Complex tibial plateau fractures treated with Ilizarov fixation frames

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Schatzker type 5 and 6

- Often high energy fractures
- Internal soft tissue degloving/open
- Condylar separation/articular depression
- Diaphyseal-metaphyseal dissociation
Treatment enigma?
Schatzker’s classification

Type 1  Type 2  Type 3  Type 4  Type 5  Type 6
Complication rates – dual plating Schatzker type 5 and 6

- Deep infection 40% (23-100)
- Skin necrosis 35%
- Loss of fixation/malunion 25%
- Amputation 8%
Dual plating
Treatment goals

- Avoid skin necrosis and infection
- Articular surface congruence
- Correct mechanical axis/joint stability
- Joint mobility
- Early weight bearing
Ilizarov fixation – tibial plateau fractures Schatzker type 4, 5 and 6

- Period: Jan. 95 - Dec. 01
- 59 patients
- Men: 28 49 yr (32-82)
- Women: 31 56 yr (24-89)
Schatzker type fracture

<table>
<thead>
<tr>
<th></th>
<th>4</th>
<th>5</th>
<th>6</th>
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</thead>
<tbody>
<tr>
<td>Men</td>
<td>1</td>
<td>13</td>
<td>14</td>
</tr>
<tr>
<td>Women</td>
<td>0</td>
<td>17</td>
<td>15</td>
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</tbody>
</table>

1 | 30 | 29 |
Soft tissue injuries

- Open fractures 13
- Closed (skin contusion) 47
- Peroneal nerve injury 5
- Compartment syndrome 6
Preoperative planning

- CT - scan
- CT - reconstruction - sagital and coronal plane
- Ring size and number
- Calcaneus traction - if surgery delayed
CT-scan is obligatory for planing
Ilizarov surgical strategy

- Minimal invasive
- Initial reduction by ligamentotaxis
- Fine reduction (elevation, bonegraft supplementary cannulated screws)
- Neutralization by Ilizarov frame
Ilizarov-technique

• 3 rings
• 1 proximal for the knee joint
• 2 distal for shaft fracture
• trans knee distraction (ligamentotaxis)
Ilizarov-technique

- Fine reduction
- Elevation
- Bone graft
- Screws
- 4 olive wires
4 olive wires are fixed to a proximal ring
If knee joint is stable
remove femoral ring
Artroscopic assisted elevation can be used.
Schatzker type 5
Treatment a.m. Ilizarov
Surgical procedures
60 Ilizarov frames

- Non bridging-knee 34
- Bridging-knee 26
- Supplementary cannulated screws 17
- Autograft 28
- Artroscopic assisted 11
Fracture dislocation
Schatzker type 6
Results – 60 Ilizarov fixations

- Fractures united: 59 (2 bone grafts)
- Hospital stay: 13 days (7-44)
- Weight-bearing: 3 weeks (0-8)
- Time in fixator = time to union: 14 weeks (10-32)
Complications
60 fractures

- Superficial pin infection: All
- Peroneal nerve/tib.post: 3
- Compartment syndrome: 6
- Amputation: 1
<table>
<thead>
<tr>
<th>Procedure</th>
<th>Count</th>
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</thead>
<tbody>
<tr>
<td>Delayed union – autograft</td>
<td>2</td>
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<tr>
<td>Pyartron – synovectomy</td>
<td>4</td>
</tr>
<tr>
<td>Artroscopic release – buckethandle</td>
<td>4</td>
</tr>
<tr>
<td>Secondary TKA + HTO</td>
<td>3</td>
</tr>
<tr>
<td>Fixator adjustment</td>
<td>5</td>
</tr>
</tbody>
</table>
Ortopædkirurgi Nordjylland
Standard Measurements

Frontal

- NSA = 130° (124°-136°)
- mLPFA = 90° (88°-98°)
- sLPFA = 84° (86°-89°)

Sagittal

- mL DFA = 81° (70°-82°)
- sLDFA = 86° (69°-98°)

Angulation:
- ALC = 2° (1°-6° median)

Angles:
- mLPTA = 87° (69°-90°)
- mLOTA = 69° (68°-86°)
- mLPSA = 69° (56°-86°)
- sADTA = 6° (7°-8°)

Normal values:
- Range ± 1SD

MAD = 10 mm median (3-17 mm)
- IOD = 10 mm (4-18 mm)
• Normal axis – in AP plane $56/59 = 95\%$
  (2 valgus, 1 varus – 10 degrees)
• Normal axis in LAT plane $57/59 = 96\%$
  (2 recurvatum – 10 degrees ext. deficit)
Correct mechanical axis optimize survival of the knee in the long term
Before After
Summary

- Good and excellent 53/60 ~ 88%
- Poor results (7)
- 2 converted to TKA
- 1 HTO
- 1 pyartron (poor movement and pain)
- 1 varus malalignment and pain
- 1 early amputation (crush+nervedeficit)
Summary

- lizarov technique avoid skin necrosis and deep bone/implant infection
- Pyarthron is a serious complication, but can be treated
- Avoid pin placement nearer than 14-16 mm from articular surface
- The technique requires often use of oral antibiotics
Summary

- Good and excellent results in 88%
- Briding the knee means loss of flexion (20 degrees)
- Mechanical axis is perfect in majority
- Stable and minimal invasive
- Acute knee ligament injuries is not a problem – reconstruction if needed should be delayed
Conclusion

Ilizarov fine wire fixation of complex tibial plateau fractures gives better short term results than open traditional dual plating.
Thank you