

DISTAL FEMUR FRACTURES: MY CLINICAL APPROACH



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Emergency Care

- Primary survey
 - Rapidly identify and manage life threatening injuries
 - c - catastrophic hemorrhage
 - A - airway (C- spine control) -- patency
 - B - breathing -- breathing efforts
 - C - circulation -- pulse
 - D - disability -- AVPU
 - E - exposure/environment
 - Resuscitation & fluid management
- Secondary survey
 - Complete head to toe examination to rule out any other injuries



Emergency Care

- Associated systemic injuries
 - Head injuries
 - Chest injuries/ Pulmonary complications
 - Abdominal & Pelvic injuries
 - Other long bony injuries
- Set priorities right
 - Patient first → limb salvage → joint preservation and good functional outcome

Clinical Examination

- Pain distal thigh; worsen on movements
- Inability to bear weight
- Swelling, ecchymosis(+/-) distal thigh and knee
- Bruising, contusion, Laceration
- Limb deformity (Varus/Valgus) with shortening and external rotation
- Knee effusion (with intra-articular involvement)
- Distal neuro-vascular examination



Clinical Presentation

- Bimodal distribution
 - Young healthy patients → high energy trauma with significant displacement
 - Elderly osteoporotic patients → low energy trauma (e.g. fall from standing height), usually with less displacement and comminution

Clinical examination

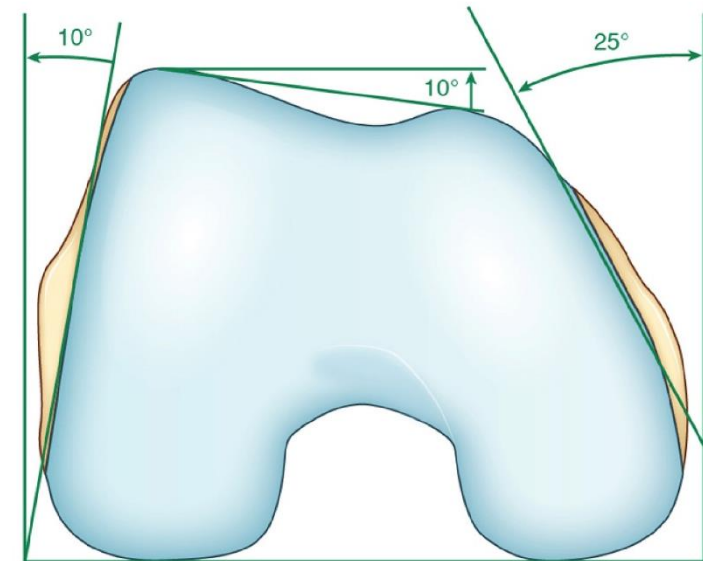
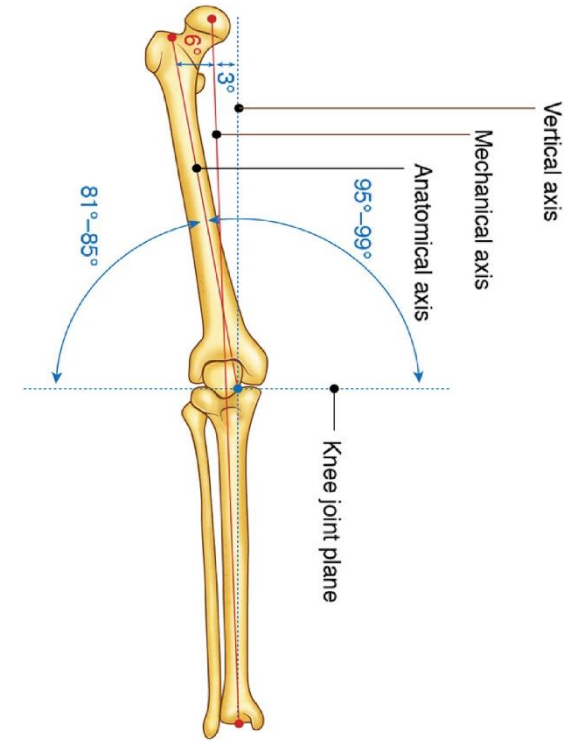
- Ipsilateral hip and shaft of femur
- Ipsilateral tibia, ankle and foot
- Open injuries (5-10%)
 - Wound commonly on anterior thigh (prox to patella)
 - May damage quadriceps muscle and extensor mechanism
- Vascular injury
- Associated knee ligament injuries

Emergency Management

- Appropriate analgesia, antibiotics and tetanus immunization
- Gentle reduction and Splintage (above knee)
- Skeletal traction
- Manage the swelling and soft tissue
- Order appropriate imaging

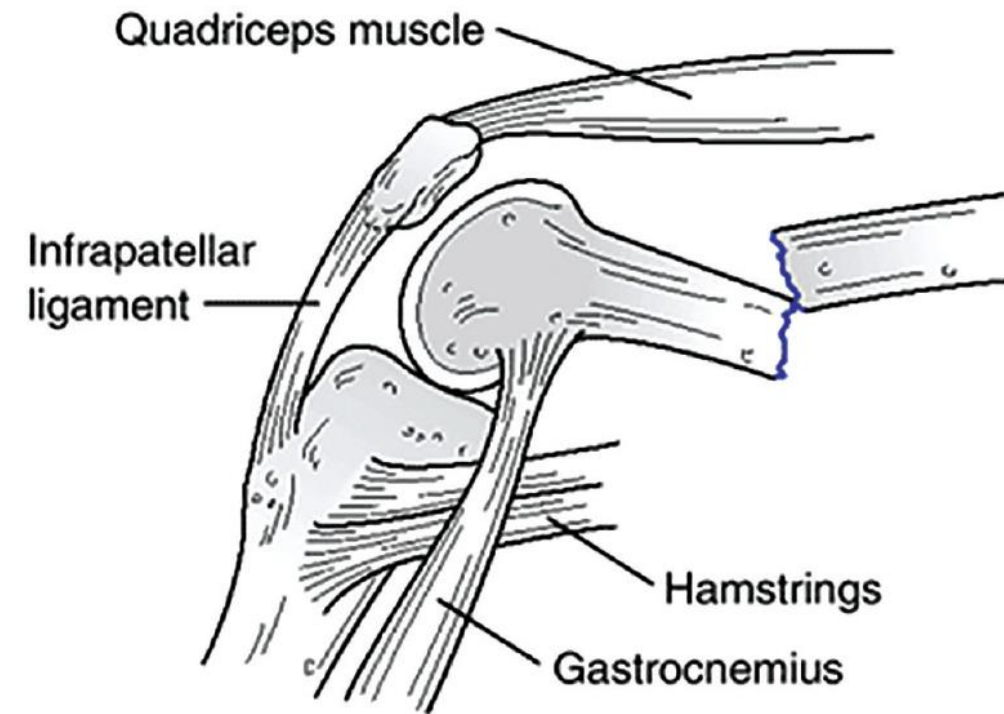
Applied Anatomy – Distal femur

- Anatomical axis is 6-11 deg of valgus
- Trapezoidal in cross-section towards knee
- Posterior halves of both condyles - posterior to post cortex of femoral shaft



