MANAGEMENT OF DISTAL FEMUR FRACTURES

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2ND YR PG
- ANATOMIC IMPLICATIONS
- INCIDENCE
- MECHANISM OF INJURY
- CLASSIFICATION
- ASSOCIATED INJURIES
- PHYSICAL EXAMINATION
- RADIOGRAPHIC EVALUATION
- MANAGEMENT
- COMPLICATIONS
ANATOMICAL IMPLICATIONS

- Represents the metaphyseal transitional zone between femoral diaphysis and distal femoral articular surface.
- This comprises the distal 9-15 cm of femur, as measured from the articular surface.
- It is important to distinguish supracondylar fractures from low diaphyseal fractures of distal femur because the methods of treatment and prognosis are different.
Articular margin
Lateral condyle
Lateral epicondyle
Adductor tubercle
Medial epicondyle
Medial condyle

The normal anatomy of the knee
INCIDENCE

- 4-7 %
- BIMODAL DISTRIBUTION
  - BELOW 40 YEARS: PREDOMINANTLY MALES.
  - ELDERLY: OSTEOPOROTIC FEMALES.
- IN THE PAST TWO DECADES THERE HAS EMERGED ANOTHER INJURY GROUP COMPRISING PERIPROSTHETIC FRACTURES
Mechanism of Injury

Most common mechanism of distal femoral fracture is direct trauma to a flexed knee, typically impact against the dashboard of a moving vehicle.

- IN BOTH STANCES, severe axial load with varus or valgus or rotational forces to the leg is the most common mechanism of injury.
- In young adults: high energy trauma motor cycle accidents fall from height
- In elderly patients: trivial injury.
Femoral shortening, posterior angulation and posterior displacement of disatl fragment are produced by the quadriceps, hamstring and gastrocnemius muscles.

Varus deformity may result from the pull of the adductor muscles.

If an intercondylar fracture is present, there will be rotational malalignment of the condyles.
ASSOCIATED INJURIES

BONE INJURIES:
- Patella fractures
- Acetabular fractures
- Femoral neck fractures
- Femoral shaft fractures
- Tibial plateau fractures.

VASCULAR INJURIES:
- Popliteal artery is at great risk of injury—up to 40%.

ASSOCIATED INJURIES:
- Associated ligamentous disruptions of the knee joint have been reported in approximately 20% of these fractures.
PHYSICAL EXAMINATION

- A careful evaluation of the whole patient as well as the involved lower extremity is mandatory, especially in a polytraumatized patient
- Swelling of the knee and supracondylar area
- Deformity
- Marked tenderness on palpation
- Manipulation of the extremity, if tolerated by the patient, demonstrates motion and crepitus at the fracture site
**CLASSIFICATION (Muller)**

**Type A** fractures involve the distal shaft only with varying degrees of comminution.

**Type B** fractures
- type B1 is a sagittal split of the lateral condyle,
- type B2 is a sagittal split of the medial condyle, and
- type B3 is a coronal plane fracture.

**Type C** fractures
- C1 fractures have no comminution,
- C2 fractures have a comminuted shaft fracture with two principal articular fragments,
- C3 fractures intraarticular comminution.
Radiographic Evaluation

- Standard anteroposterior (AP) and lateral radiographs of the knee joint and supracondylar region.
- AP and lateral radiographs, both with manual traction applied to the lower extremity, frequently demonstrate the fracture morphology more clearly.
**COMPUTED TOMOGRAPHY:** Helps in planning the surgical approach, especially in minimally invasive techniques & also to know the intra-articular extensions.

**MRI:** when ligamentous lesions are clinically suspected.

To confirm meniscal injuries.

**Colour doppler:** An absent or diminished pulse determined clinically or by Doppler pressure measurement compared with that of the normal lower extremity.
TREATMENT

Non surgical treatment:

- Traction technique
- Early Fracture Bracing or Cast

**TABLE 48-3 Indications for Nonoperative Treatment**

<table>
<thead>
<tr>
<th>Patient Factors</th>
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<tbody>
<tr>
<td>Medical contraindications to operative treatment</td>
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<td>Nonambulatory patients (e.g., paraplegia, quadriplegia)</td>
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<table>
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<tr>
<th>Fracture Factors</th>
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<tbody>
<tr>
<td>Undisplaced fracture</td>
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<tr>
<td>Impacted stable fracture</td>
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<tr>
<td>Unreconstructable fracture</td>
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<tr>
<td>Severe osteopenia</td>
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<th>Surgeon Factors</th>
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<tr>
<td>Lack of experience in operative treatment</td>
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<td>Unavailability of appropriate instrumentation or facilities</td>
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CONSERVATIVE

- Previously, the management of femoral fractures (incl. supracondylar fractures) : Traction & subsequent mobilization in cast braces.

