BICONDYLAR TIBIAL PLATEAU FRACTURES:
ONE PLATE OR TWO AND MANAGEMENT OF DISLOCATION PATTERNS

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DISCLOSURES

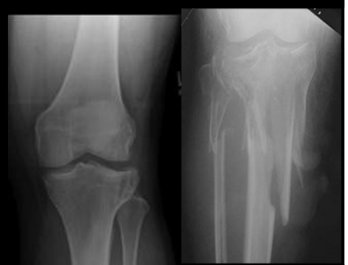
- ROYALTIES BIOMET AND DEPUY
- CONSULTING SYNTHES
- STOCK OWNERSHIP ORTHOPEDIATRICS

OBJECTIVES

- DISCUSS MANAGEMENT OF BICONDYLAR TIBIAL PLATEAU FRACTURES
- SOFT TISSUE MANAGEMENT
- SPANNING
- IMAGING
- ONE PLATE OR TWO?
- APPROACHES AND TECHNICAL TIPS, AND AVOIDING COMMON COMPLICATIONS

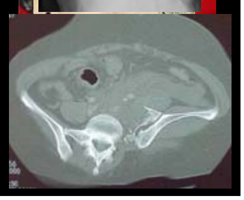
Patient workup: Mechanism of Injury

- **ATLS**
- **Off-axis axial loading, often valgus**
- **Energy**
  - **Low**
  - **High**



History

- **Mechanism**
- **Age & health of pt**
- **Associated injuries**

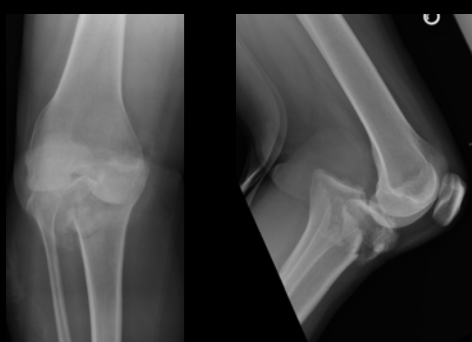


Physical Examination

- **Assess soft tissues**
  - **Open vs closed**
  - **Abrasions, fx blisters**
  - **Compartments**
- **Examine knee stability(?)**

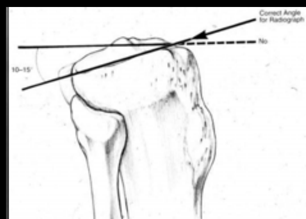
Physical Exam

- **Vascular status**
  - **Pulses, ABI's**
- **Document neurologic status**
  - **Peroneal nerve**
  - **Compartment syndrome**



Radiographic Evaluation

- Xrays
  - AP,lateral knee
- AP/Lat of Tibia & Fibula
  - Associated tib/fib shaft fx
- Plateau tilt view



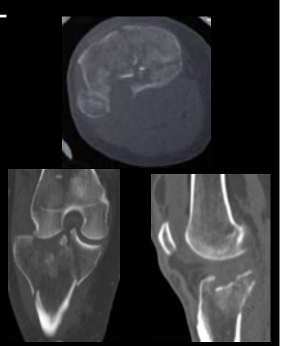
Importance of Proper Imaging


Standard AP View


"Plateau Tilt" View

CT

- Assist preop plan
- If considering non-op treatment?



Chan et al. JOT 1997: Impact of CT scan on treatment plan and fracture classification of tibial plateau fractures.

MRI

- High incidence of injury
  - Menisci
  - Ligaments
  - Capsule

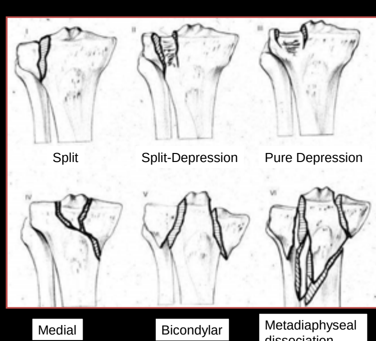
  - I don't use it for
  - Bicondylar fractures

Gardner et al JOT 2005, J Trauma 2006
Shepherd et al JOT 2002

Bicondylar Injuries: Special Considerations

- High energy
- Soft tissue compromise
- Comminution
- Need to address medial & lateral columns
- Axial alignment