Key deforming forces and Biomechanics

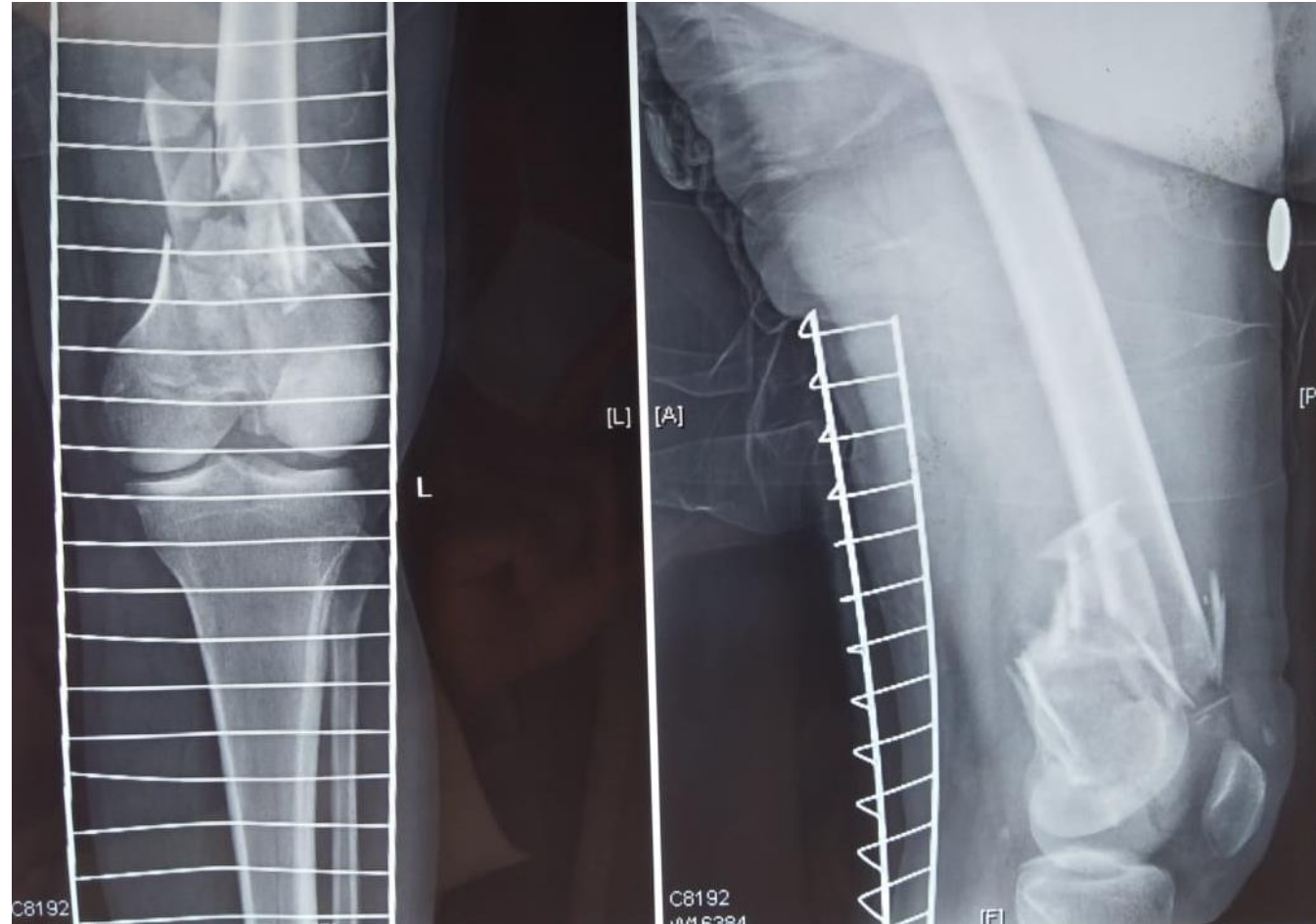
- Hamstring and Quadriceps → shortening/overlap of fragments
- Adductor Magnus → distal femur varus/valgus
- Gastrocnemius → extension at # site (apex posterior), rotation of condyles (when intercondylar split +nt)

