

Good evening  
everyone !!

*Lincoln*  
*and the*  
*Chicken Bone Case*

*Fleming vs Dr. Rogers and Crothers – 1857*  
*Lawyer- Abraham Lincoln*



# *Fleming vs Dr. Rogers and Crothers – 1857*

## *Lawyer- Abraham Lincoln*

But my leg is  
short, so I  
have to limp  
!!

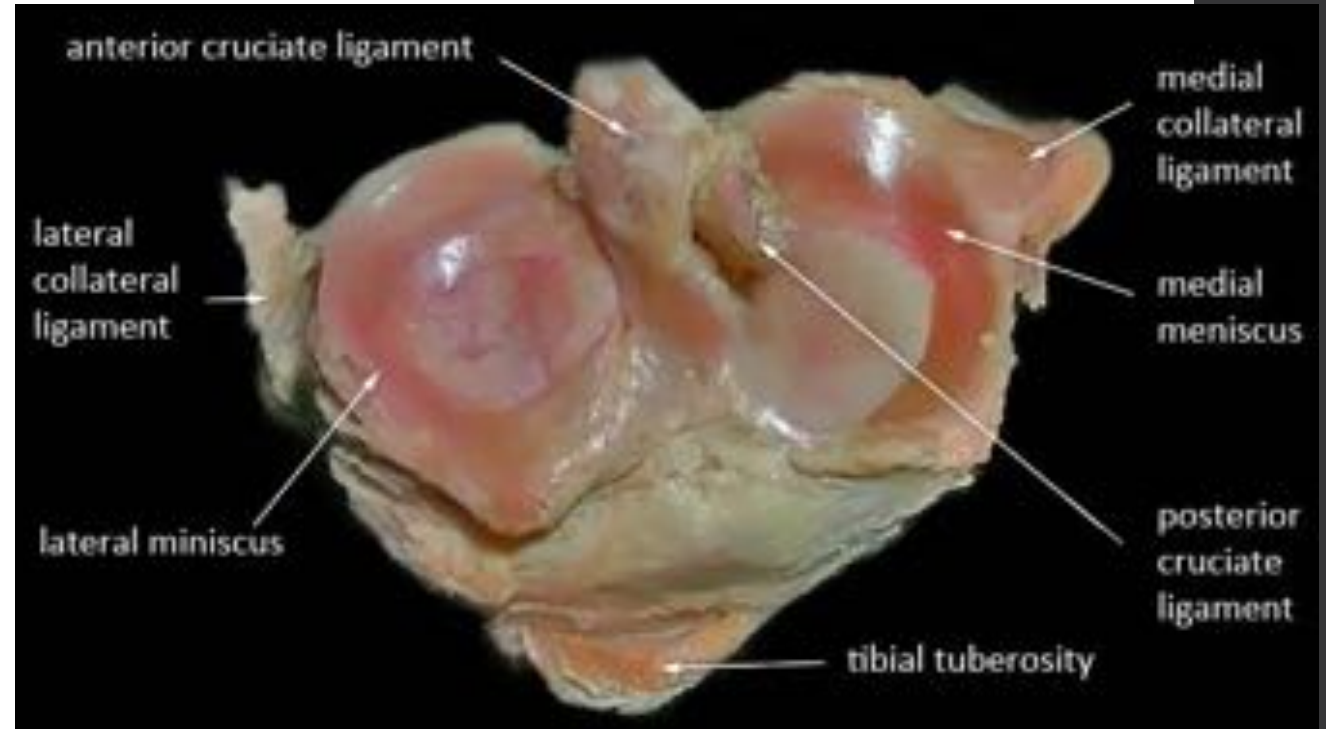
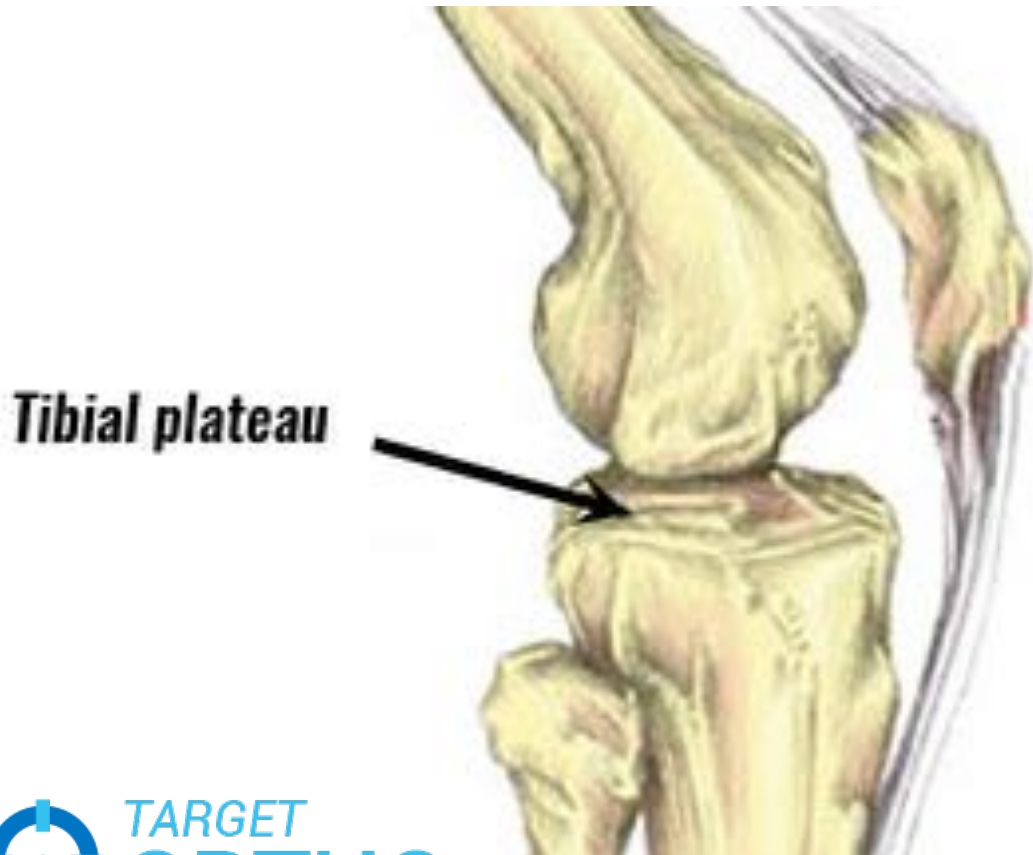
Well! What I would advise you is to get  
down on your knees and thank your  
Heavenly Father, and also these two  
Doctors that you have any legs to stand on  
at all!”