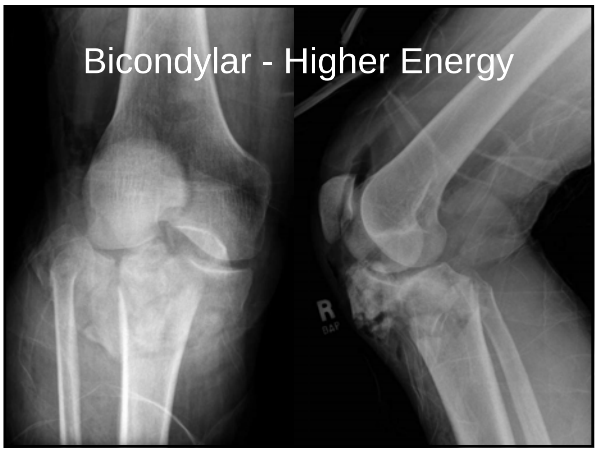
Schatzker Classification



Surgical Decision Making

- ***Soft tissue***
- ***Soft tissue***
- ***Soft tissue***

Bicondylar - Higher Energy



Bicondylar - Higher Energy

Temporary External Fixation:
1st Step in Staged Management

- **Indirect reduction via ligamentotaxis**
- **Restoration of length**
- **Await resolution of soft tissue injury**

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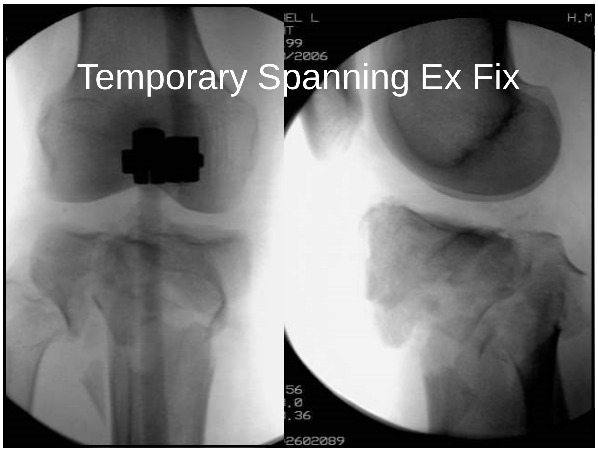
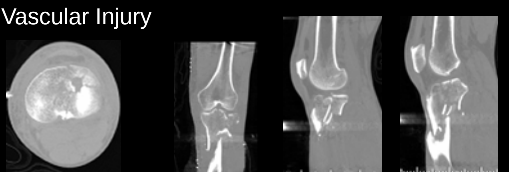
BE CAREFUL OF PIN PLACEMENT

Temporary Spanning Ex Fix

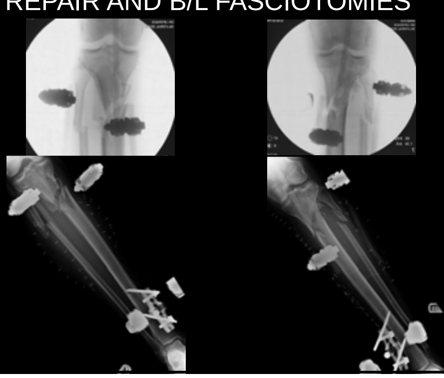


Initial Operative Goals

- Mechanical Axis
- Length
- Associated Problems
  - Compartment Syndrome
  - Vascular Injury



DW POST EX-FIX AND VASCULAR REPAIR AND B/L FASCIOTOMIES



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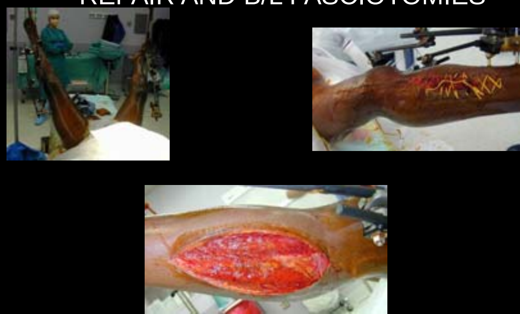
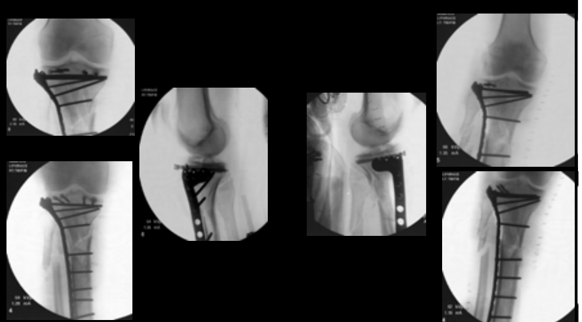


