Put Some Ice On It: Treatment and Management of the Winter Athlete Tibial Plateau Fracture

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From Bad

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To Worse

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Objective

- Describe initial evaluation and management of tibial plateau fractures
- Identify common fracture patterns
- Apply treatment principles and strategies
  - Partial articular fractures
  - Complete articular fractures
- Discuss rehabilitation, complications, and outcomes

Some slides courtesy of John Wixted, MD from OTA curriculum lecture series

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Our Patient: 53yo F skiing in Lutsen, crash vs tree

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Plateau Fractures: Initial Presentation

- 1-2% of all fractures
- Similar bimodal distribution to many peri-articular injuries
- 70% in young adult men, average age 43

Spectrum of Injuries

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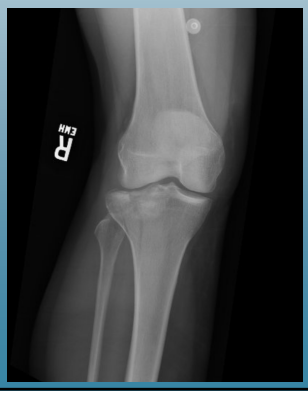
Initial presentation – mechanism matters!

- **Lower energy**
- **Simple falls, struck from side**
- **Remain length stable**



- **Higher energy**
- **Axial load, associated shearing**
- **Compartment syndrome risk**

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Initial Management

- Physical exam
  - Swelling – compartment syndrome
  - Distal pulses – vascular injury
  - ?ABIs
  - Valgus Instability?
- Splinting
  - Knee immobilizer
  - Compartment checks
  - DVT Prophylaxis
- Imaging
  - CT scan routinely obtained
  - Plain films
  - MRI for occult or suspected fractures, particularly in the elderly
  - Fracture-dislocation patterns: high risk for ligamentous damage, MRI indicated

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Physical exam drives initial management

- Rapid progression of swelling
  - Energy dissipated through the tissues
  - Blistering of the skin
  - Unsafe for definitive incisions
  - Temporizing external fixator for bony stabilization and tissue rest

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Initial Management: External Fixator

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External Fixator: Regain Length

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Initial Management

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Initial Management: CT Scan

But why? This doesn't look that bad…..does it?

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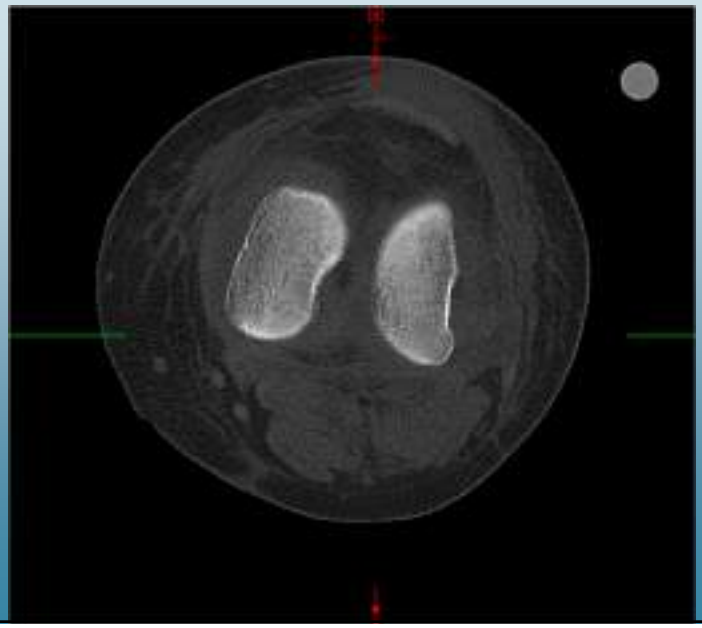
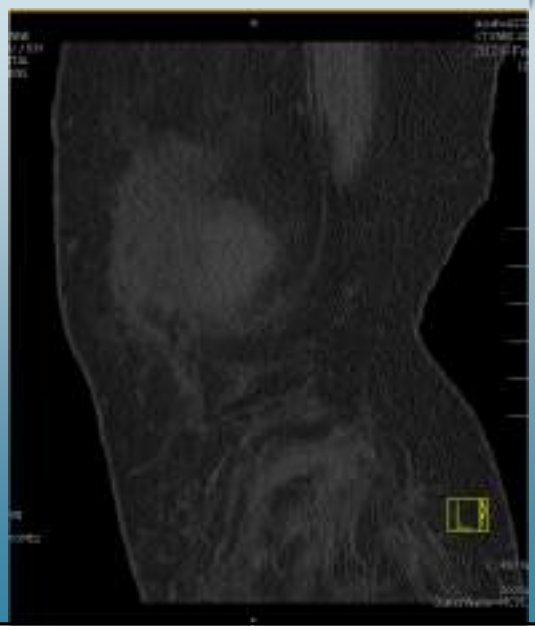
Initial Management: CT Scan