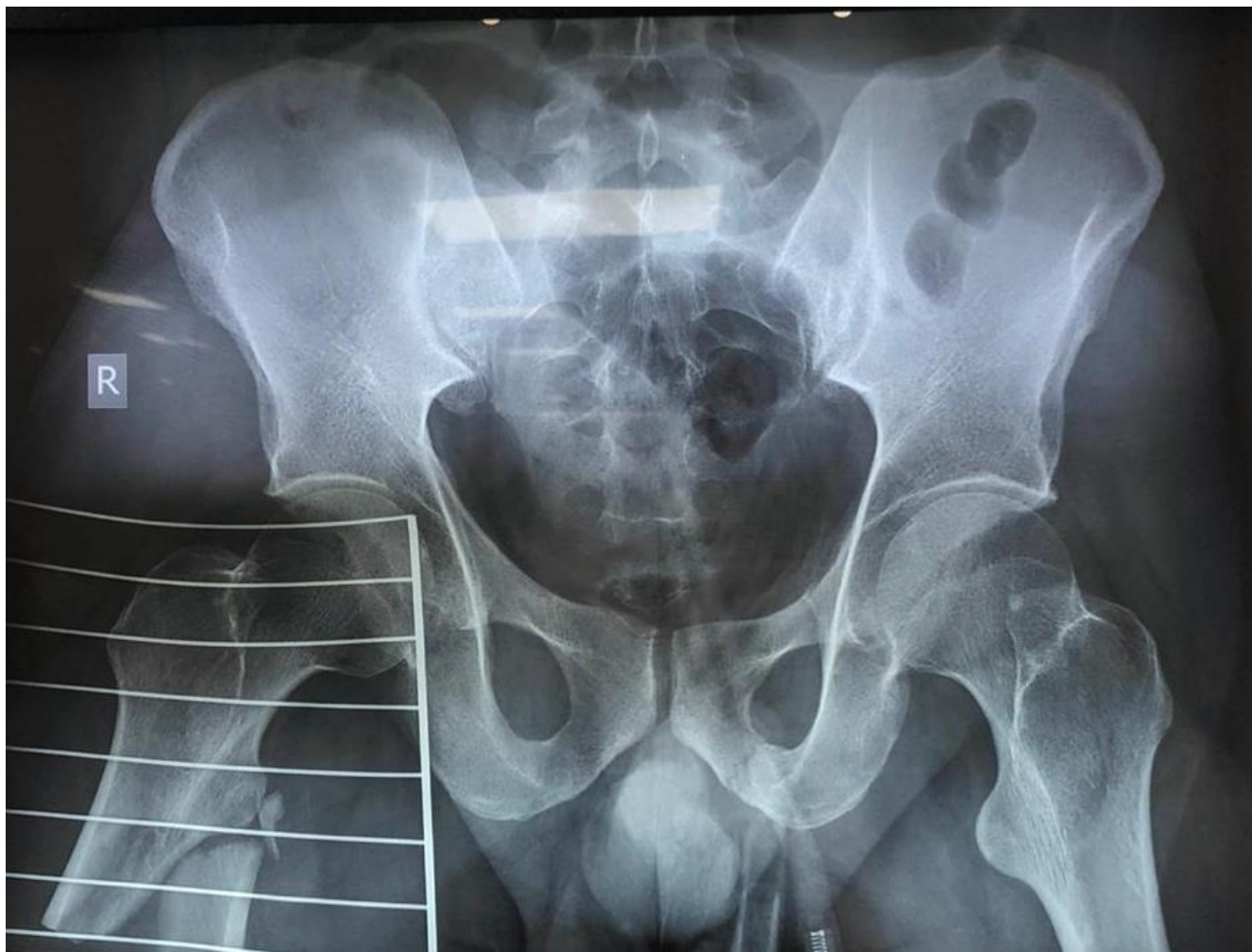
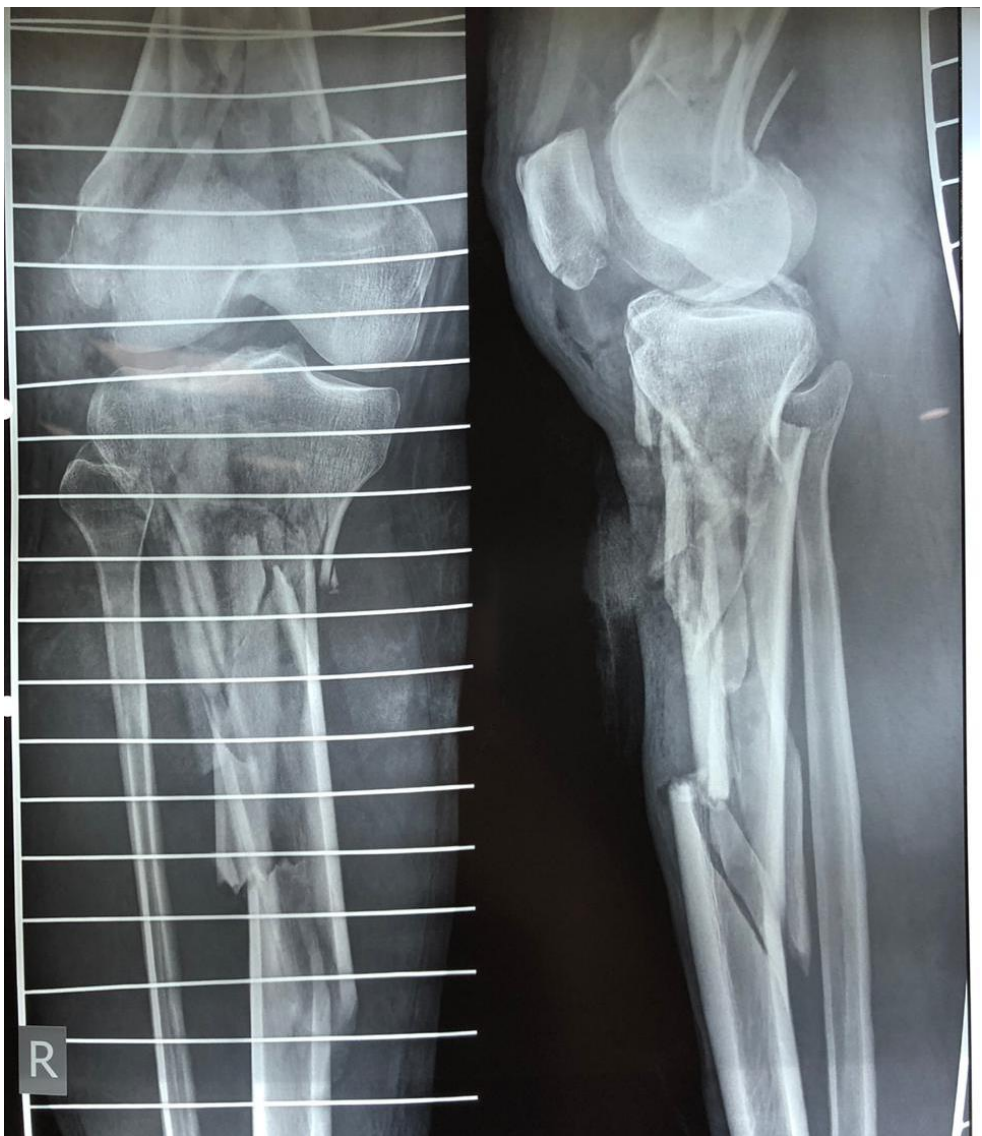


Imaging

- **Radiographs**

- AP & Lateral views
- Traction views
- Adjacent joints – r/o ass. injuries
- Contralateral femur – for pre-op planning & templating