DW POST-DEFINITIVE FIXATION



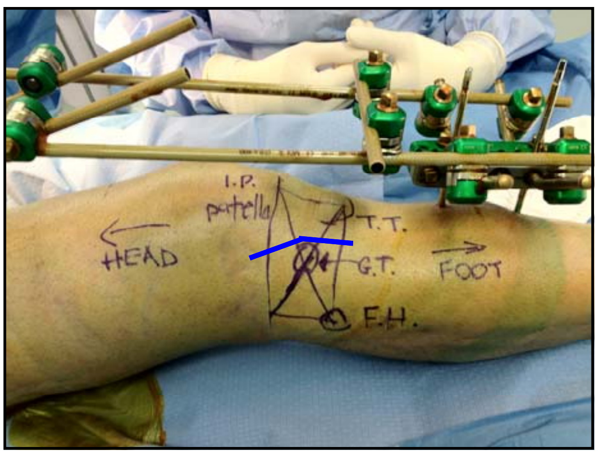
DW 4 WEEKS POST-DEFINITIVE FIXATION

RIGHT - AP

LEFT - Lateral

LATERAL WOUND
SPLIT THICKNESS
SKIN GRAFT

LATERAL WOUND
SPLIT THICKNESS
SKIN GRAFT



Treatment Goals

- **Stable Knee**
- **Restoration of mechanical axis**
- **Articular congruence**
- **Retain meniscus**
- **Early mobilization**

Alignment/Mechanical Axis

- **Poorer Prognosis:**
  - **>10° valgus, >5° varus**
  - **Varus particularly poorly tolerated**

Lansinger JBJS Am 1986
Rasmussen AOS 1972

Articular Incongruence

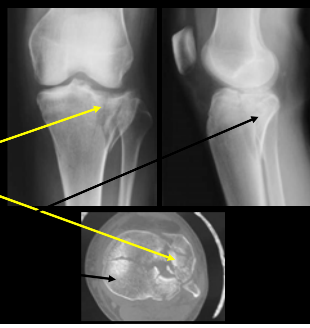
- **How much is too much?**
  - **Literature confusing**
  - **>5 mm too much**
  - **Any incongruence in presence of instability**

Brown et al, JOT, 1988
Blokker et al, CORR, 1984
Honoken et al, JOT, 1995
Barei et al, JBJS, 2006

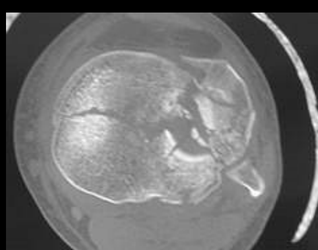
ONE LATERAL LOCKED PLATE OR TWO SEPARATE PLATES??

Schatzker VI: Bicondylar Classic Fracture Pattern

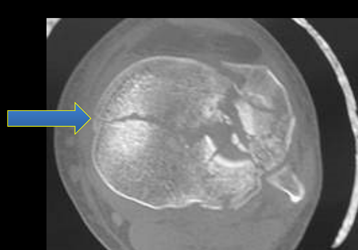
- Bicondylar Fxs
  - 2 classic components
  - Lateral split depression
  - Posteromedial coronal split



Complexity and Configuration of MEDIAL component drives decision of one lateral plate or two plates



Barei et al. JOT 2008 Incidence of coronal medial split 74% of bicondylar tibial plateau fractures



N.B. The vast majority of bicondylar tibial plateau fractures need TWO plates.

Single Lateral Locked implant for Bicondylar Fracture

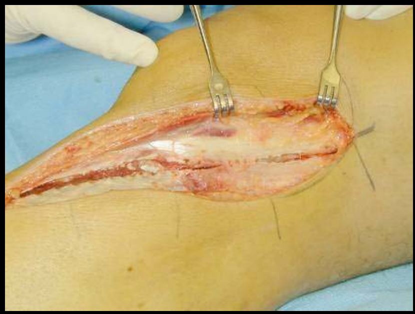
- More subsidence of fx fragments than w/2nd medial plate
  - Higgins et al JOT 2007
- Unreliable capture of posteromedial fragments
  - Barei et al. OTA 2005
- May be effective for select bicondylar fx with large, reduced medial condyle