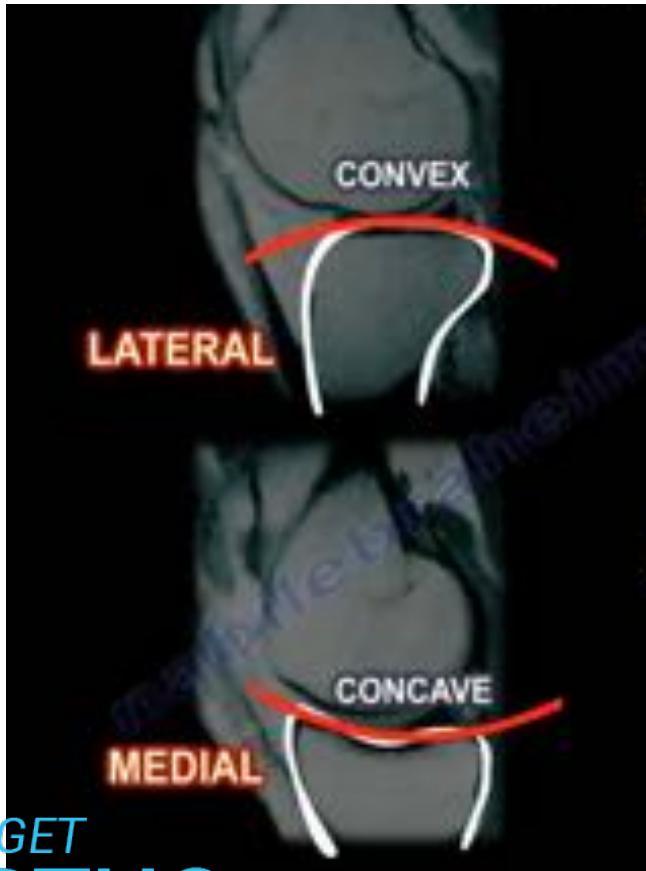
# TIBIA PLATEAU FRACTURES

BY DR DAIVIK T SHETTY

# ANATOMY OF TIBIAL PLATEAU



# BONY ANATOMY



## **LATERAL TIBIAL PLATEAU**

Convex in shape

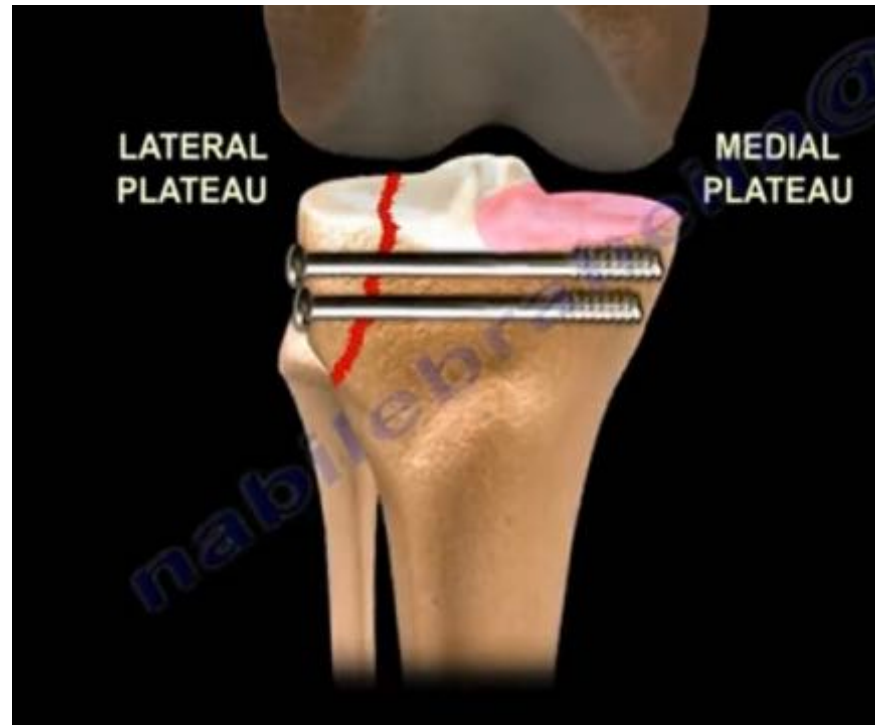
Proximal to medial plateau

## **MEDIAL TIBIAL PLATEAU**

Concave in shape

Distal to lateral plateau

# Why is this important ??





# Normal tibial plateau postero-inferior slope



5 DEGREES SAGITTAL SLOPE

3 DEGREES CORONAL SLOPE

# Neurovascular structure

- Common peroneal nerve
- Popliteal artery

# INTRODUCTION

- 1 % of all fractures
- 8% of fractures in Elderly
- **55-70%** involve lateral tibial plateau
- **10-20%** involve medial tibial plateau
- **10-30%** Both involved

# MECHANISM OF INJURY



**Leg in weight bearing position  
Valgus or Varus force with axial loading**

**Bumper injuries – 52%**

**Fall from height – 17%**

**Miscellaneous injuries- 31%**

# MECHANISM OF INJURY

Forces directed medially (valgus force) or laterally (Varus force)

- SPLIT #
- +/- Collateral ligament injury

Axial compressive force

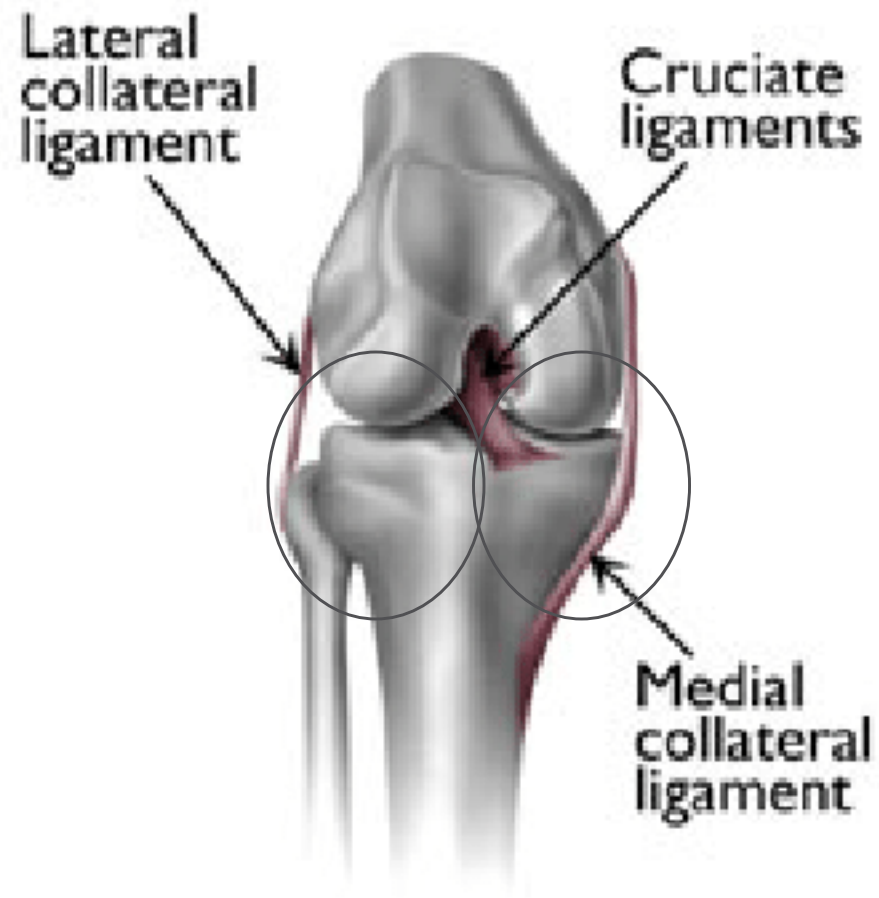
- DEPRESSION #

Both axial force and force from side

- SPLIT + DEPRESSION #
- +/- Collateral ligament injury



# Mode of injuries



# ASSOCIATED INJURIES

- Vascular injury
- Compartment syndrome
- MCL injury
- LCL injury
- Menisci
- SEGOND FRACTURE
- REVERSE SEGOND FRACTURE
- ANTEROMEDIAL TIBIAL MARGIN FRACTURES



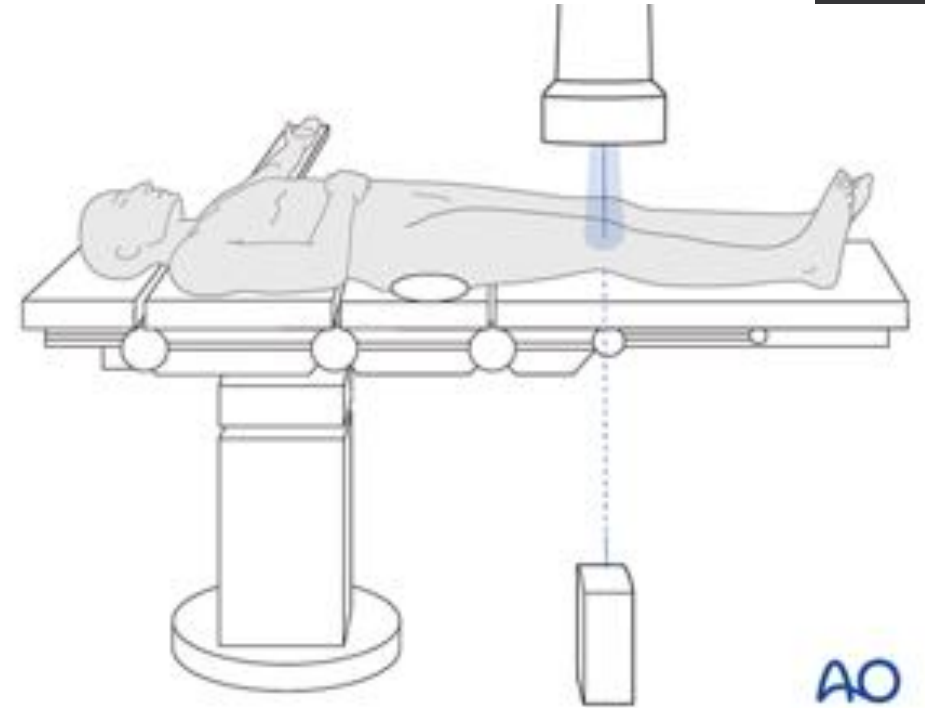
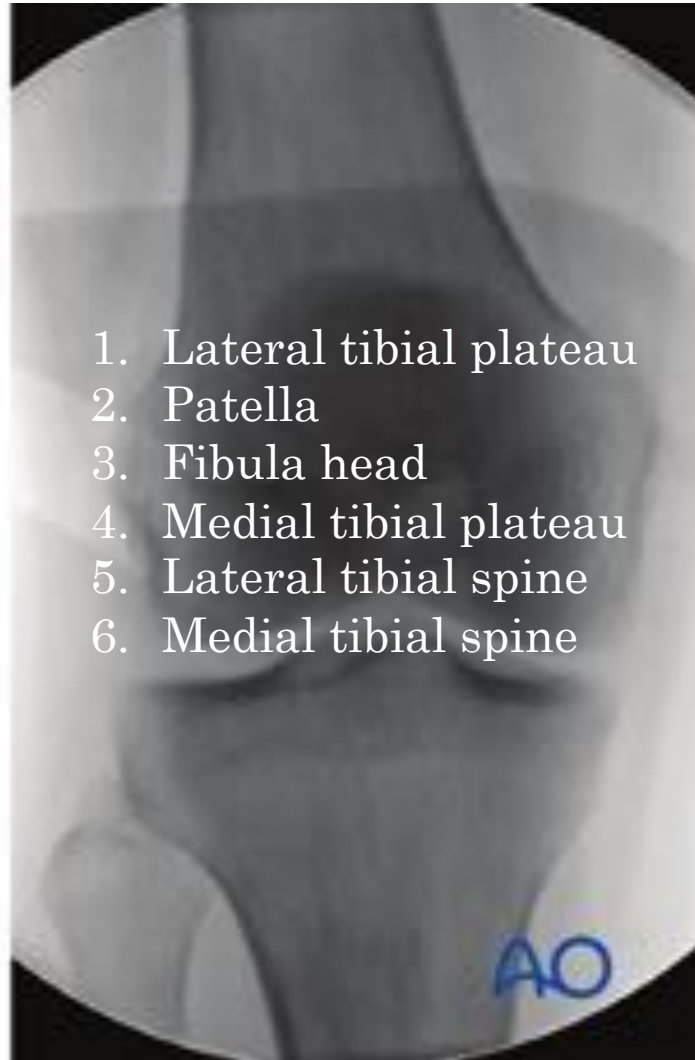
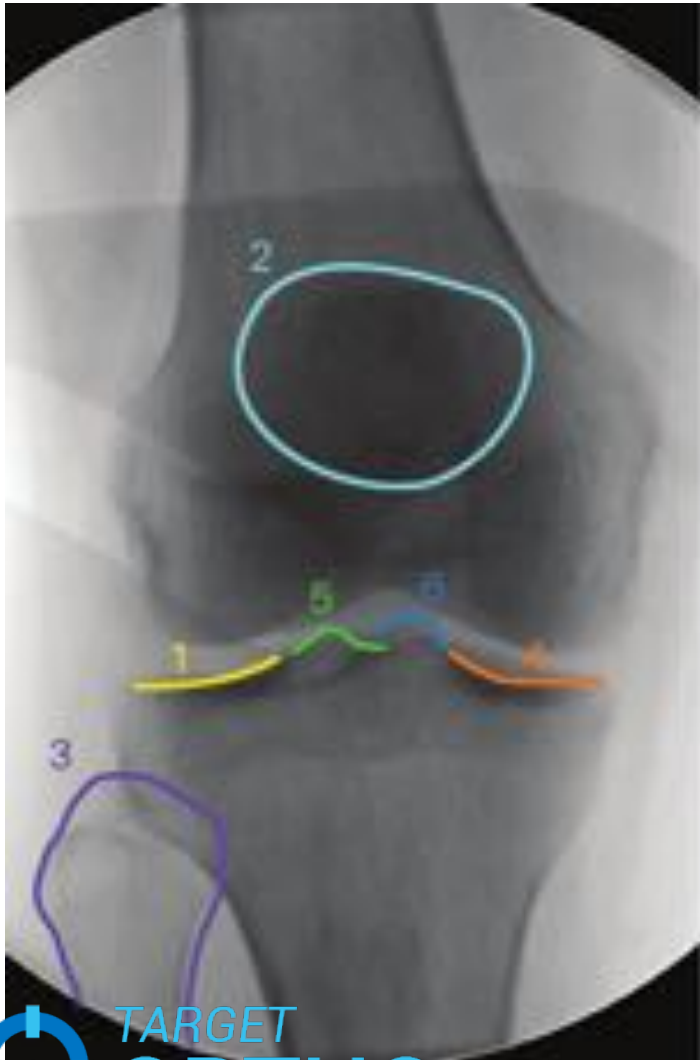
• ANTEROMEDIAL TIBIAL MARGIN FRACTURES