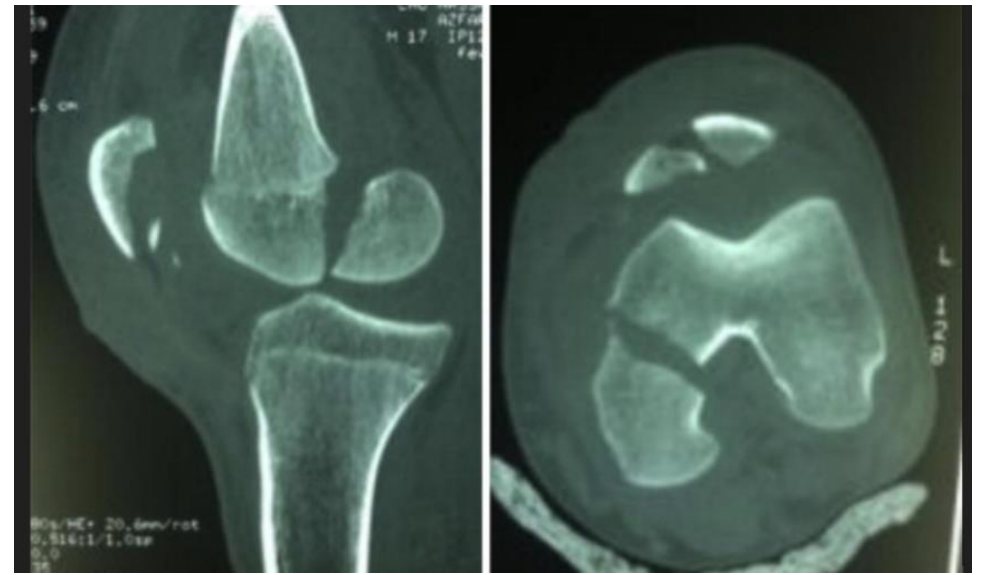


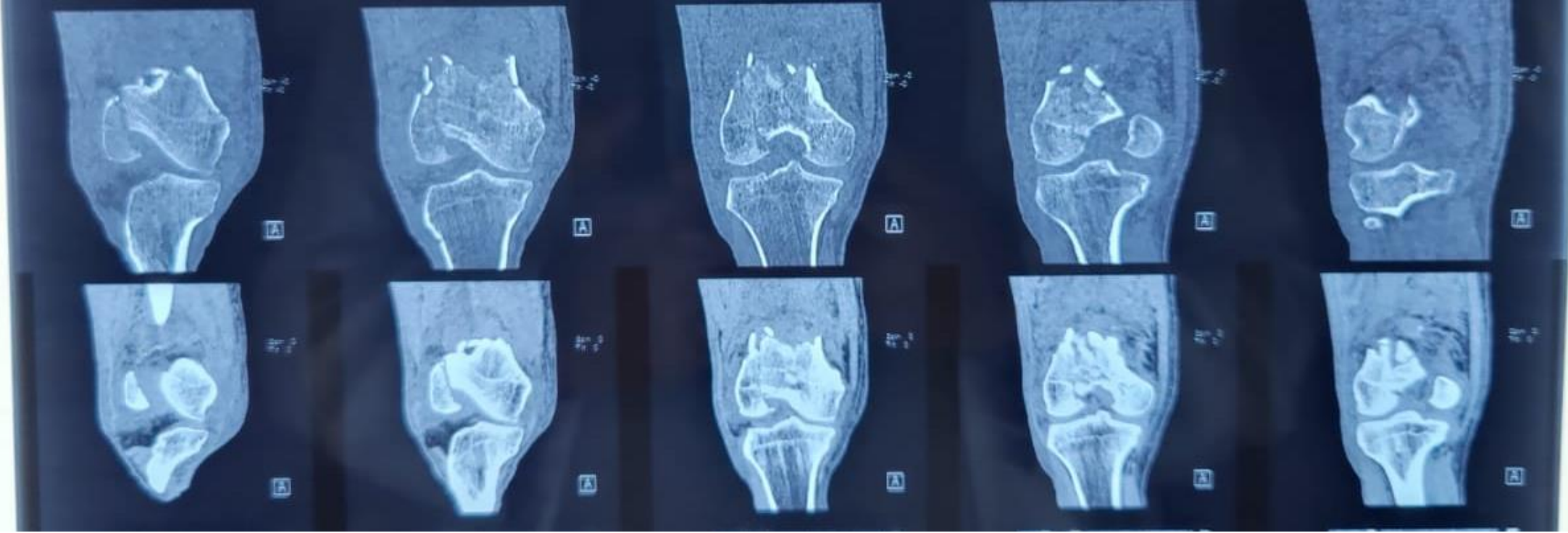
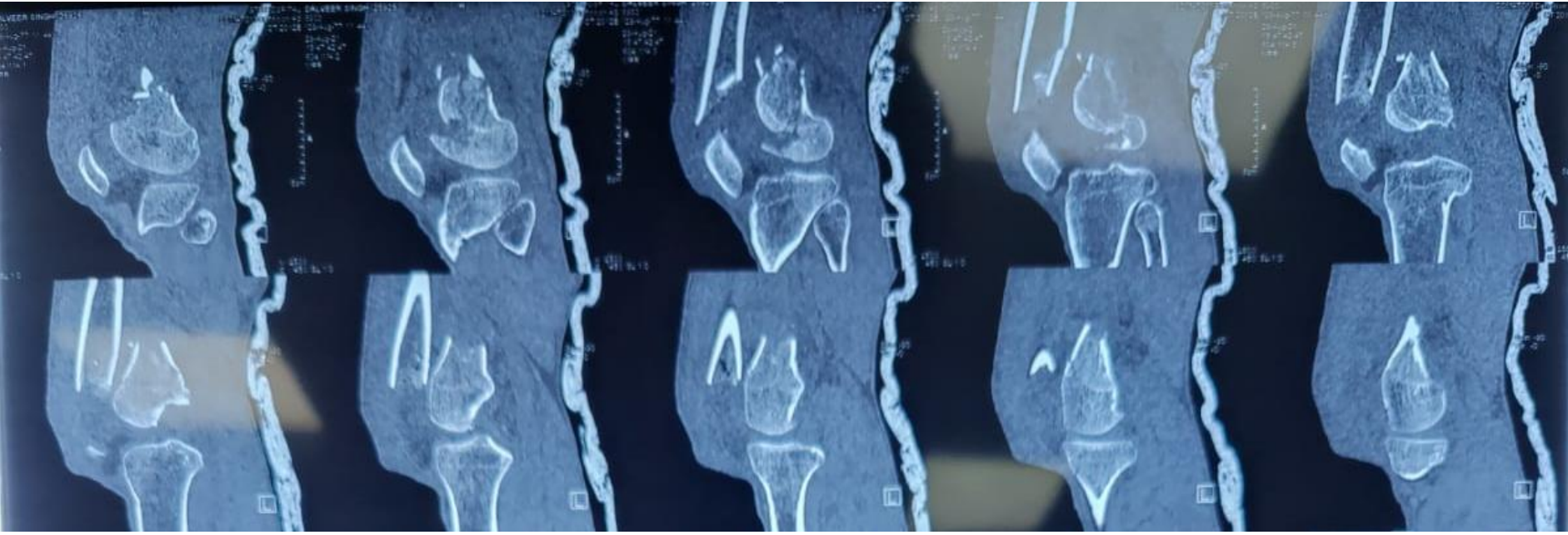