SURGICAL APPROACHES

- ANTEROLATERAL -- SAME AS USED FOR SIMPLE SHATZKER 2 CASES
- POSTEROMEDIAL – WORK HORSE FOR MEDIAL FRAGMENT FIXATION

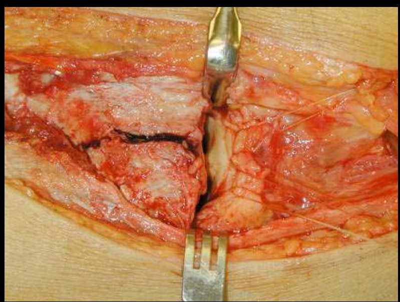
Lateral Anterolateral Approach

Lateral Anterolateral Approach

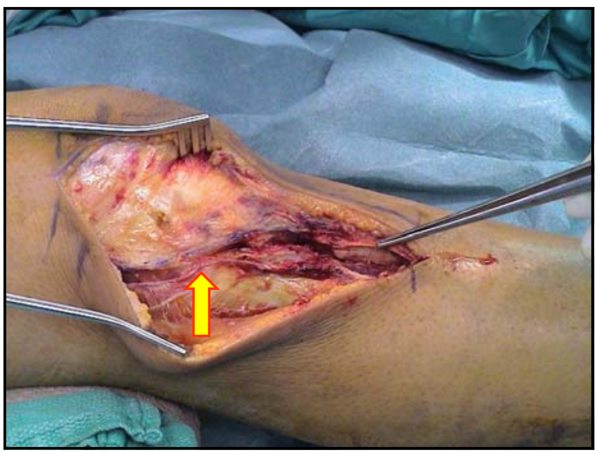


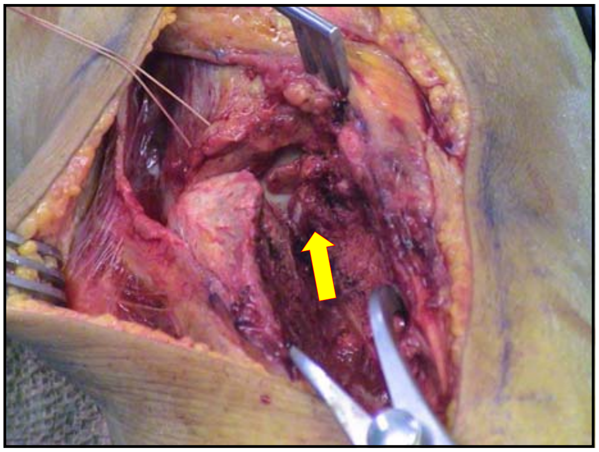
Lateral Anterolateral Approach

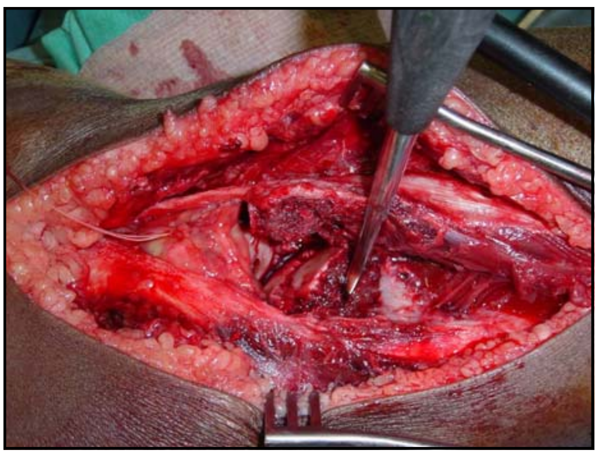
Lateral Anterolateral Approach




Lateral incision

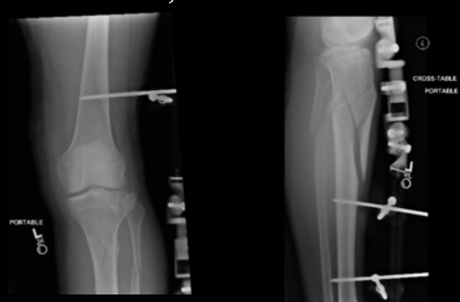




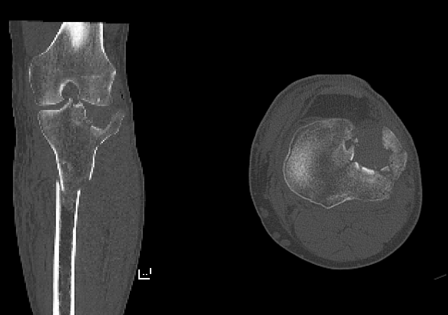


Case example single lateral plate

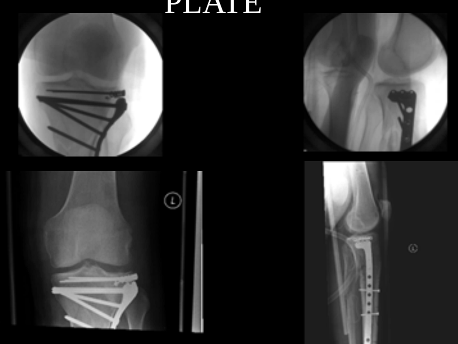
SIMPLE MEDIAL FRAGMENT
ONE PIECE, NO COMMINUTION



