

The combined use of condylar bolts & Intramedullary nailing for the fixation of intra-articular fractures around the knee

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- Main Indications of the technique

Distal Femur: Intra-articular or Supracondylar fracture with or without comminution (AO: C1 - C3)

Proximal Tibia: Intra-articular fractures with or without expansion to the tibial diaphysis, without immersing of the tibial Plateau (Schatzker: I - VI)



Surgical technique – Distal Femoral fractures



Pre-op X-rays of intra-articular distal femoral fracture



Reduction and
stabilization of the
articular surface by one
free condylar bolt

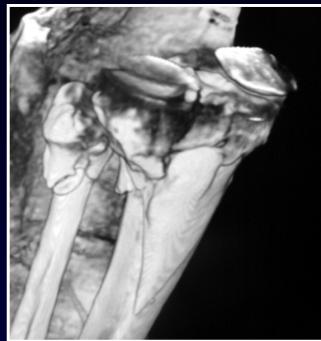


Intramedullary nailing
(SCN). Distal locking and
placement of a second bolt
via the nail for additional
stability

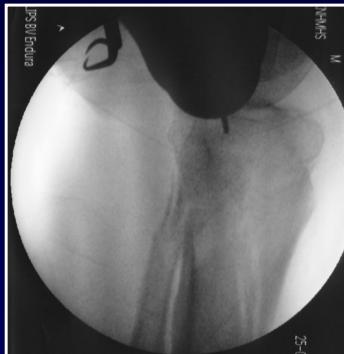


Post-op lateral
X-ray showing
the alignment
and the 2 bolts
(inside and
outside the nail)

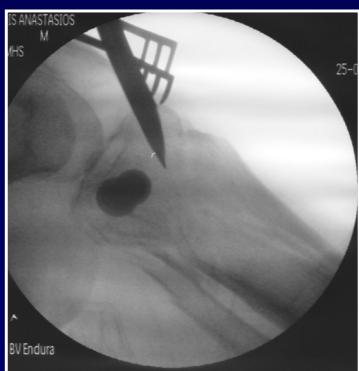
Surgical technique – Proximal Tibial fractures



Pre-op CT-Scans of a Tibial Plateau fracture without immersing of the articular surface



Intra-operative views showing the placement of the condylar bolt that stabilizes the articular surface



Post-op X-rays
(T2 Tibial nail and 1 condylar bolt outside the nail)

Patients-Methods

- Duration of study: 4 years (Jan.'04 – Jan.'08)
- 15 patients – 16 traumatic fractures
- 13 Distal femoral fractures - AO/OTA classification : C1 (7), C2 (3), C3 (3)
- 3 Proximal Tibial fractures – Schatzker classification : I (1), V(1), VI (1)
- 10 male – 5 female
- Mean age 54y (30-85y)
- Mean time of surgery from injury : 4,5 days (2-26)
- Mean follow-up : 12 months (2-28)
- Implants used : T2 Tibial nail (Stryker), Supracondylar nail (Stryker)
- Technique used : i) Reduction of the articular surface with condylar bolts
 - ii) Intramedullary nailing of the Femur or Tibia
- Condylar Bolts placement:
 - i) outside the nail : 9 cases
 - ii) via the nail : 4 cases
 - iii) combination : 2 cases

Cases

Male 31 years old. Floating Knee – Road Traffic accident



Pre-op AP & Lateral X-rays

- i) C2 (AO) Distal Femoral fracture
- ii) Extra-articular proximal tibial fracture



Post-op AP & Lateral X-rays

- i) SCN nail + 2 condylar bolts for the distal femoral intra-articular fracture
- ii) T2 Tibial nail for the Tibial extra-articular fracture



1 week post-op
Active knee ROM 0 – 90 degrees

Cases

Male 50 years old. Distal Intra-articular femoral fracture
Road Traffic accident



- Pre-op AP X-ray of a C3 (AO) distal femoral intra-articular fracture
- Intraoperative photos displaying the comminution. Open reduction and fixation of the femoral condyles
- Post-op X-rays displaying the fixation with condylar bolts, IMN, Kirschner & circlage wires. Additional use of allograft to fill the void

1 month post-op - Full knee ROM



Cases

Female 63 years old. Distal Intra-articular femoral fracture
Fall from height



Pre-op AP /Lateral X-rays and saggital CT Scan view of a Schatzker VI Tibial Plateau fracture. The CT Scan view displays the intra-articular comminution and also reassures of no immersing of the articular surface.



- Post-op X-rays displaying the fixation with 1 condylar bolt, outside the nail and Intramedullary nailing with a T2 Tibial nail

1 month post-op - Full knee ROM



Results

- No complications recorded relevant to the combined use of the condylar bolts with the Intramedullary nails
- No neurovascular complications or wound infections recorded
- Mean healing time of the fracture: 4,2 m (3-5m)
- Full knee ROM achieved in all cases earlier than 1 month from surgery
- No loss of reduction post-op
- No mechanical failure of the implants
- The physiotherapy post-op protocol included:
 - i) Immediate passive mobilization of the knee joint
 - ii) Partial Weight Bearing to start 1.5 month from surgery
 - iii) Full Weight Bearing after the clinical and radiographic evidence of callus formation

Conclusions

- This type of surgery may require sufficient technical skills
- If applied correctly the benefits are multiple in comparison with Open Reduction and Internal Fixation which is routinely used for such type of fractures
- Basic advantages of the bolts-IMN technique are
 - i) Minimal invasive technique. Apart from cases of very high comminution, minimal skin incisions are required and the bolts can be applied percutaneously.
 - ii) Lower potential infection rates due to less incisions & tissue exposure
 - iii) Immediate passive physiotherapy post-op and early partial weight bearing mobilization. Avoidance of joint stiffness.
 - iv) The implants can be removed easily if needed.
 - v) The osteosynthesis proved to be biomechanically strong.
- The proposed technique could be an alternative to other techniques used for the treatment of difficult fractures around the knee. Our preliminary results justify the continuation of its use with larger number of patients. However, its application requires high level of experience with IMN and radiographic monitored surgery.

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