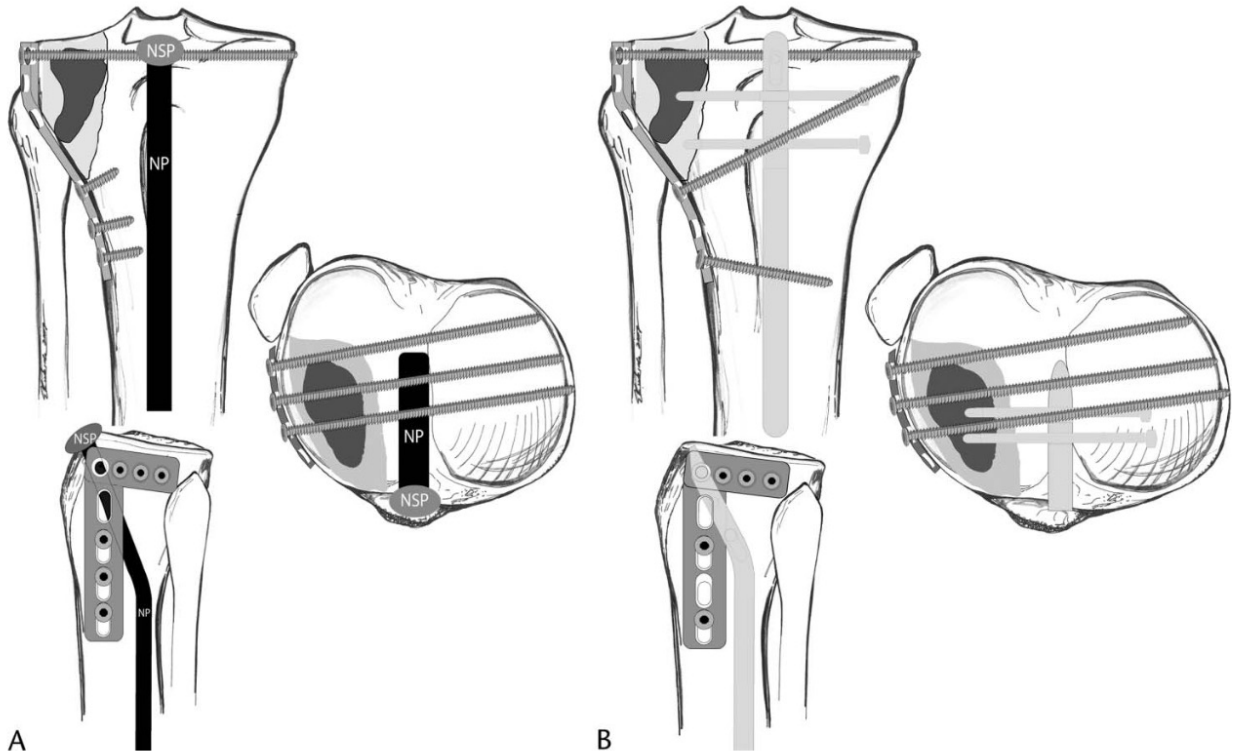




Etc.

Mod. Krause M, Müller G, Frosch K-H, 2018

Fixation Strategy



~~Conflict of fixation~~

Kubiak EN et al. J. Orthop Trauma. 2008.

A) First plate fixation of lateral plateau with approximated nail path (NP), nail starting point must not compromise the plate

B) Final placement of the nail, the unicortical screws of the shaft can be changed afterwards

Advantage?