# RADIOGRAPHS

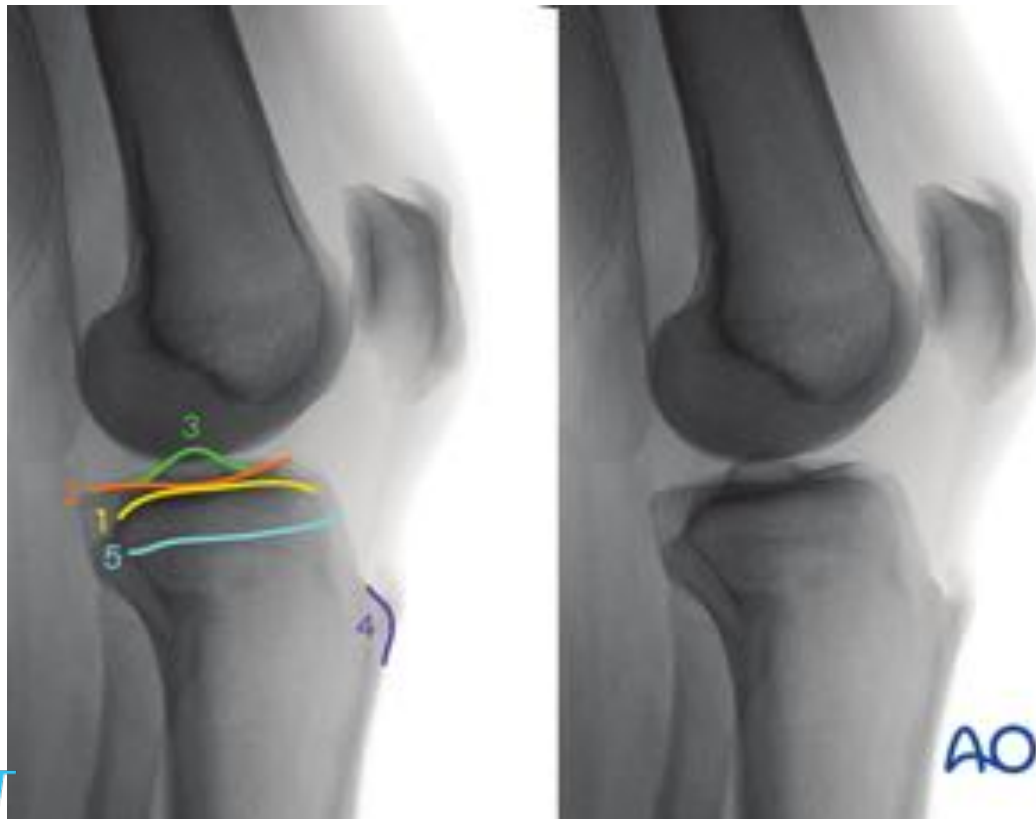
- XRAY KNEE WITH PROXIMAL TIBIA
  1. ANTERO-POSTERIOR VIEW
  2. LATERAL VIEW
  3. 10-15 DEGREE CAUDAL VIEW



# ANTERO-POSTERIOR VIEW



# LATERAL VIEW

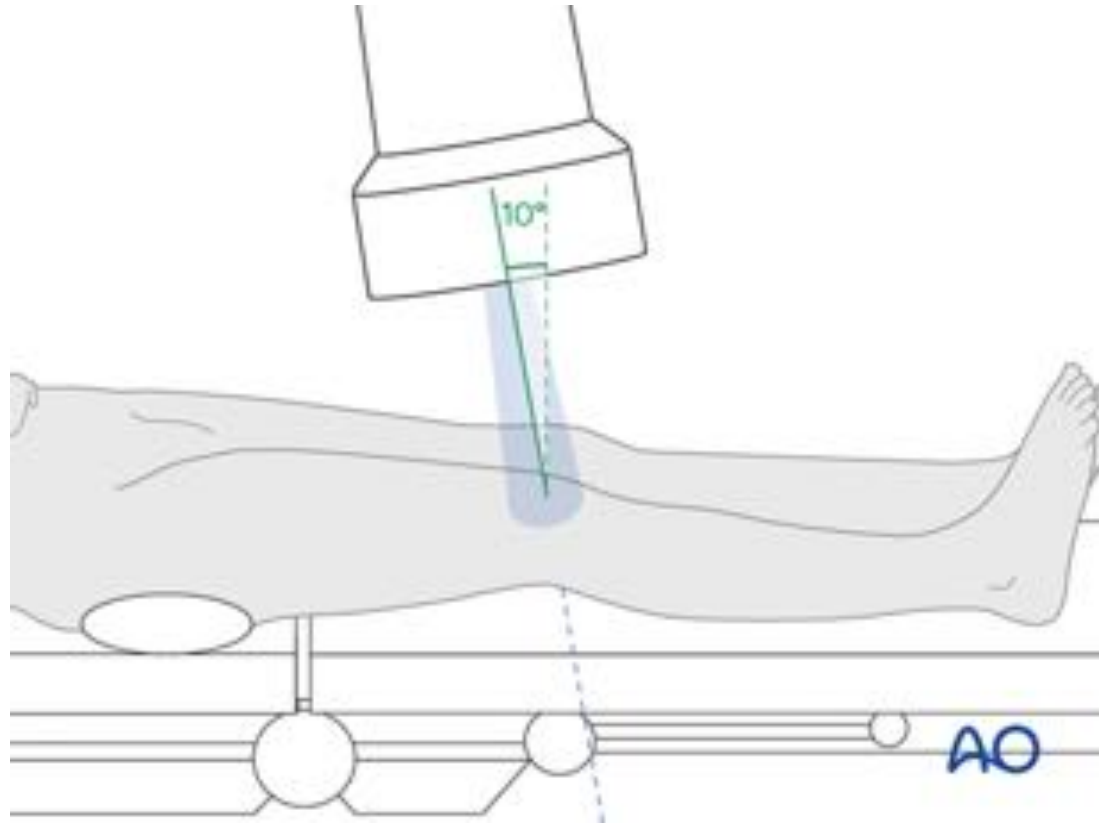


1. Lateral tibial plateau (convex line)
2. Medial tibial plateau (concave line)
3. Tibial spine
4. Tibial tuberosity
5. Epiphyseal scar