SIMPLE MEDIAL COMPONENT



SINGLE LATERAL LOCKED PLATE



POSTEROMEDIAL APPROACH

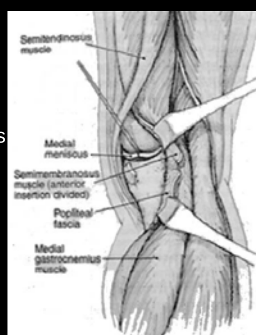
- SUPINE (SINCE I AM ALSO DOING ANTEROLATERAL IN THE SAME OPERATION)
- EXTENSILE DISTALLY
- BE CAREFUL OF RETRACTOR PLACEMENT

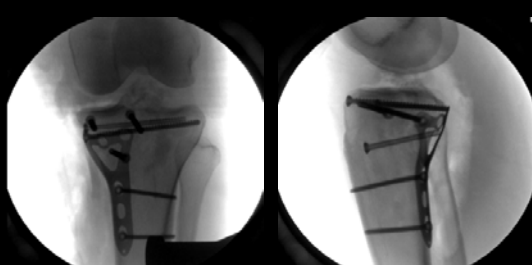
POSTEROMEDIAL APPROACH

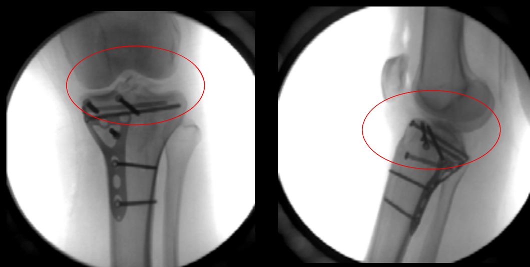
- EXTENSILE, CAN BE DONE SUPINE OR PRONE
- GREAT VISUALIZATION OF THE "FLAME" OF THE FRACTURE
- CAN GO SUB-MENISCAL TO FIX DISPLACED CORONAL SPLIT IF NEEDED

Posteromedial

- Pes and medial gastroc
- Saphenous bundle
- Posterior tibial NV structures
- Tourniquet?
- Poor joint visualization
- Indirect reduction
- Buttress plating







Optimizing the Management of Moore Type I Postero-Medial Split Fracture Dislocations of the Tibial Head: Description of the Lobenhoffer Approach.
Fakler, Johannes; Ryzewicz, Mark; Hartshorn, Cody; Morgan, Steven; Stahel, Philip; Smith, Wade

Journal of Orthopaedic Trauma. 21(5):330-336, May 2007.

A, Skin incision along the medial head of the gastrocnemius, not crossing the popliteal fossa. B, Incision down to the fascia.

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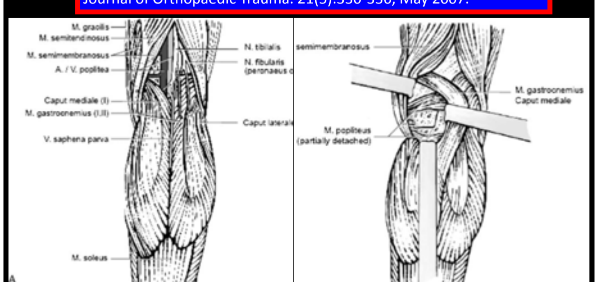