- nail-plate combinations > <u>early weight- bearing</u>
- > greater resistance to axial and torsional forces compared to single fiaxtion than either nail or plate fixation alone. (Wright DJ et al. J Orthop Trauma 2020)

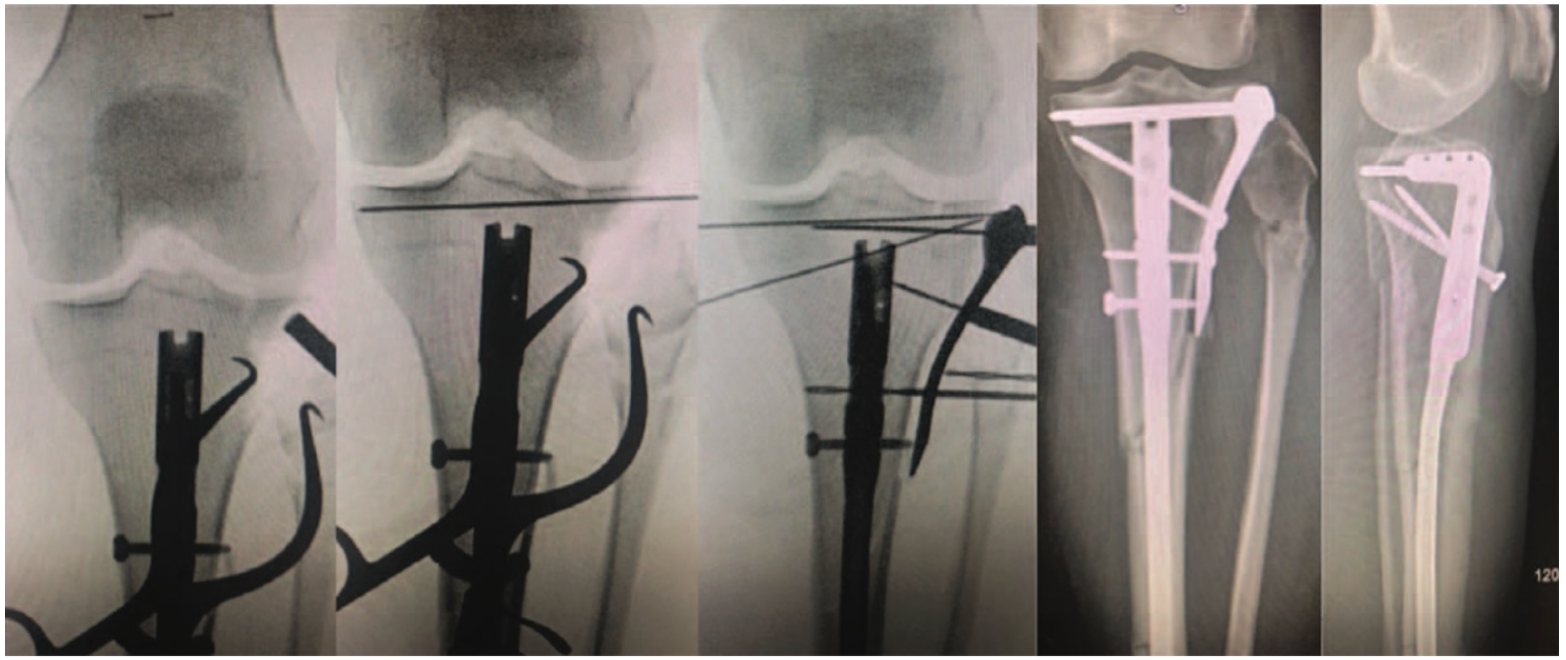
Injury characteristics, operative details, and treatment course in patients treated with nail-plate constructs and early weight-bearing

Patient	Age	Sex	Mechanism	Additional injuries	Gustilo Anderson classification	Schatzker classification	Initial external fixation	Treatment complications	Length of stay (d)	Weightbearing status	Time to healing (m)
1	38	M	Motor vehicle collision	Contralateral open tibia and fibula fracture, Contralateral distal femur fracture	—	II	Y	N	32	WBAT	8.6
2	48	F	Pedestrian struck	—	II	II	N	N	18	PWB	N/A
3	52	M	Fall from 10 ft	—	—	VI	Y	N	8	WBAT	6.5
4	62	F	Fall from 3 ft	Contralateral patella fracture, scalp laceration	—	VI	Y	N	16	WBAT	4.3
5	68	F	Pedestrian struck	Ipsilateral anterior column with posterior hemitransverse acetabular fracture	—	V	N	N	14	WBAT	9.3

Bogdan, Y et. al. OTA International, 2022.