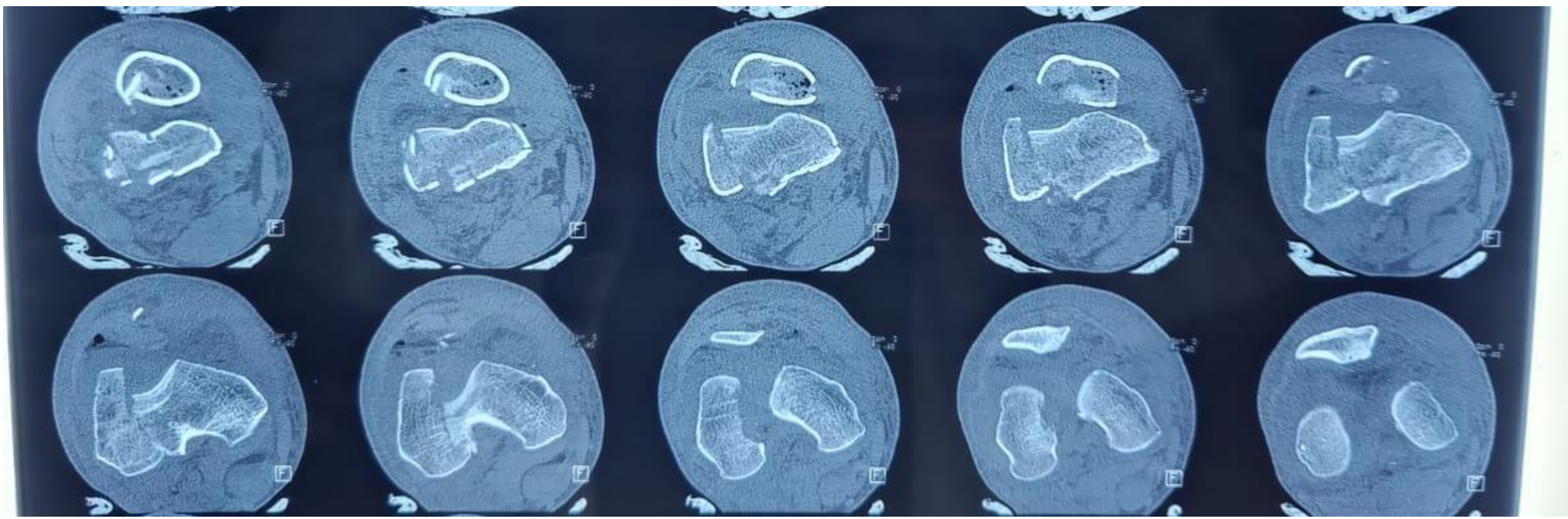
Imaging

- **CT Scan**
- **Axial, Saggital, Coronal cuts**
- Pre-op planning
- Pattern, comminution & intra-articular extension
- Joint details, coronal and sagittal splits

- Separate osteochondral fragments in intercondylar notch area
- Coronal plane #
- Femoral condyle #

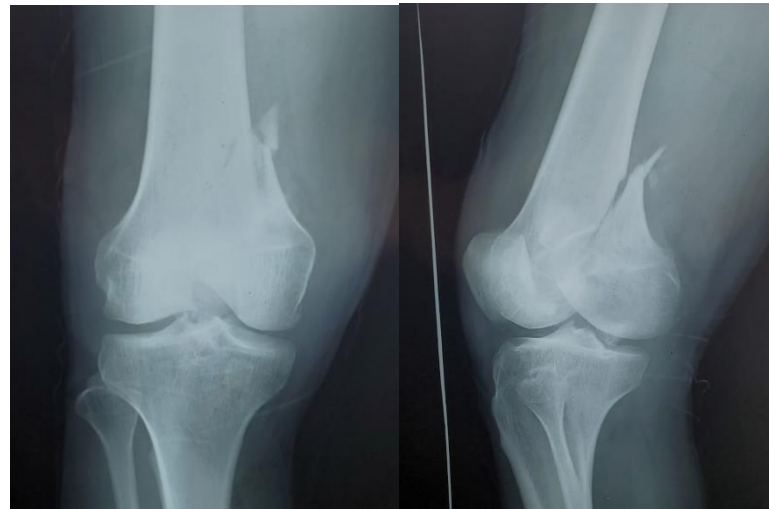






CLASSIFICATION

- Descriptive
 - Supracondylar
 - Intercondylar
 - Condylar – lateral, medial
 - Hoffa's – lateral, medial, bicondylar



