3d advanced course on knee surgery
Val d'Isère 2010

Proximal tibia fractures – complex cases: porotic bone, distal extended lesion, multiple lower limb fractures

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Goals ?

- Minimum soft-tissue damage
- Allow for fracture healing
- Allow for early mobilization
- Possibility of articular reconstruction
- Good conditions for later TKA

Osteoporotic fractures

Bone density

Age	Normal	Osteopenia	Osteoporosis
50–59 (27)	3 (11,1)	13 (48,2)	11 (40,7)
60–69 (24)	3 (12,5)	5 (20,8)	16 (66,7)
70–79 (36)	0	13 (36,1)	23 (63,9)
80–89 (65)	1 (1,6)	8 (12,3)	56 (86,1)
90–99 (16)	0	2 (12,5)	14 (87,5)
>100 (1)	0	0	1 (100)

- Fracture = alarm sign
- Signal to induce diagnostics & treatment
- Risk of later fractures can be reduced by 50 %

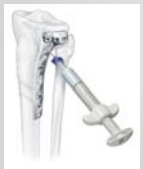
Mutschler W, Unfallchirurg 2005

Geriatric fractures

- Greater degree of comminution
- Difficult postoperative mobilization, but high necessity of mobilization
- Limited availability of autogenic bone
- Comorbidity (vascular)
- Proximal tibia: literature sparse

Krappinger D, JOT 2008

Bone defects



Norian SRS

Autologous cancellous bone
Allografts
Synthetic materials

Fractures of the proximal tibia in elderly patients

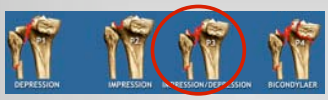
- Matched-pair analysis
- 15 patients > 60; 5 year FU
- Low-energy accidents
- Identical surgical treatment in both groups
- Higher loss of reduction
- 3-fold increase of OA
- Function, stability & pain: no difference
- Older group: lower Tegner activity score
- Satisfactory clinical result

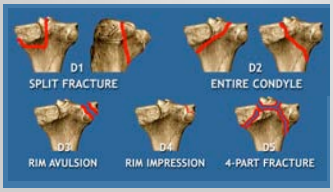
Gerich T, Unfallchirurg 2001

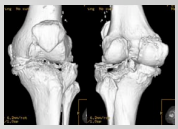
Case 1

- ♀, 70 years
- Asymptomatic medial OA

Classification







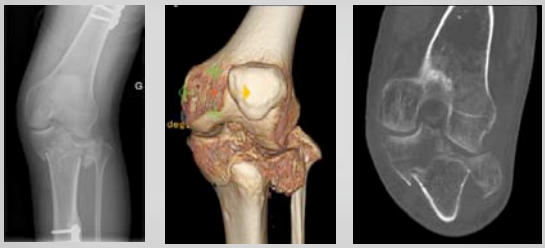
Posterior split-impression

Case 1

+ 6 months

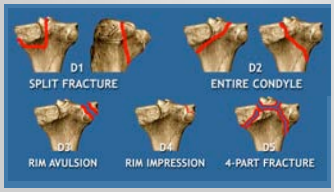
Fibula osteotomy & tension-band

Case 2



49 years, severe osteoporosis

Classification



Case 2

Spanning external fixator – knee in traction

Ligamentotaxis

49 years

Case 2

4 months postop

Bone grafting
& small locking plates:
medial
+
posteromedial
+
lateral

49 years

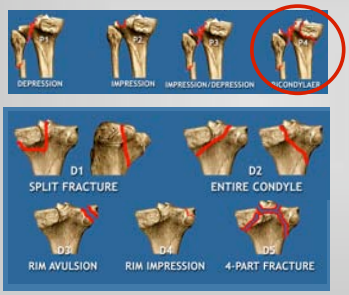
4 months postop

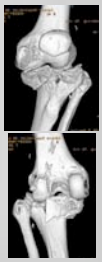
Case 3

- ♀ 86 years
- Severe osteoporosis

Case 3

Classification

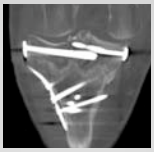




Case 3

Case 3

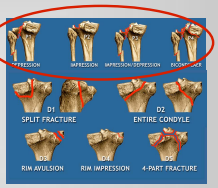
+ 5 months



Small locking plates:
posterior,
posteromedial,
lateral
Bone allograft

Osteoporotic fractures: summary

- Low-energy accidents
- Fracture-dislocations rare
- 2-stage procedure (ligamentotaxis)
- Understanding of fracture type
- Filling materials (≠ autografts)
- Higher loss of reduction (locking plates ?)
- 3-fold increase of OA
- Satisfactory clinical results