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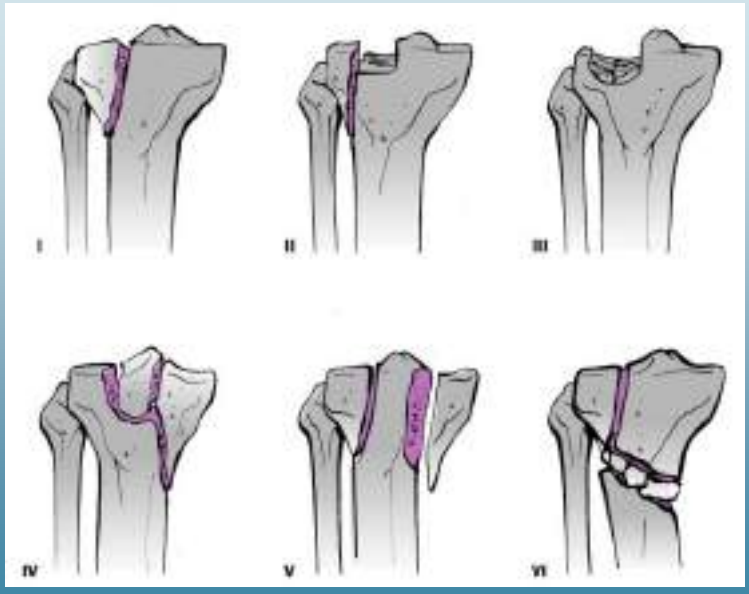
Schatzker Classification



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Schatzker Classification: Injuries isolated to the lateral plateau

- **I: Younger patients, better bone quality**
- **II: Higher energy, with associated depression of the lateral chondral surface**
- **III: Poor quality bone in elderly patients**
- **Most common patterns**

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Schatzker Classification: Isolated medial fractures come in two flavors

- Lower energy, elderly
- Simple depression
- Varus loading
- Fracture lines exit medial to spines

- Higher energy, young patients
- Medial shearing
- Higher risk for vascular injuries
- Fracture lines exit lateral to spines
- Called "fracture dislocation" variants

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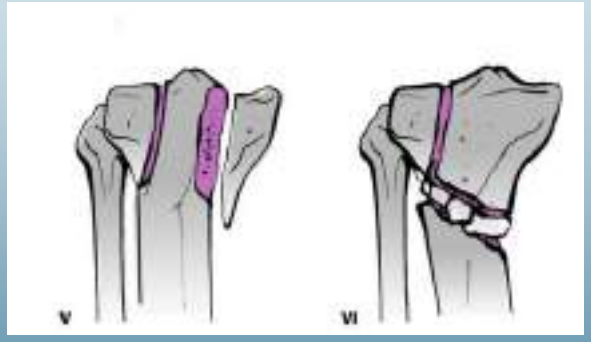
Schztzker Classification: Bicondylar injuries

- Typically higher energy
- Compartment syndrome risk
- Vascular exam a must
  - Consider ABIs
- Commonly open
- Soft tissues at risk
- Exam will progress over hours and often worsen with time
- Includes varus hyperextension

Bicondylar variant*



Firoozabadi R, Schneidkraut J, Beingessner D, Dunbar R, Barei D. Hyperextension Varus Bicondylar Tibial Plateau Fracture Pattern: Diagnosis and Treatment Strategies. J Orthop Trauma. 2016 May;30(5):e152-7.

