The Tibial Plateau Fracture

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Mechanism of Injury

- Acute knee trauma
- Knee dislocation
  - Plain film
  - MRI
  - +/- CT angiogram
  - Restore ligamentous/soft tissue stability

- Tibial Plateau Fracture
  - Plain film
  - CT
  - +/- CT angiogram
  - Restore osseous stability

Where is the fracture?

- Lateral plateau fracture

Where is the fracture?

- Medial plateau fracture
- High energy trauma
- High association with cruciate ligament and neurovascular injury
- Almost always treated with open reduction and internal fixation (ORIF)
**Where is the fracture?**

Medial plateau fracture, ground level fall

Varus malalignment poorly tolerated long term

Usually undergo ORIF

**Where is the fracture?**

Bicondylar fracture

High energy mechanism

Almost always treated surgically

**Where is the fracture?**

Posterior shear fracture

Coronal fracture plane on lateral view

Direct posterior surgical approach

**Where is the fracture?**

Posterior shear fracture

Coronal fracture plane on lateral view

Direct posterior surgical approach

**Is there a split and/or depressed component?**

Split and/or depression?

Depression Fracture

Impaction of cancellous bone

Low energy, osteoporotic bone

During ORIF, grafting of defect may be required
Split and/or depression?
Split Fracture
Shearing force splits plateau
Higher energy, normal bone
Usually see with depressed component

Split and/or depression?
Split fracture
No articular surface depression
ORIF without grafting

Split and/or depression?
Split-depression fracture
Very common, often clinically unstable

Split and/or depression?
Depression fracture lateral plateau
No split component
Pure depression fractures of lateral plateau often clinically stable

Is there articular incongruity?
Articular surface depression
Measured using opposite plateau or remaining intact surface
Measure to point of maximal depression
Condylar widening
Condylar widening
Overhang of tibial plateau in relation to femoral condyles
Sum of overhang medially and laterally if appropriate

Articular Surface Incongruity
How much is ‘too much’?
No uniform consensus
Articular surface depression: >4mm at SMH
Condylar widening: >4mm at SMH
Depression/widening ≥2 mm should be reported

Is there metadiaphyseal dissociation?

Metadiaphyseal Dissociation
High-energy mechanism, significant soft tissue and neurovascular injury
Tibial articular surface completely dissociated from diaphysis
Comminution of one or both tibial plateaus and articular surface

Metadiaphyseal dissociation?
Always undergo ORIF
Formal ORIF while soft tissue injuries addressed
Temporary external fixation, delayed ORIF

What other fractures are present?
**Associated fractures?**

- Tibial tuberosity avulsion

  May result in extension lag if not fixed

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**Associated fractures?**

- Intercondylar eminence fracture, cruciate ligament avulsion

  Fixed at time of ORIF if amenable to screw/suture fixation

  Addressed in delayed fashion if comminuted and residual instability

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**Associated fractures?**

- Fibular head fracture – posterolateral corner injury

  Timing of ORIF and/or ligament reconstruction varies

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**Value of CT**

- Medial plateau fracture?

  CT reveals split component through lateral plateau

  Bicondylar fracture; surgical approach altered
Value of CT: Assessing articular incongruity
Depression may be underestimated on plain film
6 mm depression confirmed on CT

Value of CT: Associated Fractures
Medial plateau fracture
Intercondylar eminence fracture?
Confirmed on CT

Value of CT: Associated Fractures
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Value of CT: Fragment characterization
Coronal fracture plane; separate posteromedial fragment
Common pattern in bicondylar fractures
Requires posteromedial plate, may preclude lateral-only fixation

Value of CT: Fragment characterization
Bicondylar fracture
Posteromedial fragment
Secured with posteromedial plate
Value of CT: Fragment characterization

Bicondylar fracture
Posteromedial fragment
Secured with posteromedial plate

Comminuted, split lateral plateau
CT reveals bicondylar fracture
Gross comminution of medial plateau, not amenable to fixation

Comminuted, split lateral plateau
CT reveals bicondylar fracture
Gross comminution of medial plateau, not amenable to fixation

Summary: Questions to Answer

1. Where is the fracture? Lateral, medial, bicondylar, posterior
2. Is there a split and/or depressed component?
3. Is there articular incongruity? Articular surface depression, condylar widening
4. Is there metadiaphyseal dissociation?
5. What other fractures are present? Tibial tuberosity, intercondylar eminence, fibular head

Summary: Indications for Operative Fixation

Bicondylar fractures
Medial plateau fractures
Lateral plateau fractures:
>10° varus/varus instability
>4mm articular surface depression
>4mm condylar widening
Open fractures
Compartment syndrome/arterial injury

Value of CT: Fragment characterization

References