AO Classification

- OTA 33

- A Extra-articular

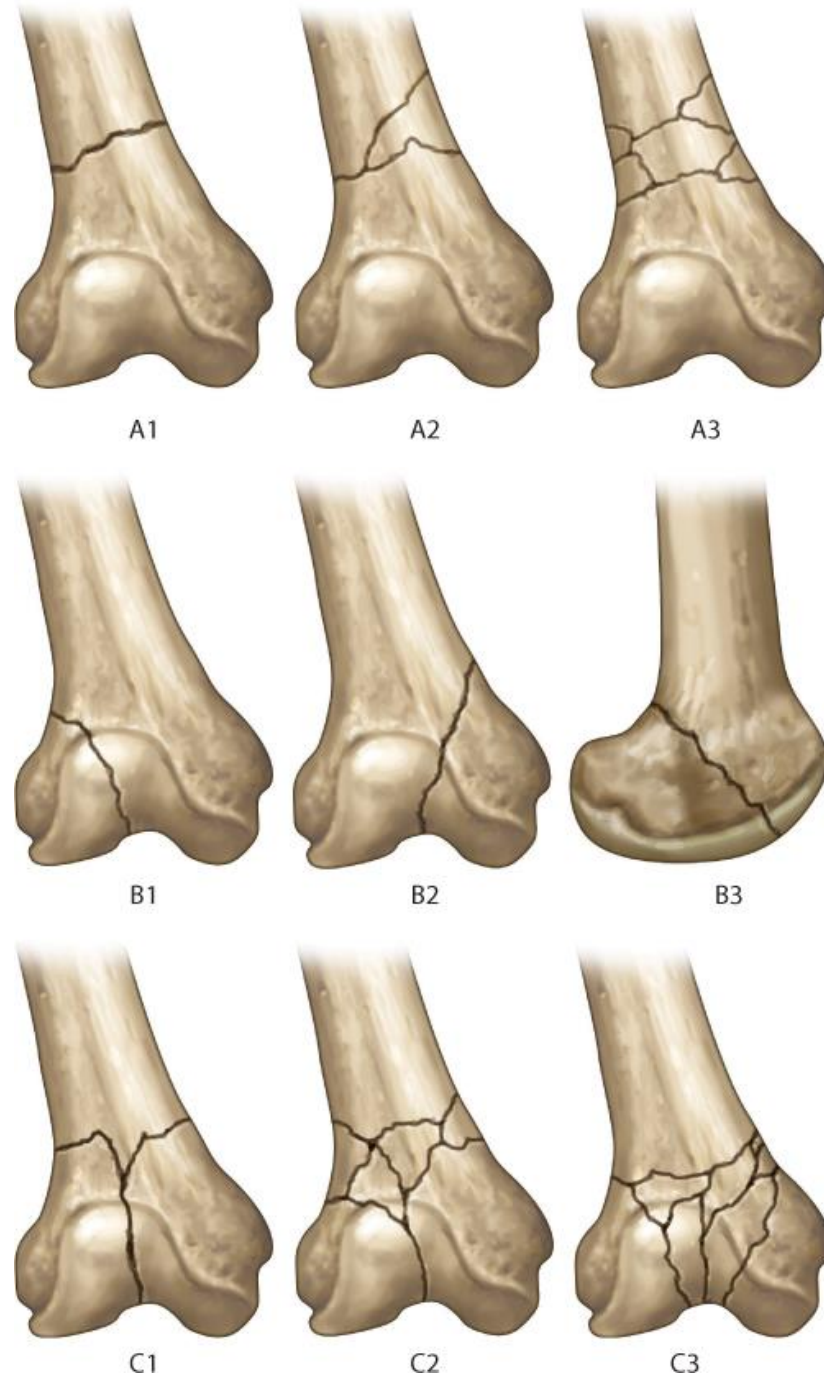
- A1 Simple
- A2 Metaphyseal wedge
- A3 Metaphyseal complex

- B Partial articular

- B1 Lateral condyle, sagittal
- B2 Medial condyle, sagittal
- B3 Frontal/Coronal

- C Complete articular

- C1 Articular simple, metaphyseal simple
- C2 Articular simple, metaphyseal multi-fragmentary
- C3 Multi-fragmentary articular fracture



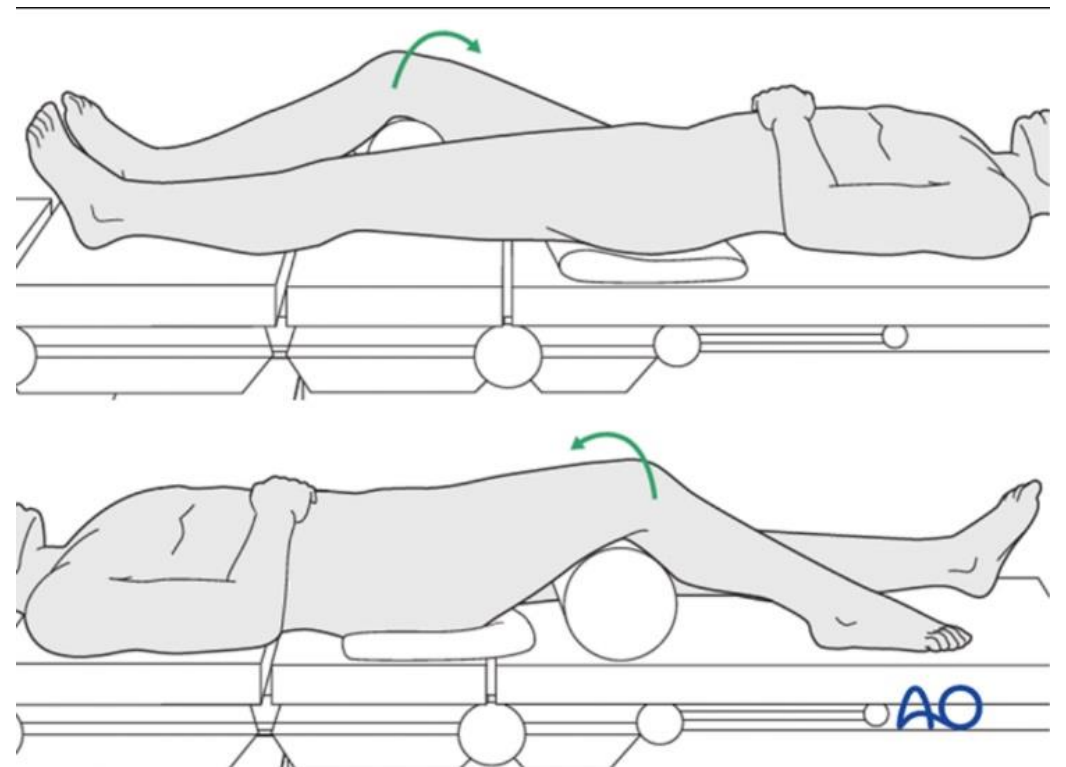
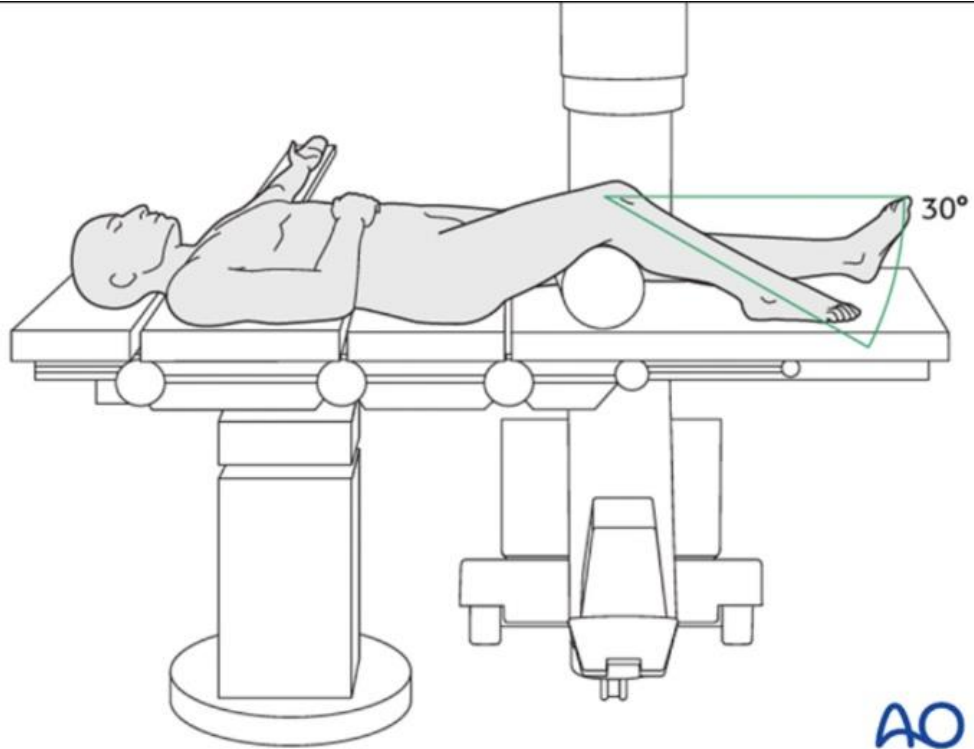
Planning