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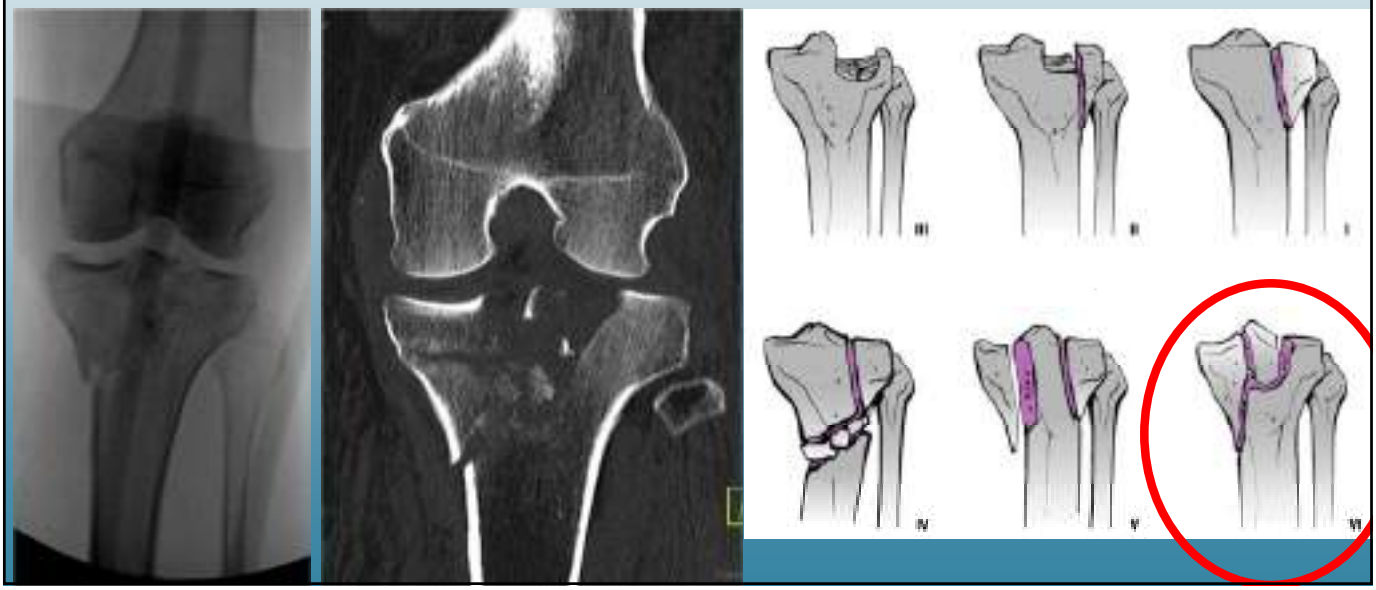
Classify Our Patient:



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Our Patient: Type 4 Fracture- Dislocation

- Higher energy, young patients
- Medial shearing
- Higher risk for vascular injuries
- Intact lateral column
- Called “fracture dislocation” variants

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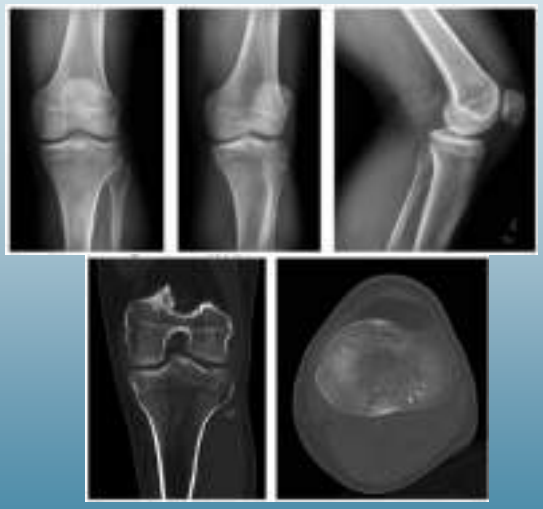
Nonoperative management

- **Valgus instability – 5-10 degrees**
- **Articular step-off threshold is controversial**
- **Isolated medial injuries: late varus collapse**
- **In general, small isolated lateral injuries without valgus instability**
- **Early ROM, limited wb x 8-12 weeks, +/- bracing**
- **Angular malalignment poorly tolerated**