WBAT: weight bearing at tolerance, PWB: partial weight bearing

Nail first, plate second?



Bogdan, Y. and Dedhia, N. OTA International (2022)

sufficient nail stability via single screw proximally and distally

adding more srews for additional stability is recommended after plate insertion

Other options?

Suprapatellar intramedullary nail combined with screw fixation has comparable surgical outcomes to minimally invasive locking plate fixation in ipsilateral tibial plateau and shaft fractures

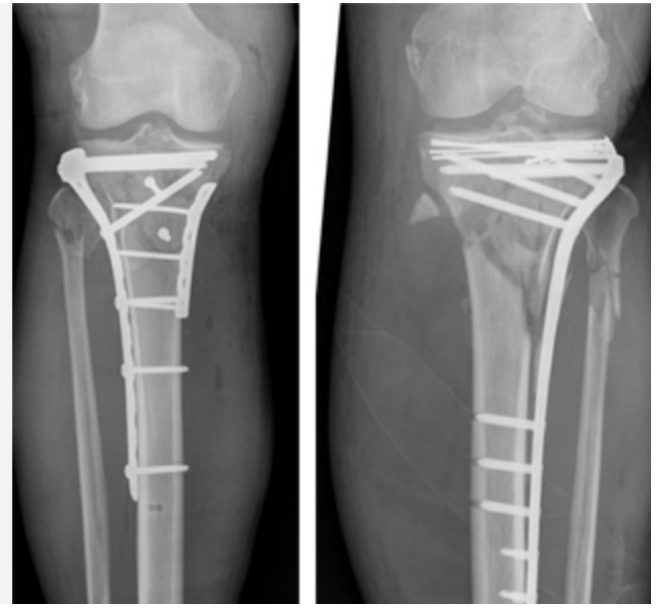
Sumin Lim[1] · Hyung Keun Song[1] · Tae Hun Kim[1] · Do Young Park[1] · Jong Wha Lee[1] · Jun Young Chung[1]

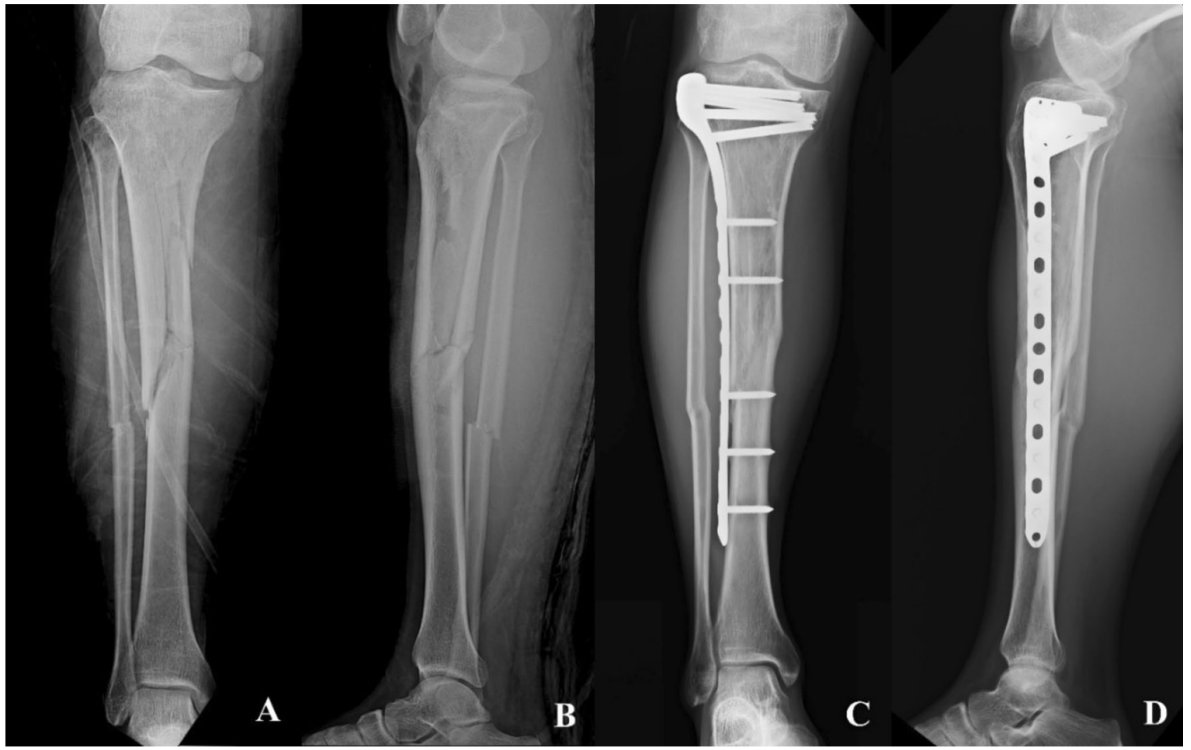
Received: 21 December 2022 / Accepted: 13 November 2023 / Published online: 30 November 2023