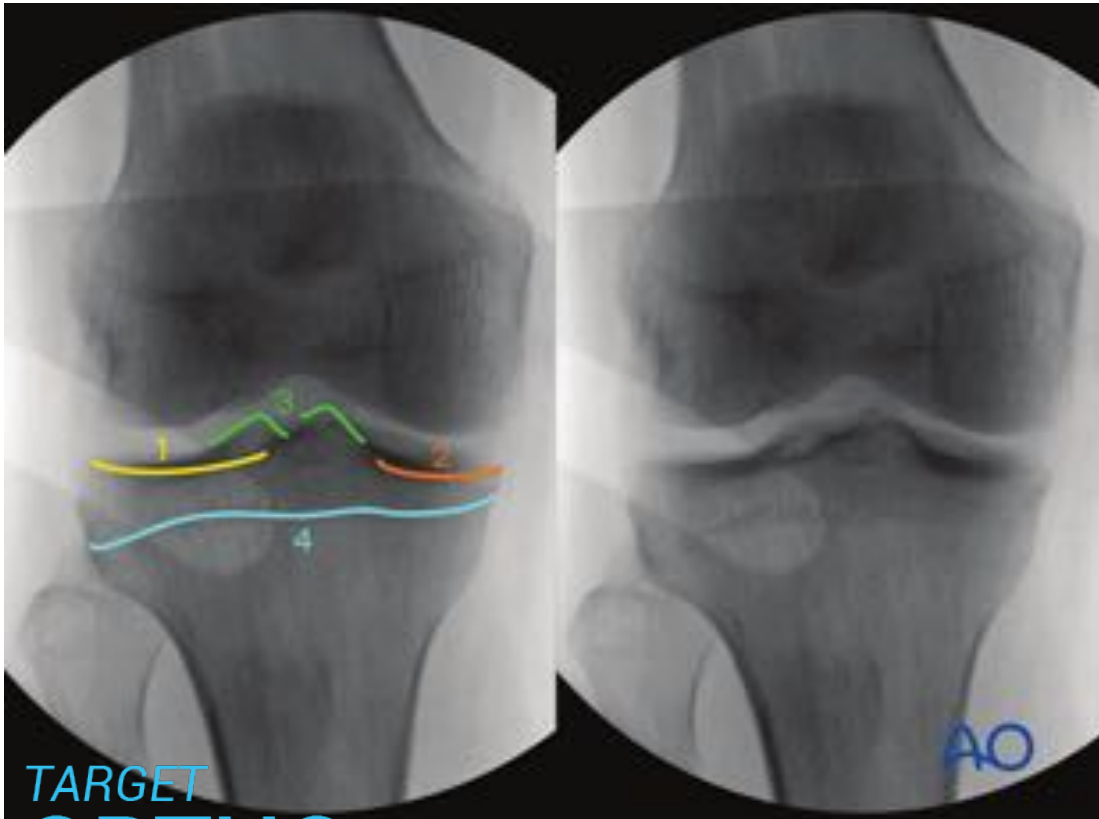
# LATERAL VIEW



# 10 DEGREES CAUDAL TILT



# 10 DEGREES CAUDAL TILT



1. Lateral tibial plateau (convex line)
2. Medial tibial plateau (concave line)
3. Medial and lateral tibial spine
4. Epiphyseal scar

- Articular surfaces
- Displacement and depression of condyles

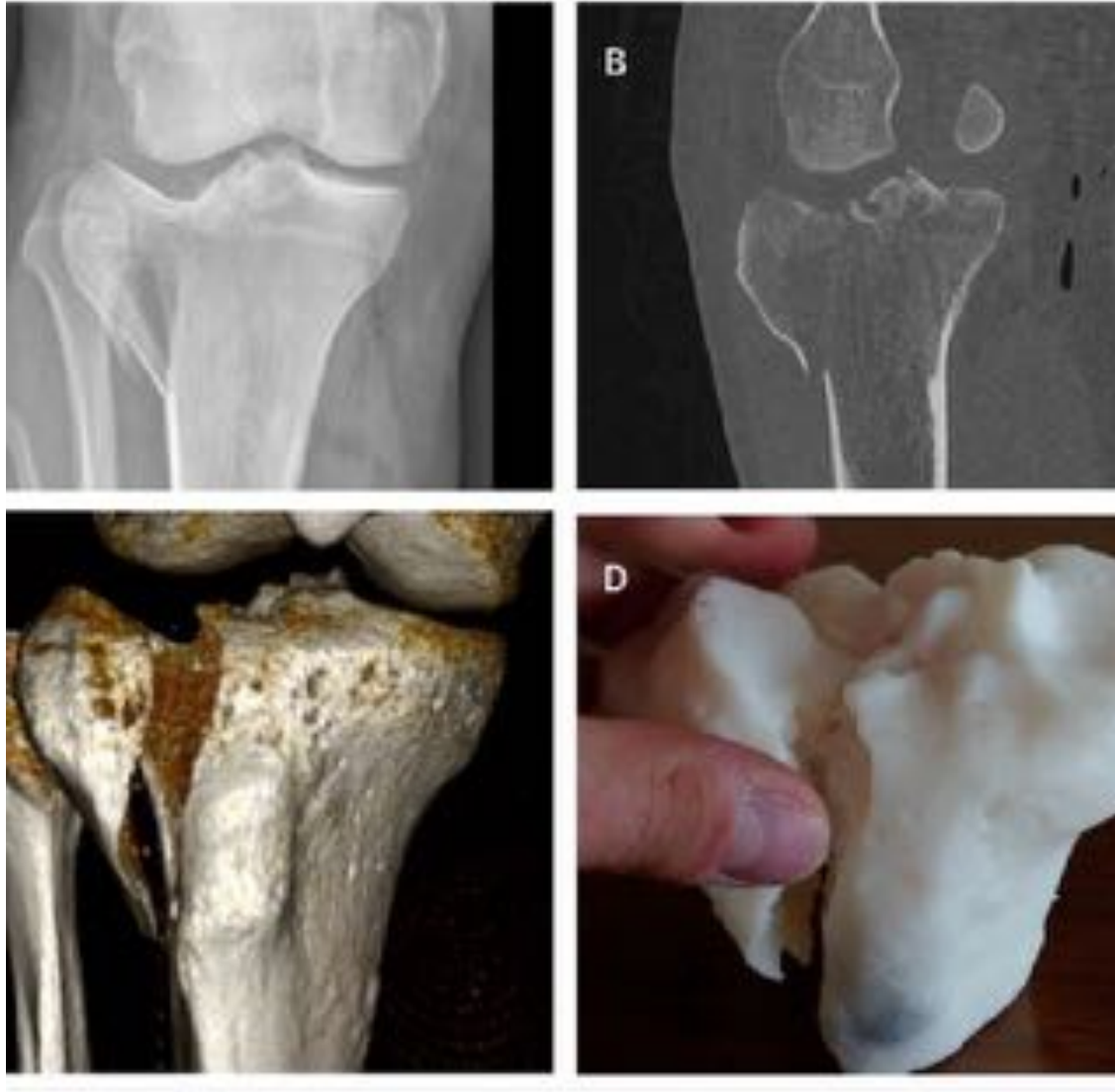
# TRACTION VIEWS

- RESTORES GROSS GEOMETRY
- DECREASES OVERLAP

# CT SCAN

**‘Personality of the fracture’**

**Critically important aid  
to preoperatively plan for  
operative approach and fixation  
technique**



# MRI SCAN

- Equivalent to 2D CT
- Identifies occult fractures and articular displacement
- Not routinely used
- Soft tissue injuries
  - Menisci
  - Ligaments



# Classification of tibial plateau fractures

# SCHATZKER CLASSIFICATION

- Gold standard
- Described in 1979
- Guide to treat most fractures till date
- BASED ON AP VIEW OF PROXIMAL TIBIA

# SCHATZKER CLASSIFICATION

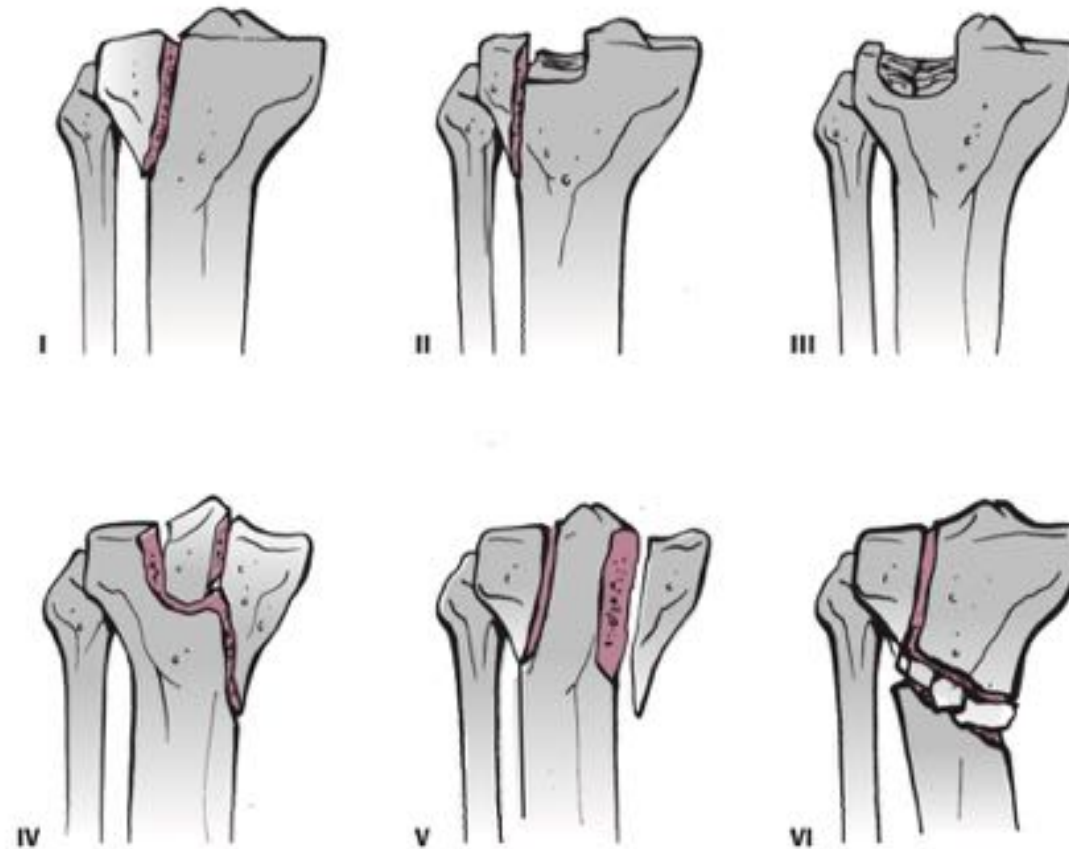


FIGURE 55-9 The Schatzker classification of tibial plateau fractures.