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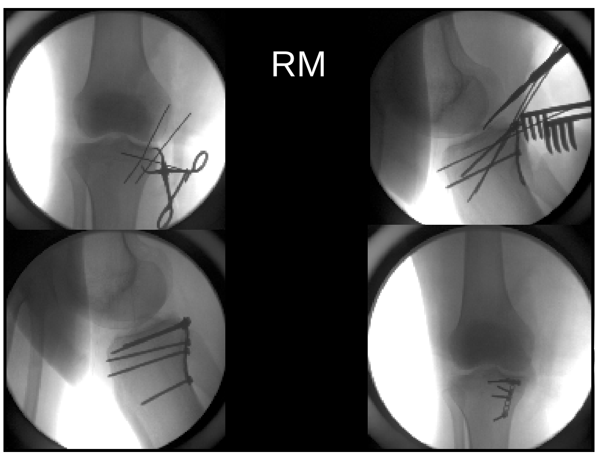
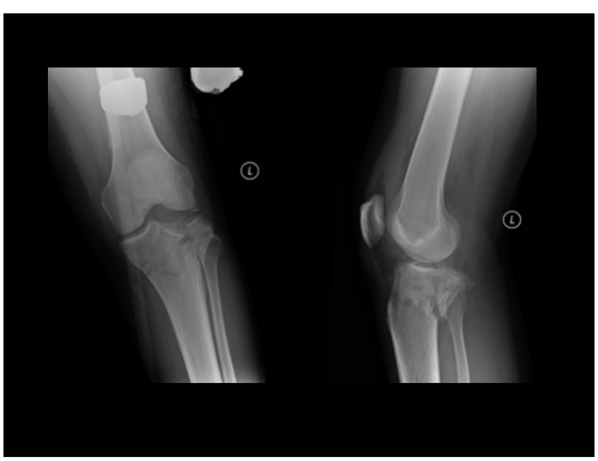
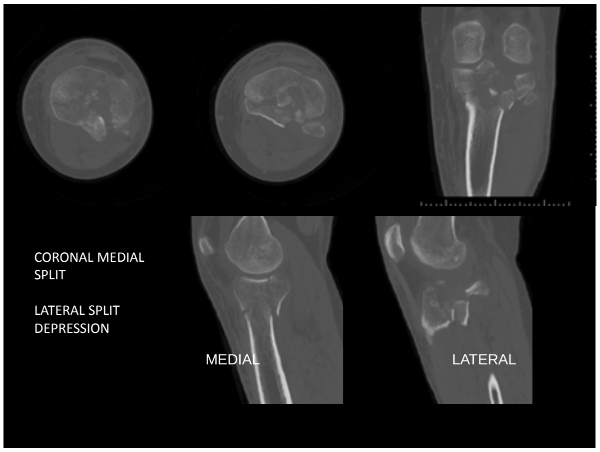
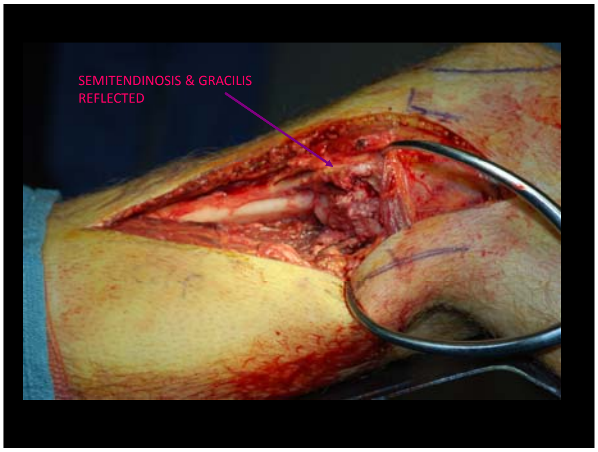
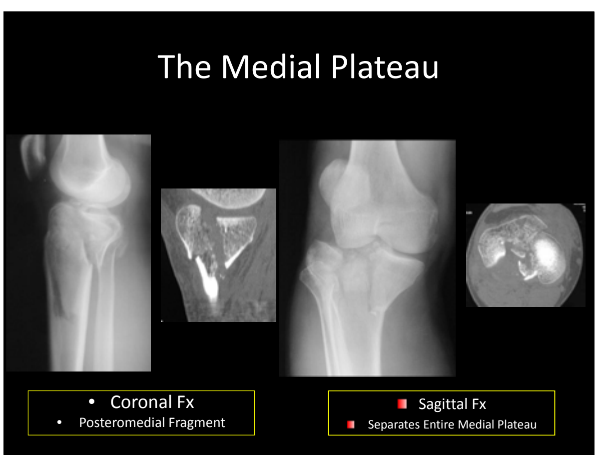