same results in:
union rate
union time
alignement
complications

or ?

- minimally invasive plate osteosynthesis (MIPO) technique
- reduced soft tissue damage even in long plates!

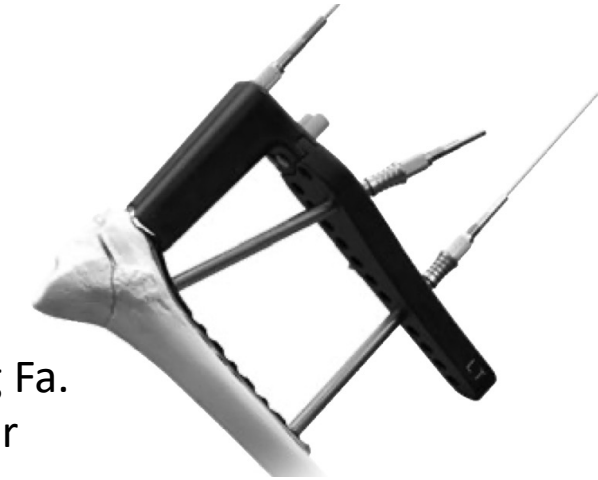




Lim, S et al. Archives of Orthopaedic and Trauma Surgery (2024)

Technique

- specialized plates necessary! e.g. Zimmer® MISTM Periarticular Proximal Tibial Locking Plate or Synthes LCP Proximal Tibial Plate
- medial or lateral approach based on fracture type
- creating tunnel for plate insertion with separating of soft tissue, using elevator
- reduction via traction and temporary K-wire fixation > accurate intraarticular fragment reduction
- insert plate attached to the MIS jig > maintaining accurate reduction
  .
- screw placement through cannula