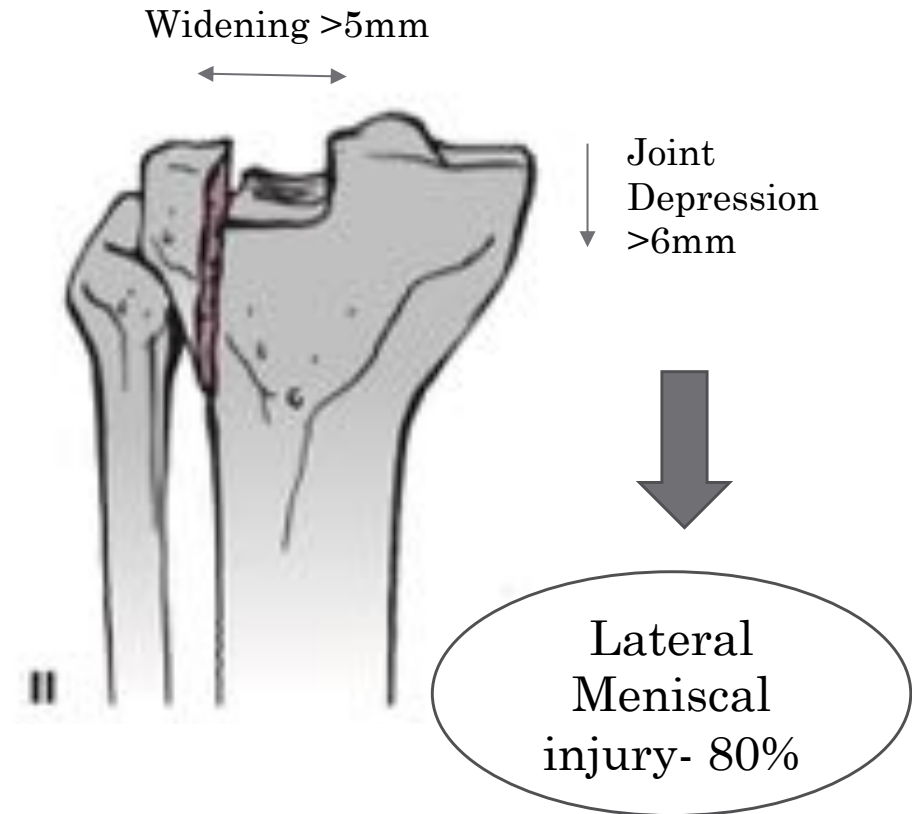
# TYPE 1 – PURE SPLIT FRACTURE LATERAL PLATEAU

- PURE CLEAVAGE FRACTURE
- LOW VELOCITY
- COMMON IN YOUNG



# TYPE 2 – SPLIT + DEPRESSION FRACTURE LATERAL PLATEAU

- Cleavage fracture with articular surface depression
- Seen in older individuals
- Lateral meniscal tear common



# TYPE 3 – DEPRESSION FRACTURE LATERAL PLATEAU

- Pure central depression fracture of the lateral tibial plateau with an intact osseous rim
- Usually seen in elderly, osteoporotic bones



# TYPE 4 – MEDIAL PLATEAU FRACTURE

- Split or depression fracture of medial tibial plateau
- HIGH VELOCITY INJURY
  - Impending compartment syndrome
  - Vascular injury
- Tibial spine may be involved
- Medial meniscus injury common
- Possible popliteal artery injury



# TYPE 5 – BICONDYLAR METAPHYSIS & DIAPHYSIS RETAIN CONTINUITY



ORTHOTRAUMA FRACTURES & WOUNDS



# TYPE 6 – BICONDYLAR META-DIAPHYSIS DISSOCIATION

- NO NEED FOR COMMINUTION , ITS **DISSOCIATION** !
- No part of metaphysis in line with diaphysis



# CONS OF SCHATZKER CLASSIFICATION

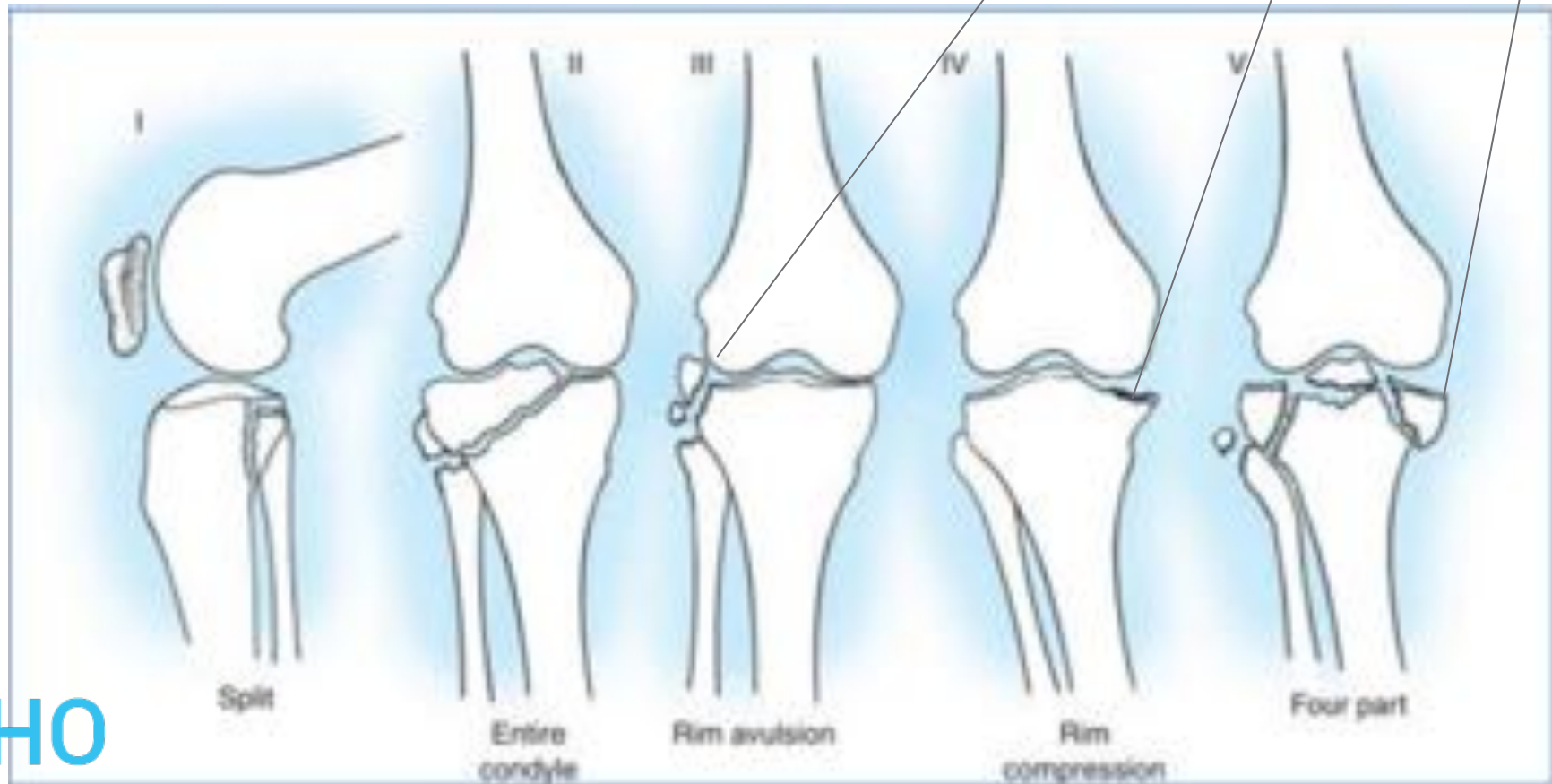
- Coronal plane was not considered
- CT was not considered

# Both are Bicondylar fractures



# HOHL AND MOORE CLASSIFICATION

- Takes into account the Coronal cuts



Due to  
excessive  
Varus  
hyperextension  
forces

Pull of muscles

Comminuted

# AO Classification

Type A	EXTRA-ARTICULAR
Type B	PARTIAL ARTICULAR
Type C	INTRA ARTICULAR

# Management

- Non operative
- Operative

# NON OPERATIVE

- IMMOBILISATION WITH CAST, BRACE – 4-8 WEEKS
- HINGED KNEE BRACE

Non displaced

Minimally displaced fractures in advanced osteoporosis

- QUADRICEPS ACTIVITY

# SURGERY

## INDICATIONS

- Articular step off >2mm
- Young age
- Increased activity demand
- >5mm condylar widening
- >10 degrees instability – Valgus, Varus instability
- Open fracture
- All medial plateau fractures
- All bicondylar fractures
- a/w Compartment syndrome
- Vascular injuries



# SPAN → SCAN → PLAN

- Use of spanning external fixator as temporizing measure in significant soft tissue injury and high energy individuals