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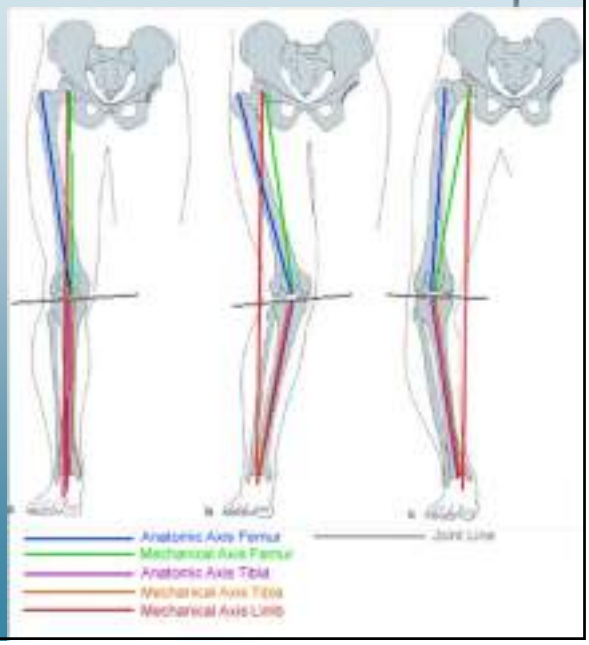
Goals of Surgical Fixation – Plateau Fractures

- **Restore Mechanical Alignment**
  - Coronal
  - Sagittal
  - Slope
- Normal Condylar width
- Fully Stable knee
- Congruent Articular Surfacte



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General Principles for Plateau Treatment

- Fracture location and classification generally dictate approach
- Anterolateral, posteromedial, direct medial most common
- Visualization of the fracture – key for articular reduction
  - Direct visualization; ie anterolateral with submeniscal approach
  - Fluroscopic; ie minimally invasive reduction and plating
  - Arthroscopic; in conjunction with fluoroscopic
- Use of temporary external fixation may be considered
- Fractures which are length stable can be safely delayed with bracing alone

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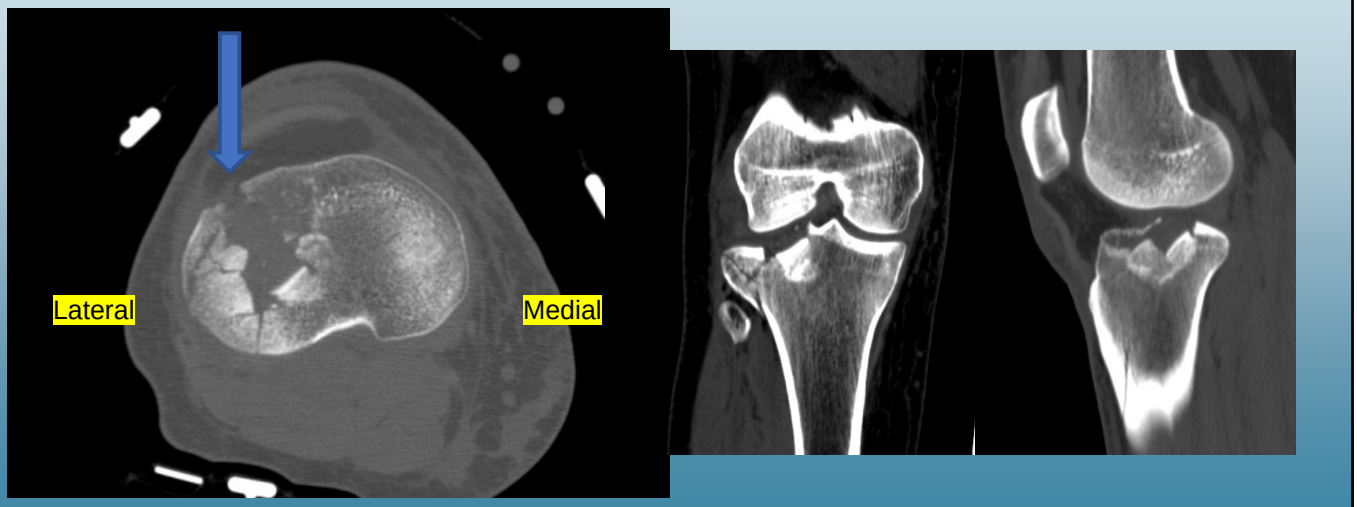
CT Imaging – axial cuts demonstrate approach