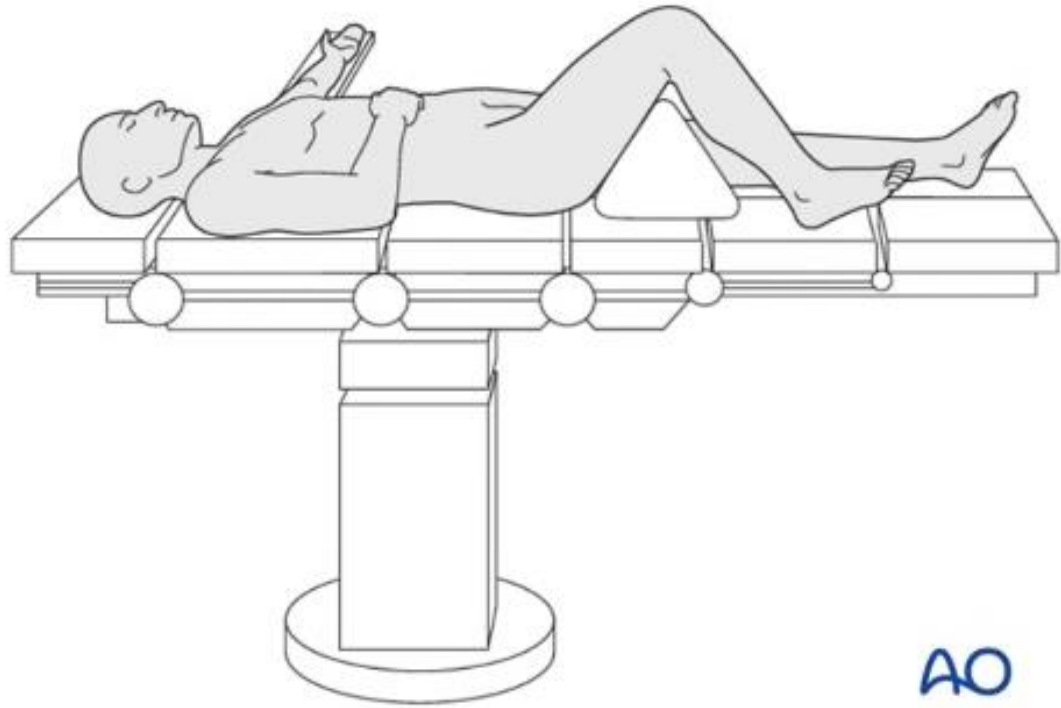
- Problems faced
 - Small articular fragments
 - Comminution
 - Soft tissue
 - Combination

Plan Ahead

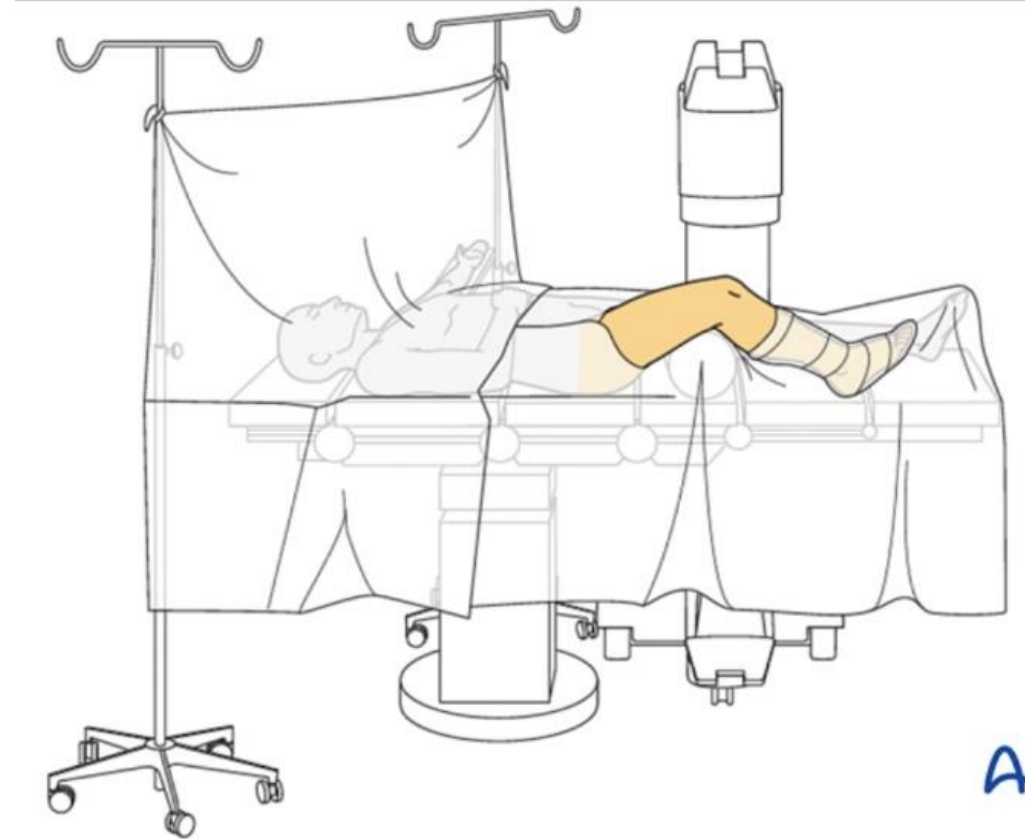
- Principles of surgical treatment
 - Careful handling of soft tissue
 - Surgical approach
 - Anatomic reduction of articular surface and restoration of limb axial alignment, rotation and length
 - Indirect reduction techniques
 - Stable internal fixation – type of implant, instrumentation