# IMPLANT OPTIONS

- **Plate and screw –**

Buttressing against shear forces or for neutralizing rotating forces

- **Screw alone-**

Simple split

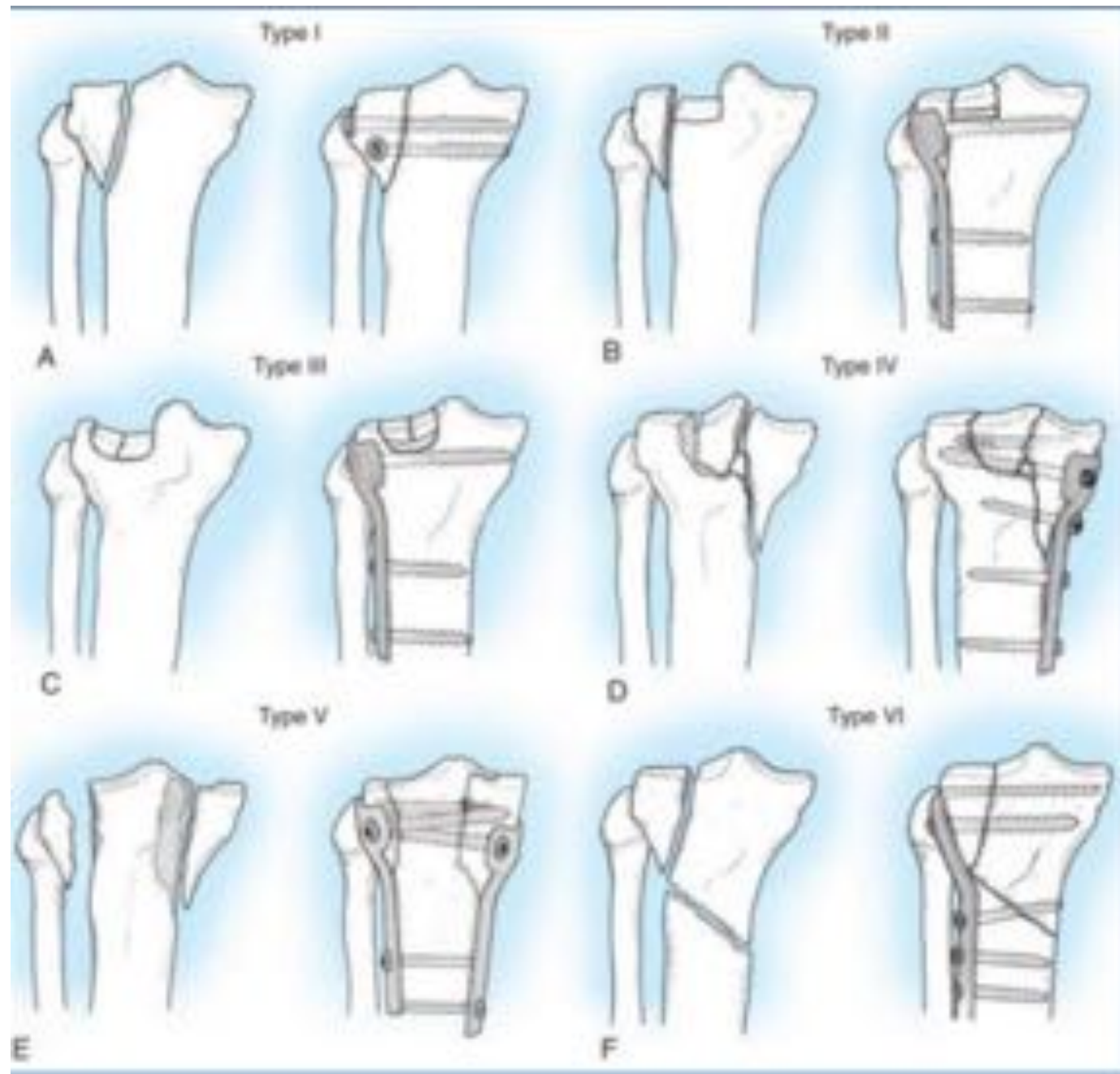
Depressed fracture elevated percutaneously

- **External fixator -**

Bridging, Hybrid, Ring

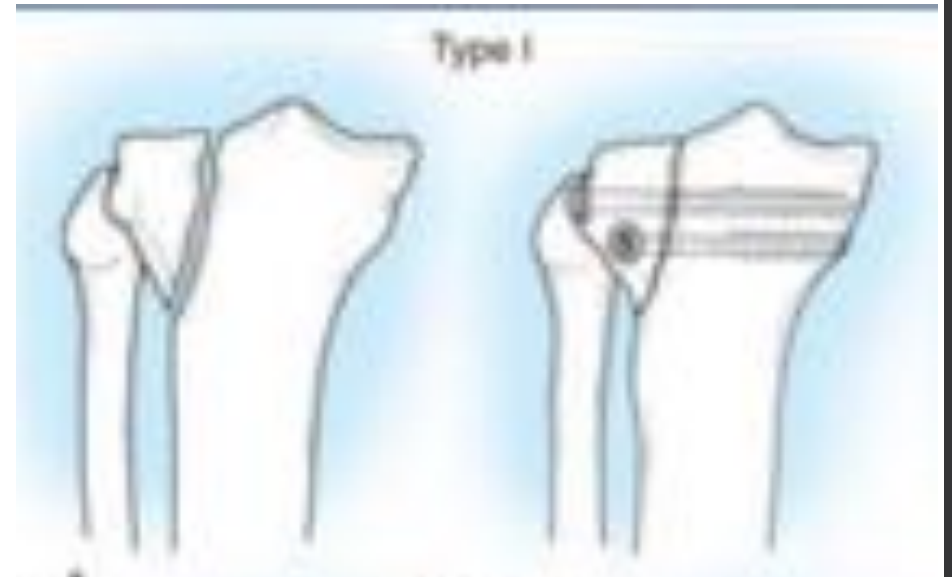
**Thinner plates**

# Treatment options



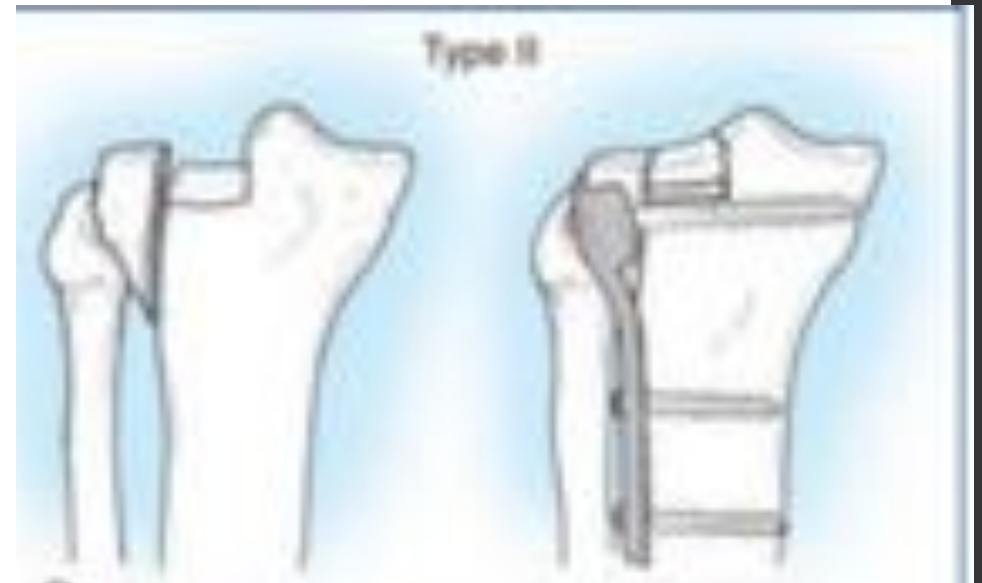
# SCHATZKER TYPE 1

- Closed reduction
- 6.5mm cancellous lag screws with washer
- YOUNG – screws adequate
- OLD - Buttress plate required



# SCHATZKER TYPE 2

- ANTEROLATERAL APPROACH
- Open reduction and elevation of the depressed fragment
- Bone graft placed to support elevated fragment
- Temporarily held by K-Wires
- Fixed with  
Lateral buttress plates  
Cancellous screws