- Neer stated that “no category of fracture at this level seemed well suited for internal fixation & sufficient fixation to eliminate the need for external support or to shorten convalescence was rarely attained.”

- In 1958 the Swiss AO Group was formed, thus commencing a new era in fracture care.
Indications for Surgery

- DISPLACED INTRA-ARTICULAR FRACTURES
- OPEN FRACTURES
- ASSOCIATED VASCULAR COMPROMISE
- IPSILATERAL FRACTURES OF THE TIBIA
- BILATERAL FEMORAL FRACTURES
- POLYTRAUMATIZED PATIENTS
- PATHOLOGIC FRACTURES
PRINCIPLES OF SURGICAL TREATMENT

- Careful handling of soft tissues and careful planning of the surgical approach
- Direct and anatomic reduction of the articular surface
- Treatment of multi-fragmentary metaphyseal fractures by indirect reduction techniques to preserve as much of the vascular supply to the fracture fragments as possible.
- Restoration of limb axial alignment, rotation, and length
- Stable internal fixation
- Early and active functional rehabilitation
Surgical exposure

Figure 9-6 The incision may be extended distally to expose the entire shaft of the femur.
IMPLANTS

- FIXED ANGLE BLADE PLATE,
- CONDYLAR BUTTRESS PLATE,
- DYNAMIC CONDYLAR SCREW
- CANCELLOUS SCREWS,
- LOCKING CONDYLAR BUTTRESS PLATE,
- RETROGRADE INTERLOCKING NAIL AND
- ANTEGRADE INTERLOCKING NAIL
- EXTERNAL FIXATOR
Fixed angle blade plate
Dynamic condylar screw
Condylar buttress plate
Retrograde femoral nail
Retrograde nail
COMPOUND FRACTURES
All patients undergoing ORIF of distal femoral fractures should have the ipsilateral iliac crest prepared steriley in case adjunctive bone grafting is necessary.

**Indications:**

- comminuted supracondylar fractures
- For fractures with significant bone devascularization
- In fractures necessitating additional medial plating (i.e., when significant instability or a bone defect is present

However, the timing of grafting depends on the condition and control of the soft tissues. If at all in doubt, bone grafting should be delayed in severe soft tissue injuries.
COMPLICATIONS

- INFECTION
- FIXATION FAILURE
- NON UNION
- MALUNION
- KNEE STIFFNESS
- POSTTRAUMATIC OSTEOARTHRITIS
The infection rate from operative stabilization of these demanding fractures has ranged from zero to approximately 7%.

Factors

- (1) high-energy injuries
- (2) open fractures
- (3) extensive surgical dissection
- (5) inadequate fixation
Loss of fixation

- Factors
  - (1) increased comminution.
  - (2) increased age and osteopenia.
  - (3) low transcondylar and comminuted intercondylar fractures in which distal fixation is hard to achieve.
  - (4) poor patient compliance with loading and weight bearing before healing
  - (5) infection
NON UNION

- 1. Bone loss or defect.
- 2. High-energy injuries, especially fractures that are open or comminuted with extensive soft tissue stripping and loss of bony vascularity.
- 3. Inability of the surgical team to obtain adequate bony fixation.
- 4. Failure to augment healing in comminuted fractures with autologous bone graft.
- 5. The presence of a wound infection.
MALUNION

- Results from malalignment at the time of surgery.
- Varus is the common deformity.
- More common with use of IM Nails.
- Increased varus or valgus may lead to over loading of joint & subsequent arthrosis of medial & lateral compartment respectively.
Knee stiffness

- Loss of knee motion results from damage to the quadriceps mechanism & joint surfaces following trauma or surgical exposure used for fixation or both.

- Causes:
  - Immobilisation of knee > 3wks of duration.
  - Quadriceps scarring with or without arthrofibrosis of knee

Best prevented:
- Early range of motion
- Lysis of adhesions or quadricepsplasty.
FOLLOW-UP CARE AND REHABILITATION

- Immediate continuous passive motion not only enhances cartilage healing but also helps prevent quadriceps contractures, decreases swelling, and enhances early knee motion.

- Continuous passive motion is maintained full-time until ambulation is commenced on the third to fourth postoperative day and thereafter used only intermittently.
Thank You