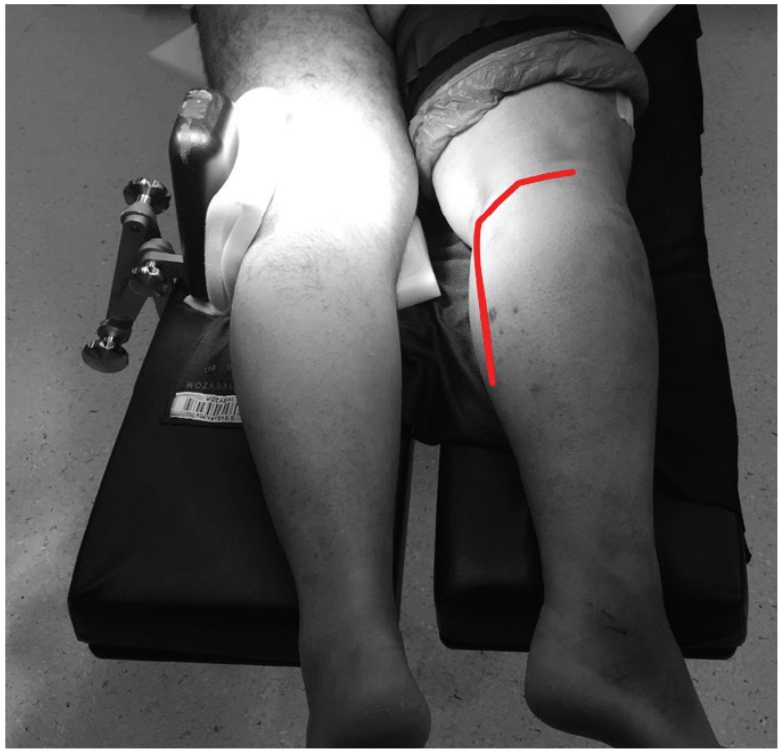
MIS Jig Fa.
Zimmer

Plate combination

- But combination of plates often necessary!
- still minimal invasive?

especially if dorsal fracture component

Tips and tricks



- „Floppy“ setting for adressing lateral AND dorsal plateau

Complications

- Knee stiffness
- Acute infection
- Chronic infection (osteomyelitis)
- Malunion
- Non-union
- Post-traumatic osteoarthritis
- Residual knee instability secondary to ligament damage that was not addressed initially

Comparison

Original Article

Treatment of tibial plateau fractures: A comparison of two different operation strategies with medium-term follow up

Zhongzheng Wang [a b 1], Zhanle Zheng [a b c 1], Pengyu Ye [a b], Siyu Tian [a b], Yanbin Zhu [a b c], Wei Chen [a b c], Zhiyong Hou [a b c], Qi Zhang [a b c], Yingze Zhang [a b c d 2]

Journal of Orthopaedic Translation 2022

MIS Fixation vs. **classic ORIF**

<u>less:</u>
pain
p.o. stiffness
superficial infection rate

Conclusion

- combined tibia plateau and shaft component are rare
- fixation strategy is based on fracture morphology, location and soft tissue effection
- surgical approach follows the reduction plan

Conclusion

- various combinations of osteosynthesis techniques can be applied
- good clinical outcomes are more based on the surgeon's experience then on specific osteosynthesis material

Personal experience:

nailing in this type of fractures is really difficult
> MIPO!