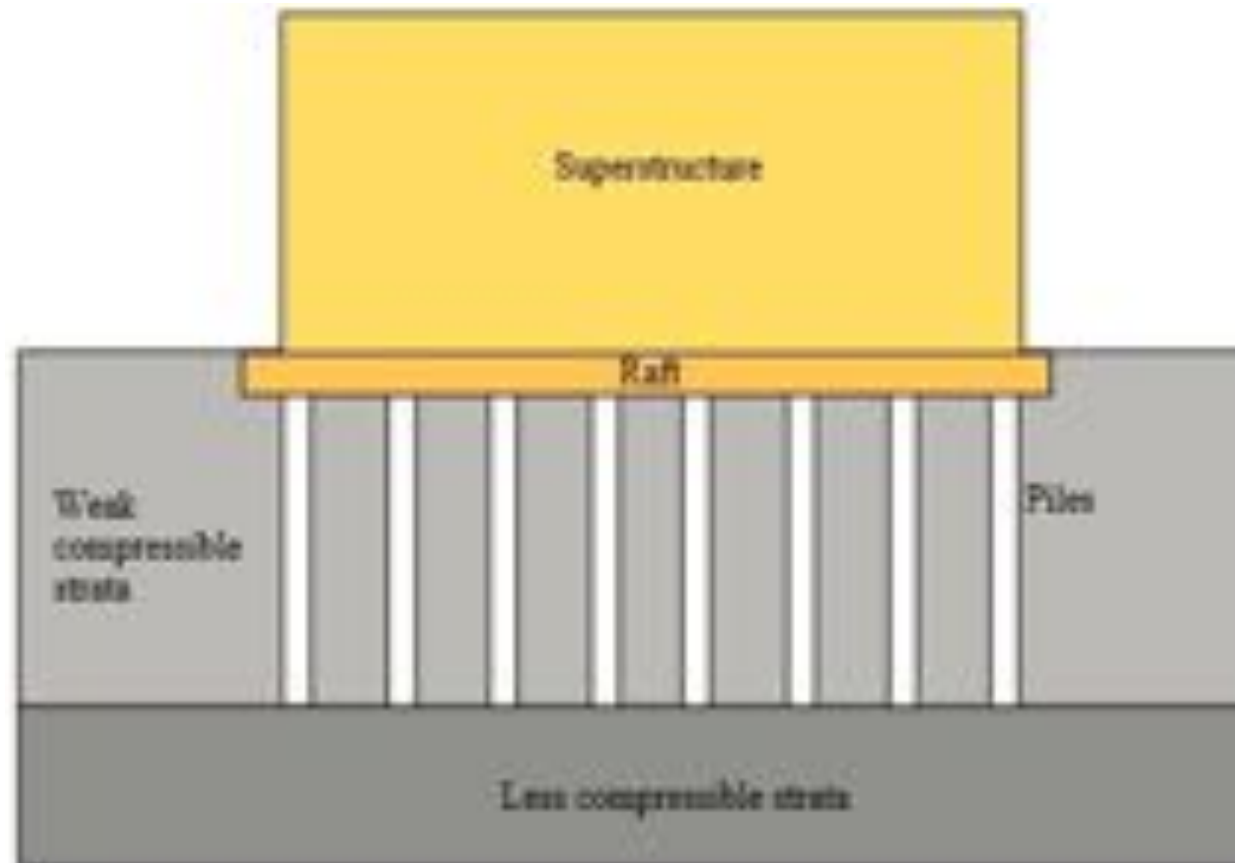


# SCHATZKER TYPE 2



F

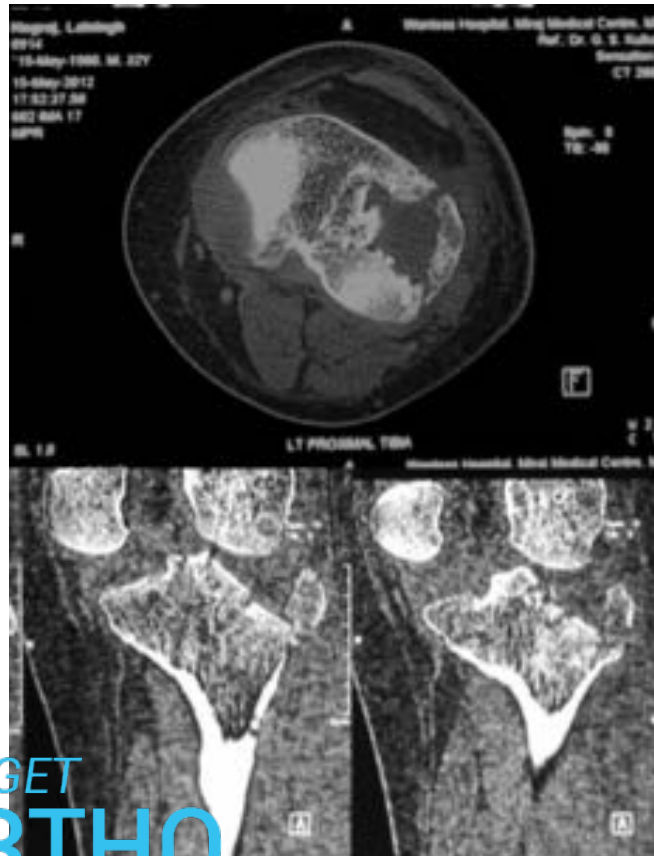
# What are raft screws ??



# RAFT SCREWS

## Use of a raft construct through a locking plate without bone grafting for split-depression tibial plateau fractures

Sunil G Kulkarni, Ravishanker Tangirala, Shekhar P Malve, Milind G Kulkarni, Vidisha S Kulkarni, Ruta M Kulkarni, Suresh Kriplani  
Department of Orthopaedics, Post-Graduate Institute of Swasthiyog Pratishthan, Miraj, India





# RAFT SCREWS



Use of 3.5 mm screws preferred as biomechanically less  
Chances of displacement (*Twaddle et al AAOs*)

No difference in pullout strength (*Westmoreland et al J Ortho trauma*)

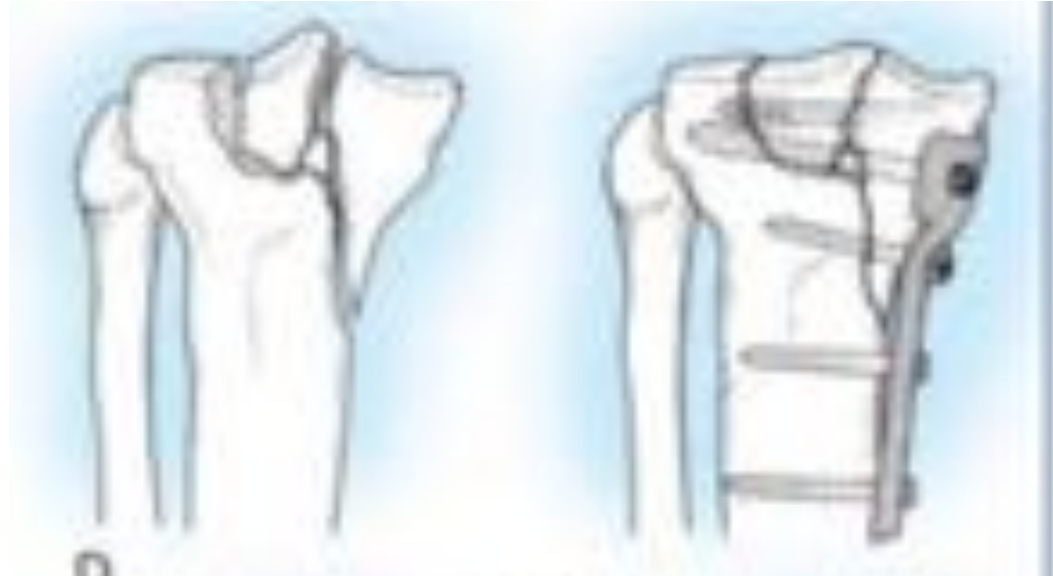
# SCHATZKER TYPE 3

- Elevation of depressed fragment by metaphyseal window
- Bone graft to support
- Fix using a subchondral plate and screws



# SCHATZKER TYPE 4

- Fracture tend to angulate in Varus
- MEDIAL BUTTRESS PLATE AND CANCELLOUS SCREWS

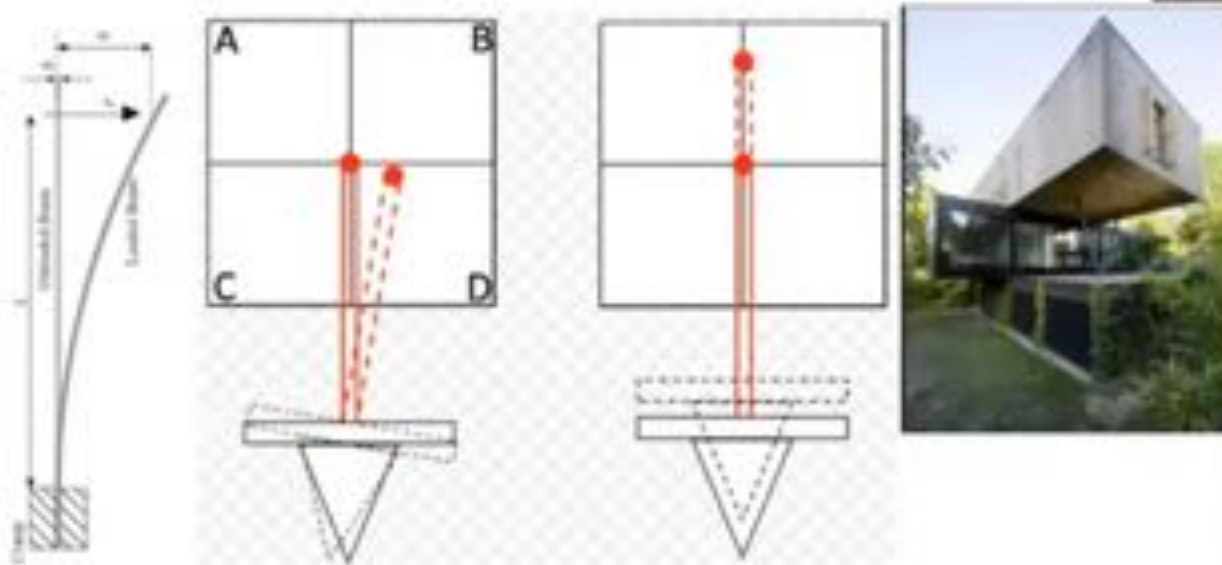


# Bicondylar fracture



# LATERAL PLATING

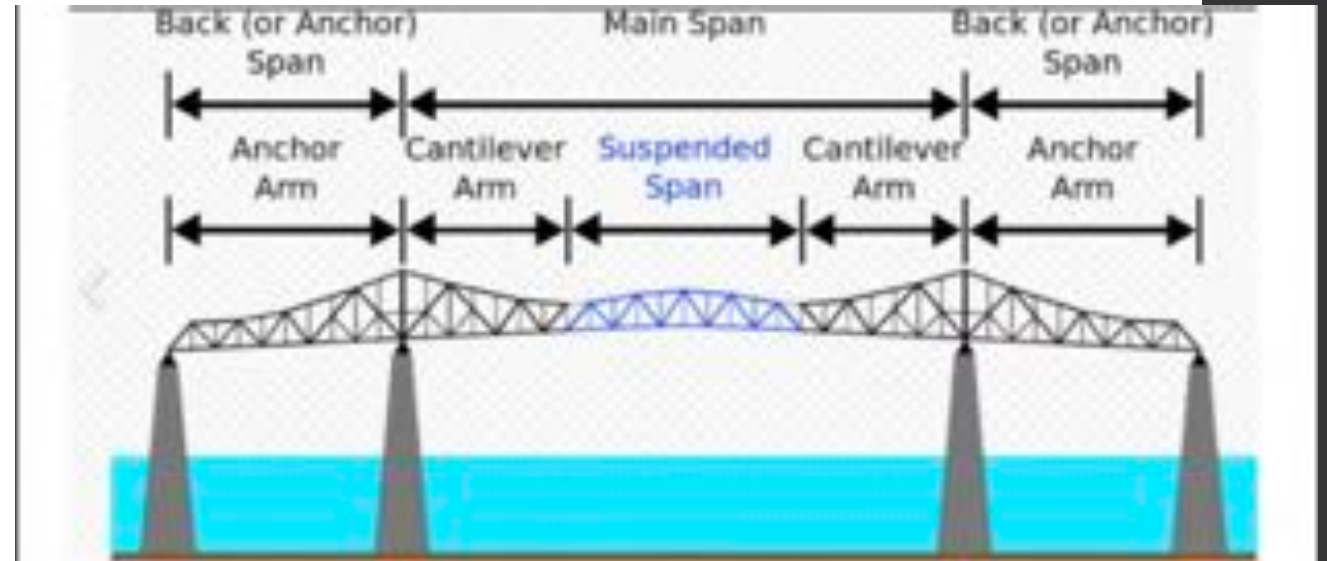
Single Column Plating works on Cantilever principle