Patient positioning

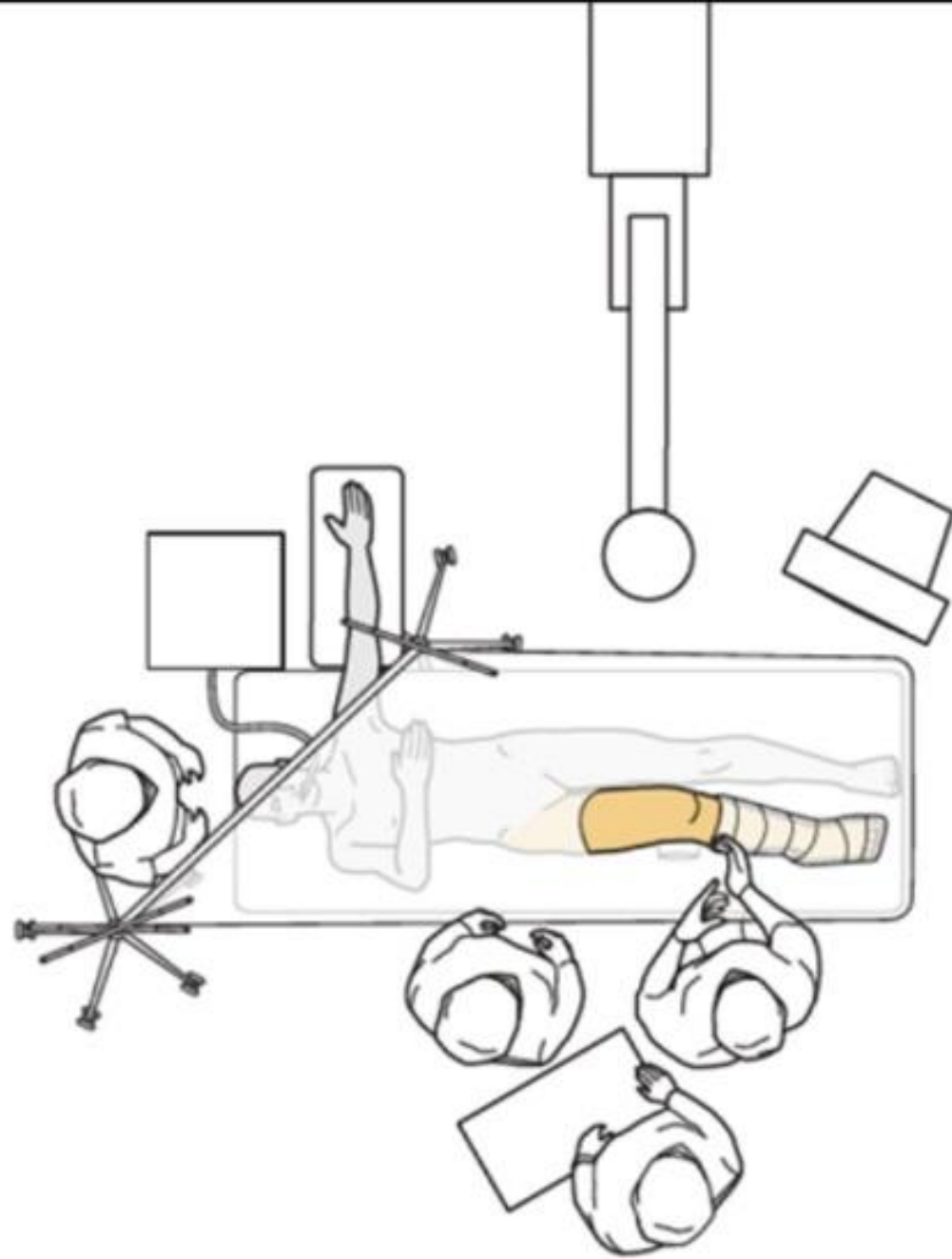




AO



AO



AO

Plan of action

- Reduce articular surfaces first (direct reduction techniques)
 - Reduce the Hoffa's #
 - Restore the articular surface
 - Reduce the metaphysis to diaphysis
- Secure fixation of articular surfaces
 - Inter-fragmentary screws
 - Must be in consideration with other hardware to go
- Restore continuity of articular block with shaft (indirect reduction techniques)
 - Indirect reduction aids (bump, ext fix/distractor, joysticks, percutaneous clamps, checking lateral view for alignment and proximal plate position)

Make a list of problems

- Soft tissue consideration
- Hoffa's #
- Articular reduction
- Restoring meta-diaphyseal relationship
- Controlling stiffness of implant

| PITFALLS | PREVENTIONS |
|---|--|
| Missed coronal plane or other intra-articular fracture | Preoperative CT |
| Malalignment : varus-valgus, flexion-extension, rotational, axial(shortening) | Careful surgical techniques with intra-operative radiographic assessment and comparison to uninjured side clinically |
| Flexion-extension malalignment | Careful radiographic assessment Well placed bump Use of joysticks |
| Length malalignment (usually short) | Careful radiographic and physical evaluation Use of femoral distractor (or ext fix) |
| Intra-articular hardware | Careful radiographic assessment (AP view, notch view and lateral view) Appropriate plate application |

Take home message

- Choose approach wisely
- Plating or Nailing
- Fragment specific screws/fixation
- Reduction aids

THANK YOU