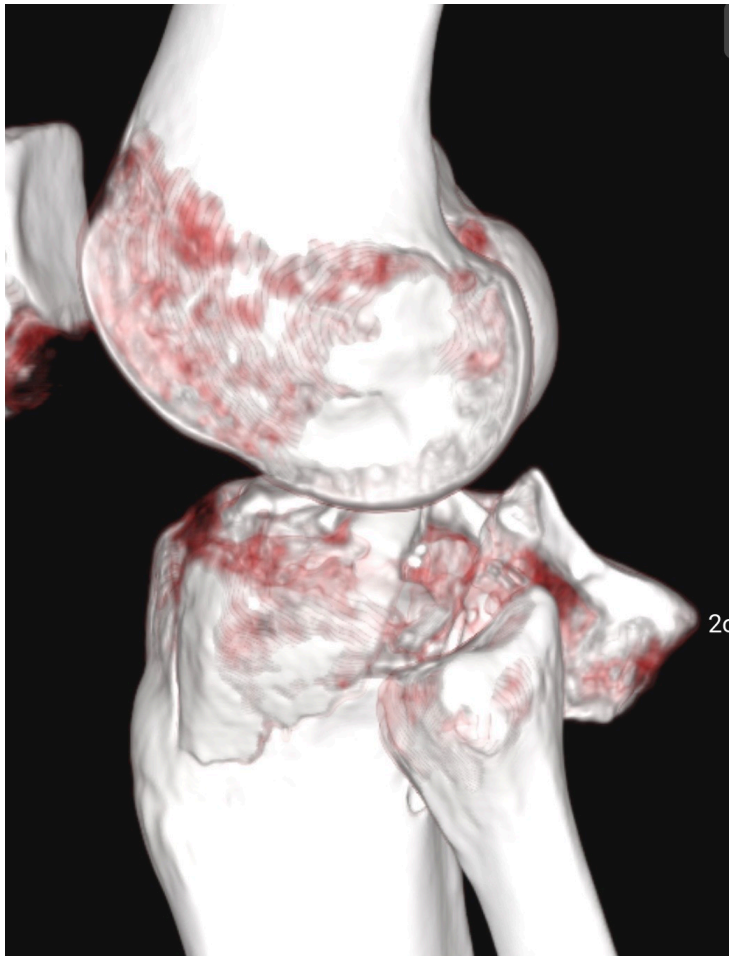
Thank you

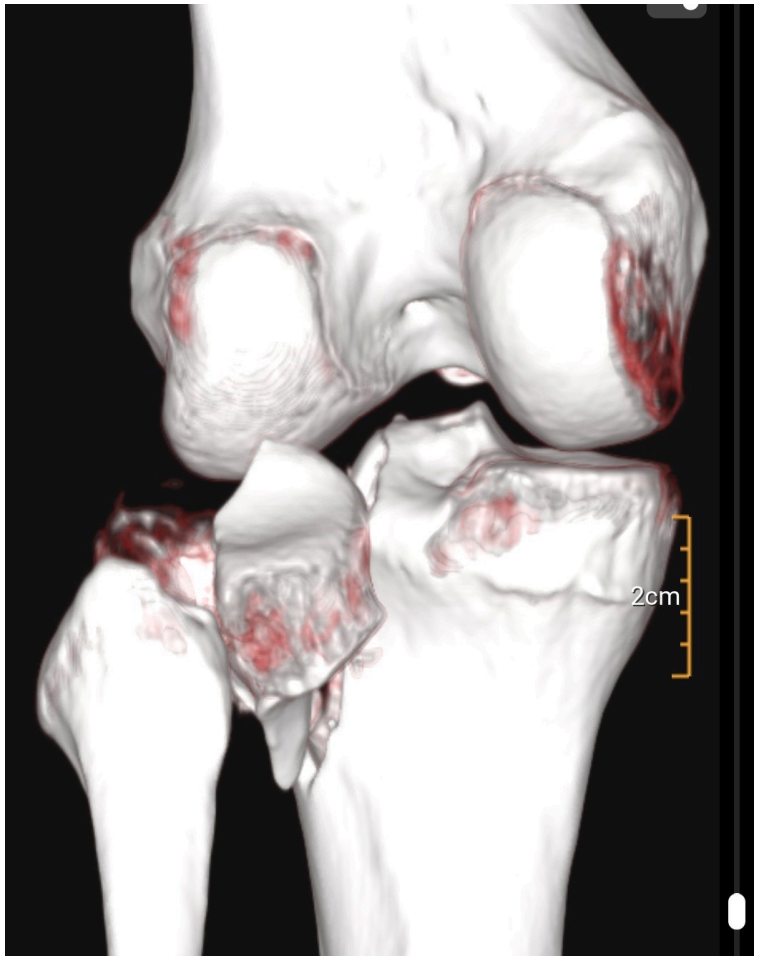
FIFA MEDICAL CENTRE OF EXCELLENCE