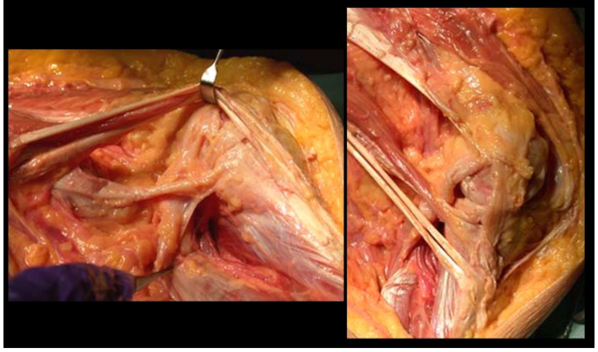


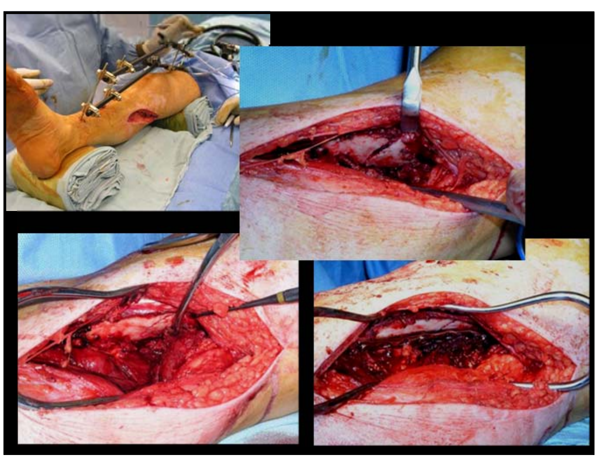
Double Plating – Posteromedial Buttress AND anterolateral locked

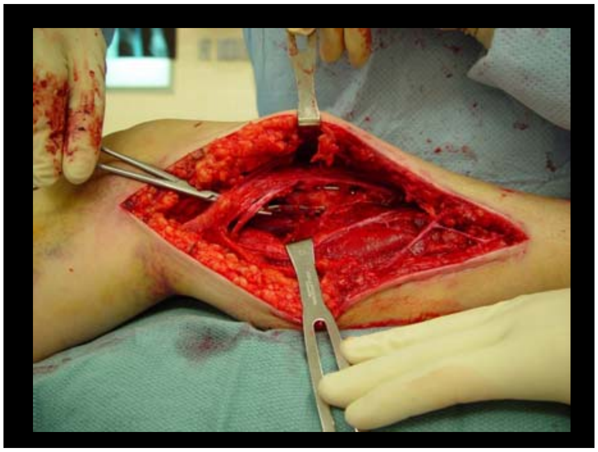

SEMITENDINOSIS & GRACILIS
REFLECTED


The Medial Plateau
Coronal Fx
Posteromedial Fragment
Sagittal Fx
Separates Entire Medial Plateau