A cantilever is a beam anchored at only one end. More the length of Cantilever arm less the compression forces.

ZO

# DOUBLE COLUMN PLATING “POST AND LINTEL SYSTEM”



# When is dual plating necessary ??

- Comminuted medial condyle
- Very displaced
- Relatively smaller fragments

The choice of dual plating is largely driven by characteristics of medial side injury

# DOUBLE PLATING SYSTEM

Soft tissue friendly  
More micromotion



More Strength  
Better stability  
Early Wt bearing





# SCHATZKER TYPE 5 & 6

- Traditional ORIF + Plating involves extensive exposure
- Hence use LESS EXTENSIVE APPROACH

- Indirect reduction by

LATERAL BUTTRESS PLATE with

MEDIAL PLATING

OR Screws , External fixator or Antiglide plate

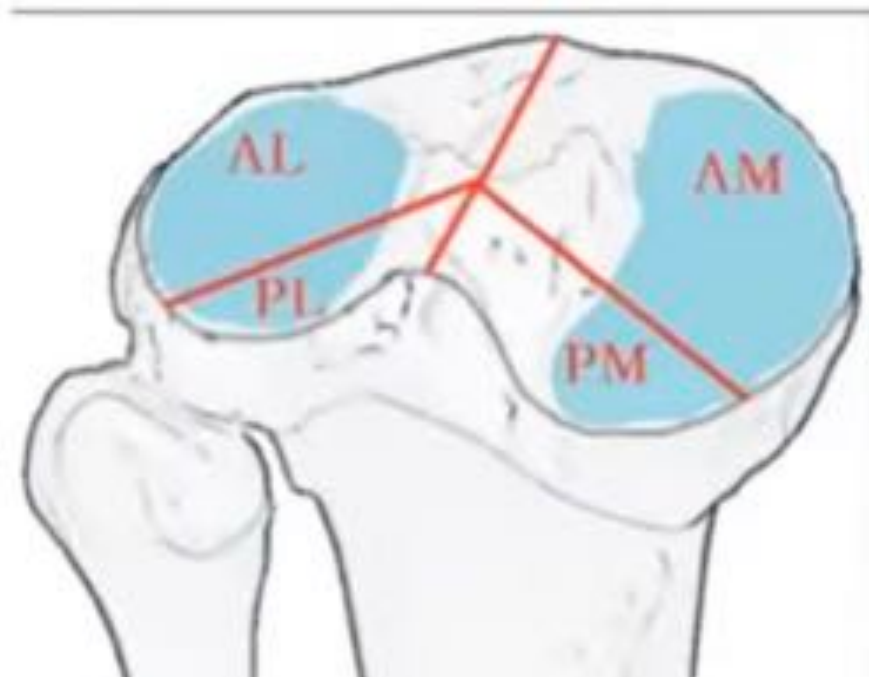
# In Dual plating

1. Medial side approached and fixing done first
2. Incisions should be nearly 180 degrees from each other- AL and PM
3. Initial medial fixation must be accurate
4. Medial side screws should account for lateral side injury  
Targeting screws anteriorly avoiding lateral fracture zone
5. Limit number of screws early in case
6. Consider both approaches while positioning

# Excessive comminution!!

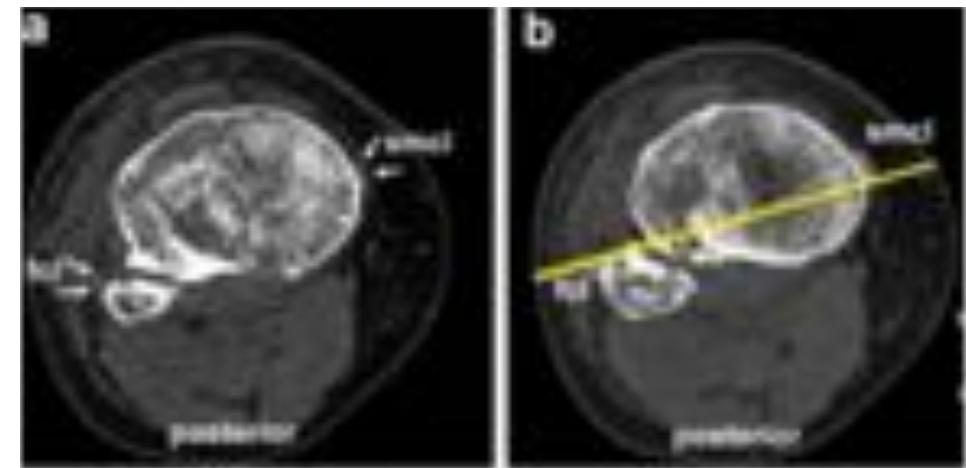
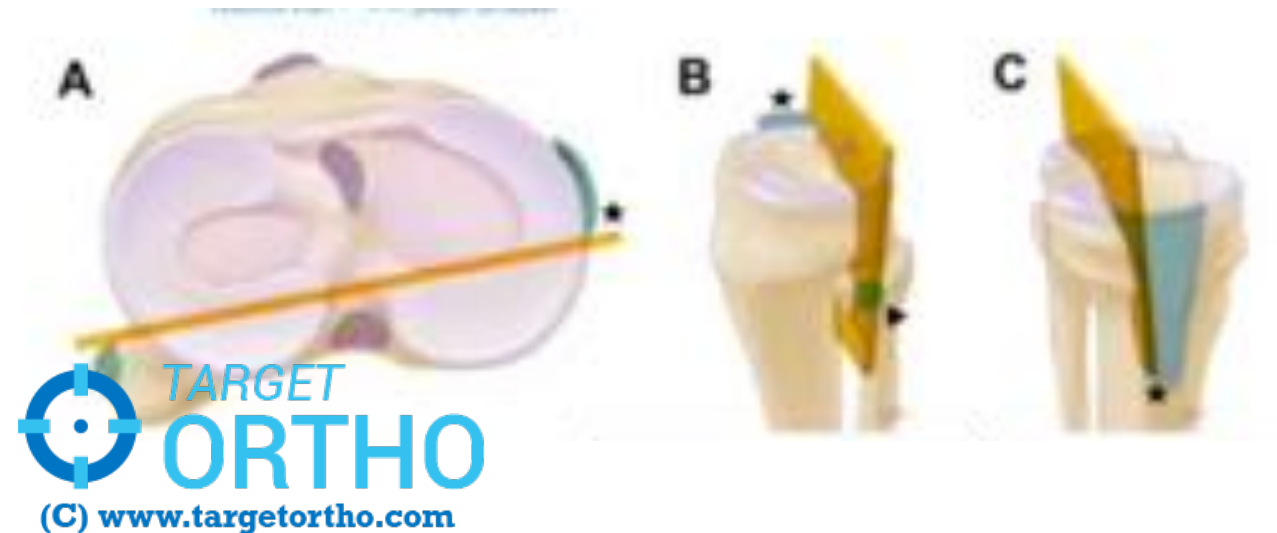


# CT based classification



*Chang SM et al. Schatzker Type IV  
Medial Tibial Plateau Fractures: A  
Computed Tomography-based  
Morphological Subclassification  
Orthopedics August 2014 - Volume 37 -  
Issue 8: e699-e706*

# Kfuri et al – Column based classification



# Based on quadrant

QUADRANT	APPROACH
Anterolateral quadrant	LATERAL PARAPATELLAR OR HOCKEYSTICK
Posteromedial quadrant	POSTEROMEDIAL APPROACH
Combined (5, 6)	AL & PM

# MEDIAL COLUMN FRACTURES

- Seen in Schatzker Type 4,5,6
- Rule out neurovascular injury (ABI, Compartment syndrome)
- CT Scan – degree of comminution ,orientation and location of fragment

# POSTEROMEDIAL FRAGMENT



Mechanism is described as

- Knee flexion
- Varus
- Internal rotation of MFC



# Approaches

- Extensive medial
- Anteromedial
- Posteromedial

# Lobenhoffer – Posteromedial approach

- Prone position
- Dorsal incision
- Lateralizing the medial head of gastroc muscle

And partial proximal detachment of soleus

Fix the main PM fragment



# COMPLICATIONS

- Loss of reduction
- Wound breakdown and infection
- Knee stiffness
- Painful hardware
- Nonunion
- Malunion
- Post traumatic arthritis

# Thank you !!