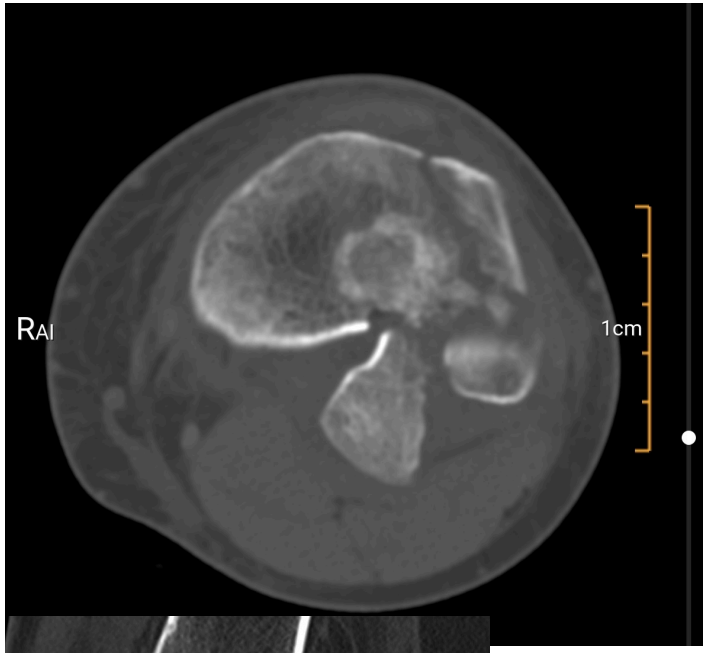
ESSKA Teaching Center

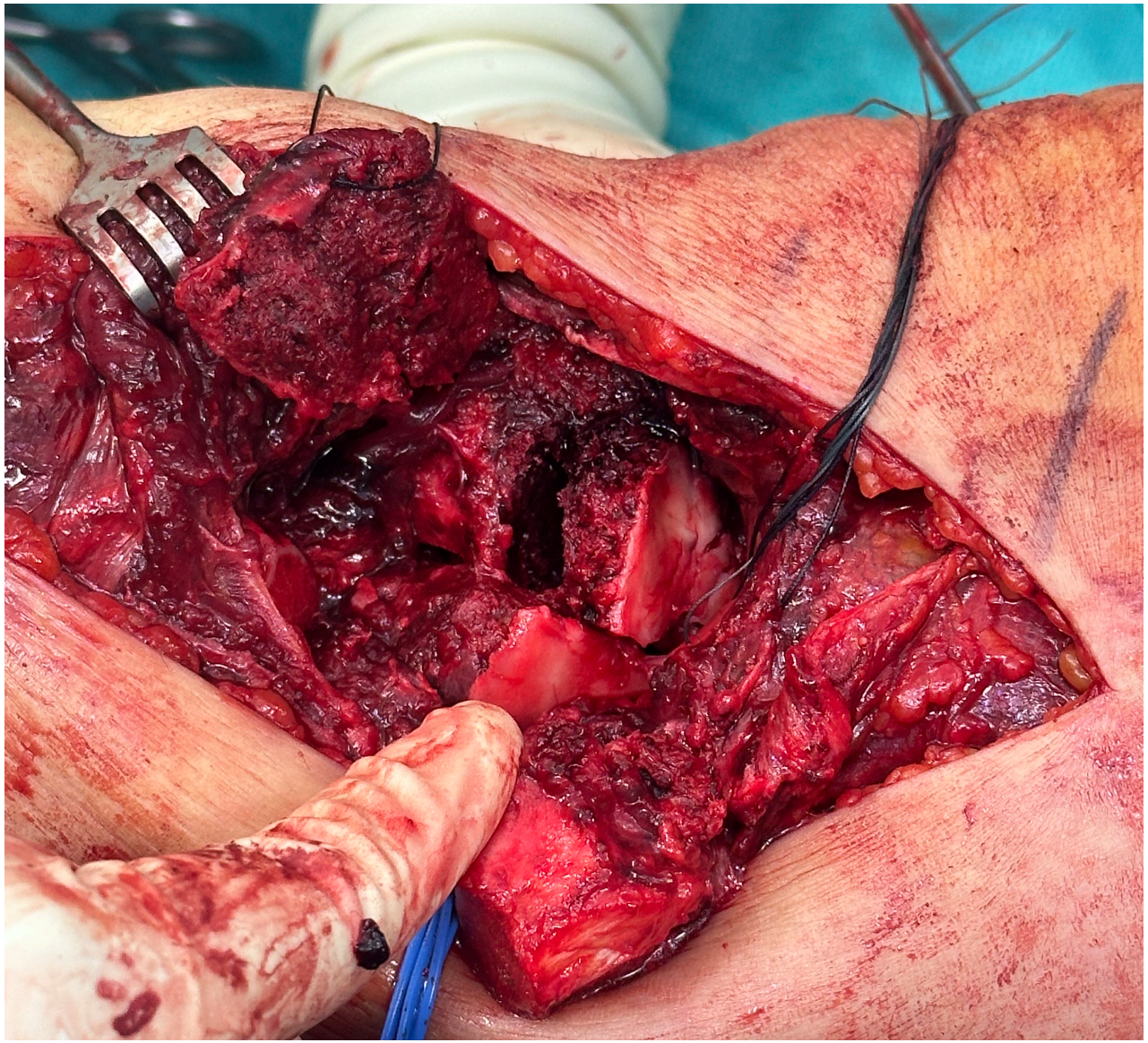
UMIT
the health & life sciences university