Medial Knee Anatomy



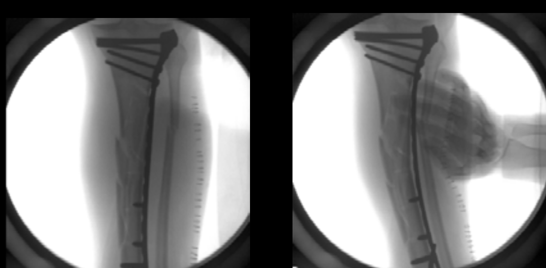




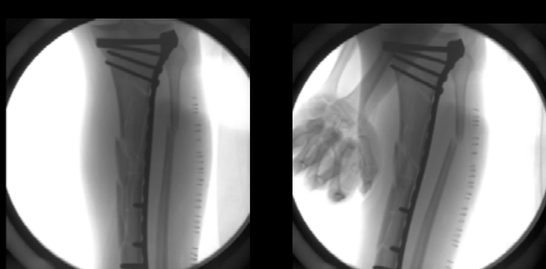
ESOTERIC STUFF

Even a Locked Plate may not be enough

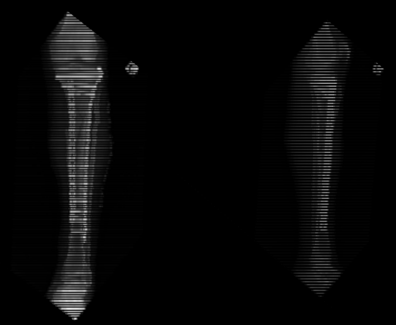
Even a Locked Plate may not be enough



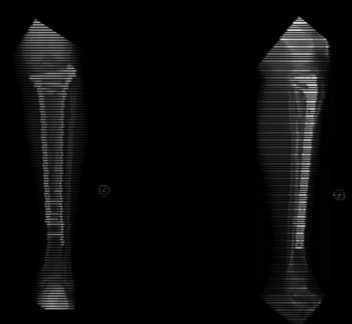
Even a Locked Plate may not be enough



Even a Locked Plate may not be enough

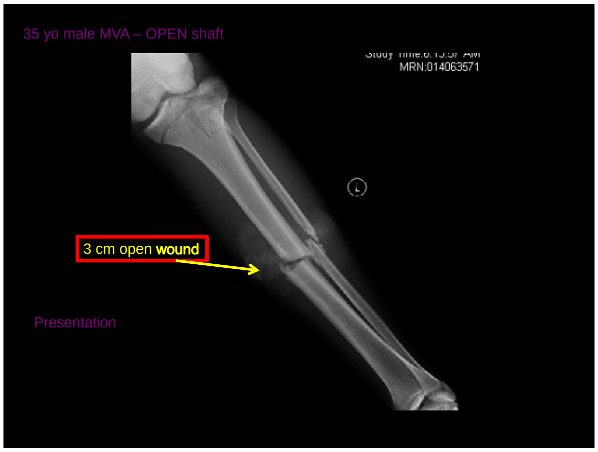


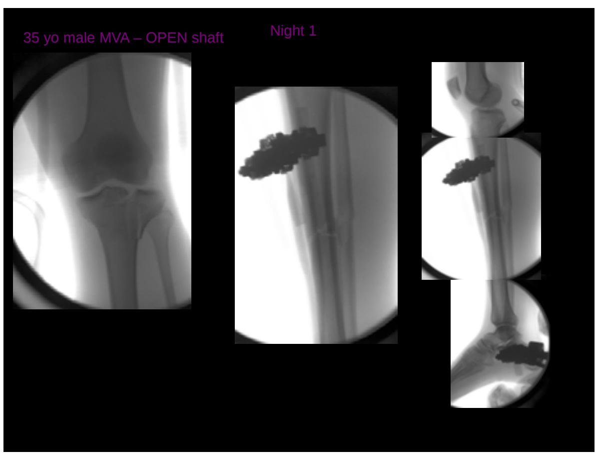
5 months

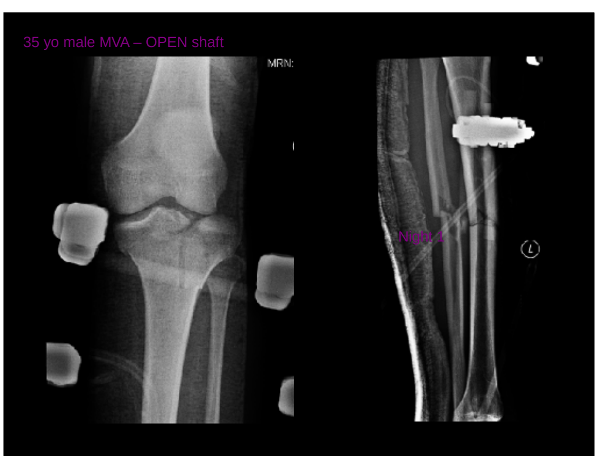


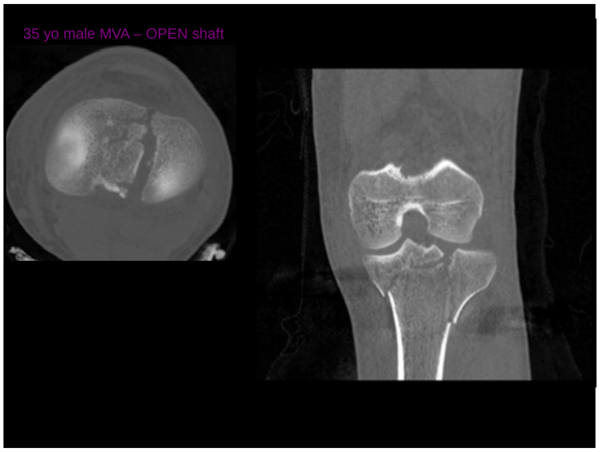
Combination Injuries

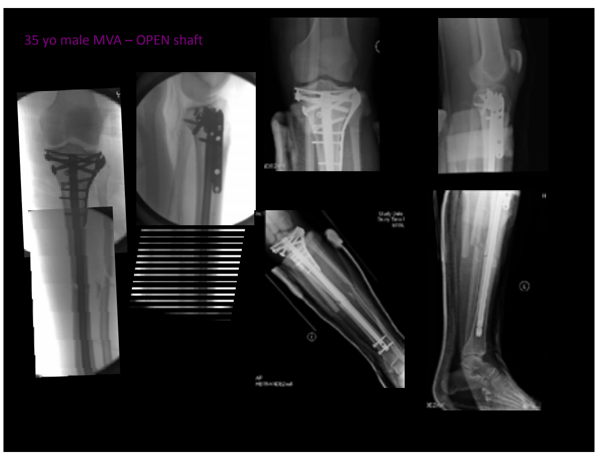
- Metaphyseal fracture ± articular extension
- Shaft fracture
- Planning of implant locations
- Goal: stable fixation


35 yo male MVA – OPEN shaft
MRN:014063571
3 cm open wound
Presentation


35 yo male MVA – OPEN shaft
Night 1


35 yo male MVA – OPEN shaft
MRN:
Night 1


35 yo male MVA – OPEN shaft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