Complex, multi-stage proximal tibia & combined fractures

Multi-stage proximal tibia fractures

Epiphyseal
Metaphyseal
Diaphyseal

- Rare in comparison with tibial head or shaft fractures
- High-energy trauma, associated fractures
- High complication potential:
  - soft-tissues
  - compartment syndrome

Multi-stage proximal tibia fractures

Series of 24 cases:

19 → 3 stages; 5 → 2 stages

- Single injury:	10
- Combined injury:	4
- Severe polytrauma:	10
- Injury same limb requiring surgery:	11
- Knee ligament injuries:	6

Beck M, Unfallchirurg 2008

Conventional ORIF ?

High complication rate:
- Malalignment
- Pseudarthrosis
- Infections (local, osteomyelitis, arthritis)

Infections:
- Single plate: up to 32 %
- Double plate: up to 87 %

Moore TM, CORR 1988; Perry CR, JBJS – Am, 1984;
Stokel EA, Orthopedics 1991; Young M, Orthop Rev 1994

Multi-stage proximal tibia fractures

Current options 1:

Temporary external fixator

- Fracture reposition
- Temporary stabilization before final fixation
- Soft-tissue management

Multi-stage proximal tibia fractures

Current options 2:

Hybrid fixator

- Fracture reposition
- Comminuted fractures
- Soft-tissue management
- Specific complications (15%):
  - peroneal nerve injuries
  - intraarticular pin
  - pin infections

Hutson JH JOT, 1998
Mikulak SA CORR, 1998

Multi-stage proximal tibia fractures

Current options 3:

Internal fixation:

LISS plates & various approaches

Few complications:
- malalignment
- infections

Cole PA, Injury 2003
Schütz M, Injury 2003

Multi-stage tibial fractures: LISS experience

-Open fractures:	26 %
- Infections:	6 %
- Postoperative malalignment > 5°:	12 %
- Loss of correction > 5°:	3 %
- Healing rate at 6 months:	95 %

N=419

Beck M, 2009; Boldin 2006; Cole 2004; Egol 2004; Gosling 2005; Phisitkul P 2007; Ricci 2004; Schütz 2003; Stannard 2003 & 2004

Intramedullary stabilization ?

Technically difficult,
especially if in association with tibial plateau fracture

32 proximal fractures
56% Valgus deformity > 5°
28% sagittal malpositioning

Lang GJ, Clin Orthop 1995
Freedman EL, Clin Orthop 1995

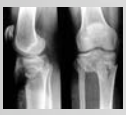
Extensor mechanism: early repair

From: Petersen W, Unfallchirurg 2006

Dashboard injury
Open fracture
Tear of: patellar tendon, PCL, collaterals

Treatment:
1. Temporary stabilization, debridement & **patellar tendon repair**
2. ORIF with lateral LISS & bone grafting

Extensor mechanism: early repair



Open 4-part fracture
TTA avulsion

Treatment:
1. Temporary stabilization, debridement & **TTA refixation**
2. Hybrid fixator

Multi-stage proximal tibia fractures

4-part fracture

Multi-stage proximal tibia fractures

First operation

Multi-stage proximal tibia fractures

Multi-stage proximal tibia fractures

4 months

3 years

Multi-stage proximal tibia fractures

Floating knee

From: Petersen W, Unfallchirurg 2006

- Fracture dislocation of proximal tibia
- 1. external fixator
- 2. ORIF (LISS + Tomofix)

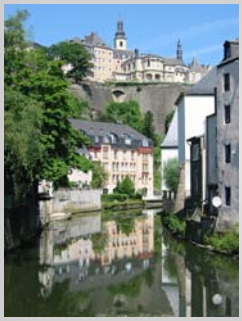
Complex injuries

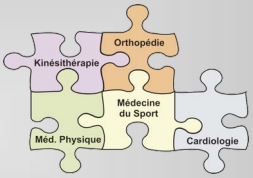
Same principles:
1. Soft-tissue control
2. Temporary stabilization
3. Treatment strategy
4. Final fixation

=> experience & teamwork approach !

Complex & multiple injuries: conclusions

- High-energy; fracture-dislocations
- 1. step: Immobilization
  Reduction (external fixator, ligamentotaxis)
  Soft-tissue management
- 2. step: Exact diagnosis (CT, 3-D reconstructions)
- 3. step: ORIF (various approaches, based on understanding of fracture
- 4. step: Re-assess ligament/cartilage/meniscus status
- Little space for arthroscopic assisted internal fixation
- Create best possible conditions for later TKA





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