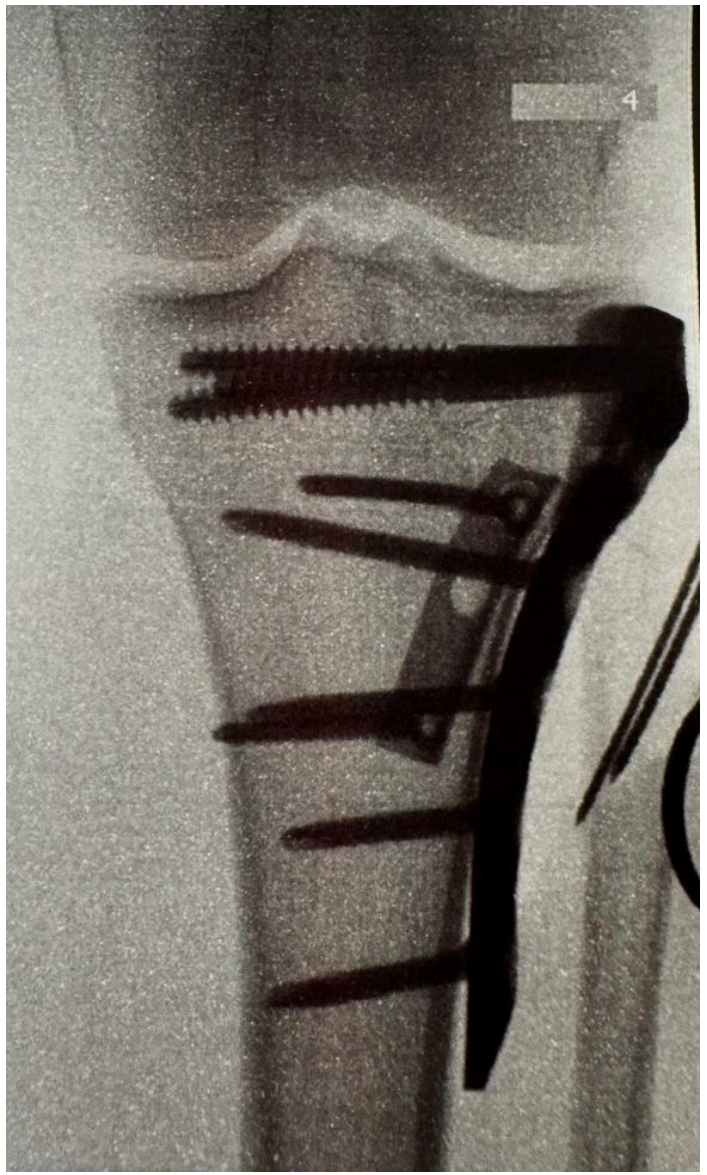
GA, 24 years skiing accident







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