Different patient

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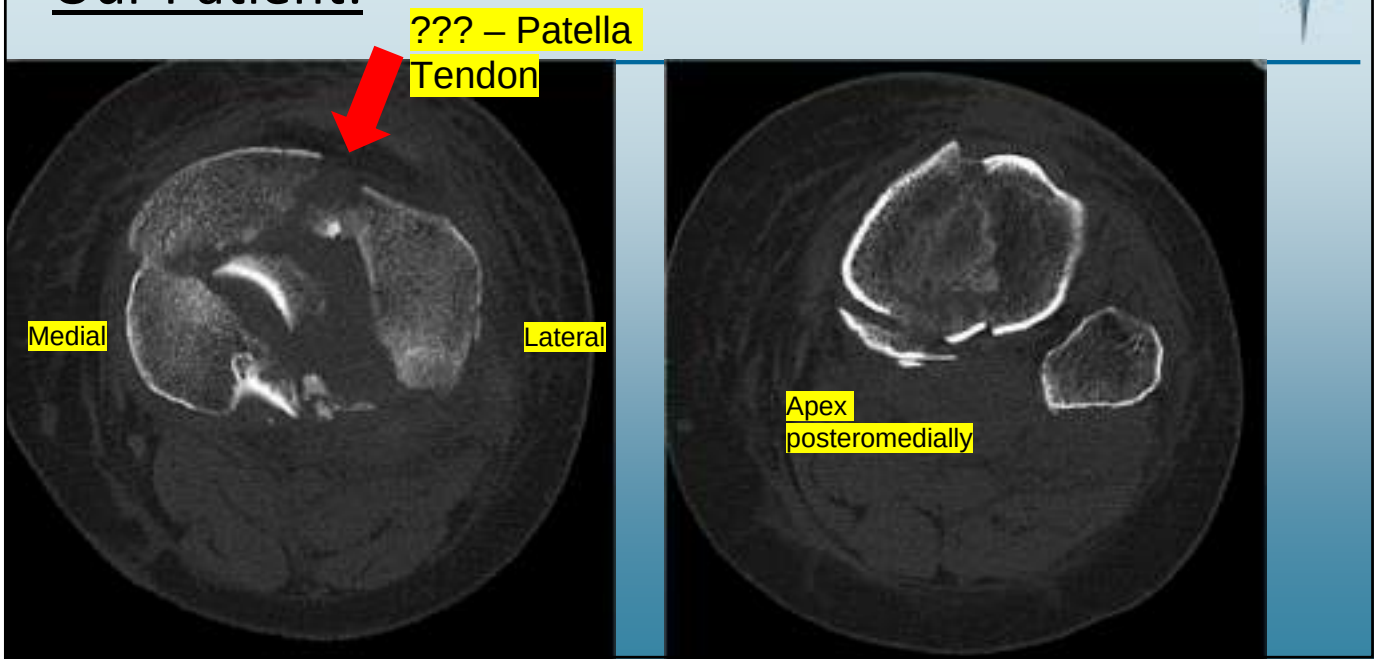
Our Patient:



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Isolated medial injuries

- **Much less common**
- **Posteromedial approach**
- **Key steps:**
  - **Generally buttress at the apex**
  - Direct approach to apex
  - **Indirect reduction at joint line (***Direct visualization via lateral fracture line***)**
  - Fluroscopic reduction key

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Our Patient:

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Rehabilitation

- Post op protocols :
  - Can vary by fracture severity
  - Goal of surgery – allow for complete ROM immediately postop
  - Unlocked hinged knee brace commonly used
  - Consider appropriate DVT prophylaxis
  - Touch down WB 8 weeks
  - Advance after 8 weeks depending on severity
  - Quad sets, isometrics important

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Complications

Tibial Plateau Fractures: Common Adverse Outcomes and Complications

- Loss of reduction
- Wound breakdown and infection
- Septic arthritis after external fixation
- Knee stiffness
- Prominent or painful hardware
- Nonunion or delayed union
- Posttraumatic arthritis

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Our Patient: 1 Year Follow-Up

- Mild knee stiffness
- No knee pain
- Radiogrtaphic finding of mild arthritis
- Rertuned to most activities however has not returned to skiing as of yet

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Questions?

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