



How I Fix A Bicondylar Fracture

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Disclosures



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CORR, Bone Joint Journal, BJO,
J Arthroplasty, AJSM, OJSM, VJSM, KSSTA,
JISAKOS, Knee, JOS, KSRR



● **First Vice President | 2024 - 2025**

Asia Pacific Orthopaedic Association
(APOA)

● **Founding Godfather**

ISAKOS Global Connection

● **President | 2019 - 2022**

Arthroplasty Society in Asia (ASIA)

● **President | 2019 - 2022**

Asia Pacific Knee Society (APKS)

● **President | 2020 - 2022**

Asia Pacific Arthroplasty Society (APAS)

Introduction



Tibial plateau fractures are **complex** and despite timely and excellent reduction, they **may result in sub-optimal results**

This may due to the inability to detect and correct sagittal malalignment resulting from **a reversal of the posterior tibial slope**

Schatzker type VI constitute nearly **one-fifth (20%)** of tibial plateau fractures and are the **most challenging fracture patterns**

AO Principles of **Bicondylar Fracture Treatment**



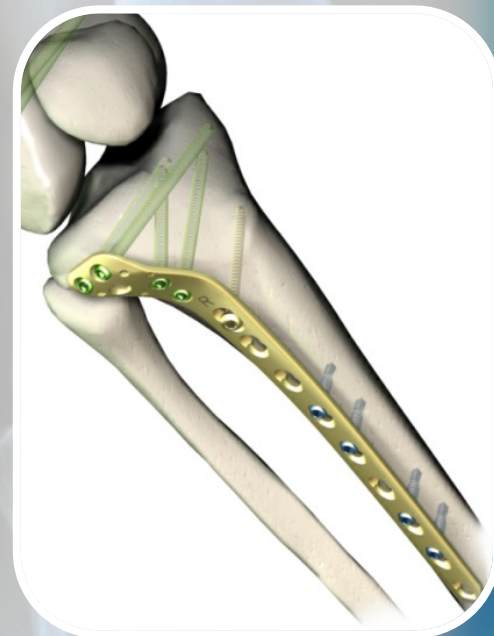
- ✓ **Functional reduction**
- ✓ **Stable fixation**
- ✓ Preservation of **blood supply**
- ✓ Early **active** movements



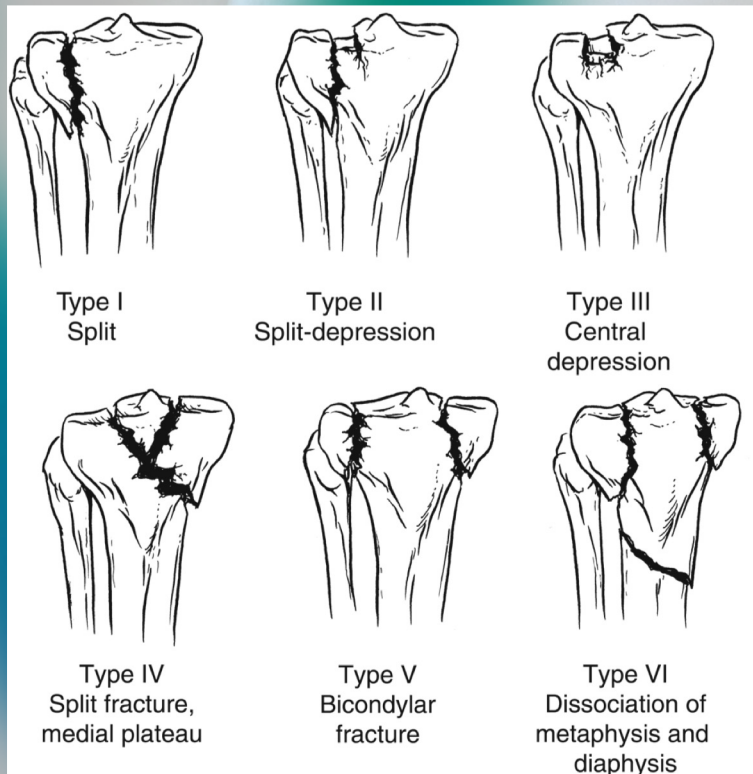
Treatment Options



- **Conservative with casts**
- **Skeletal Traction**
- **Cannulated screws**
- **External fixation / JESS**
- **Ilizarov Ring Fixators**
- **DCP – Buttress plates**
- **ORIF (MIS) with LCP**



Classification



Degree of **Violence**

Low

Medium

High

Type I



Type II



Type III



Type IV



Type V



Type VI



Schatzker

Timing of Surgery



- High energy fractures have massive swelling and soft tissue injury

- Incisions should only be made after the soft tissue envelope has recovered

- The skin should be soft; blisters should have epithelized; and skin wrinkles should be present

- Never be afraid, or 'lazy' to span the joint & wait**

What is The First Rule ?



1 Check for limb threatening conditions !!!

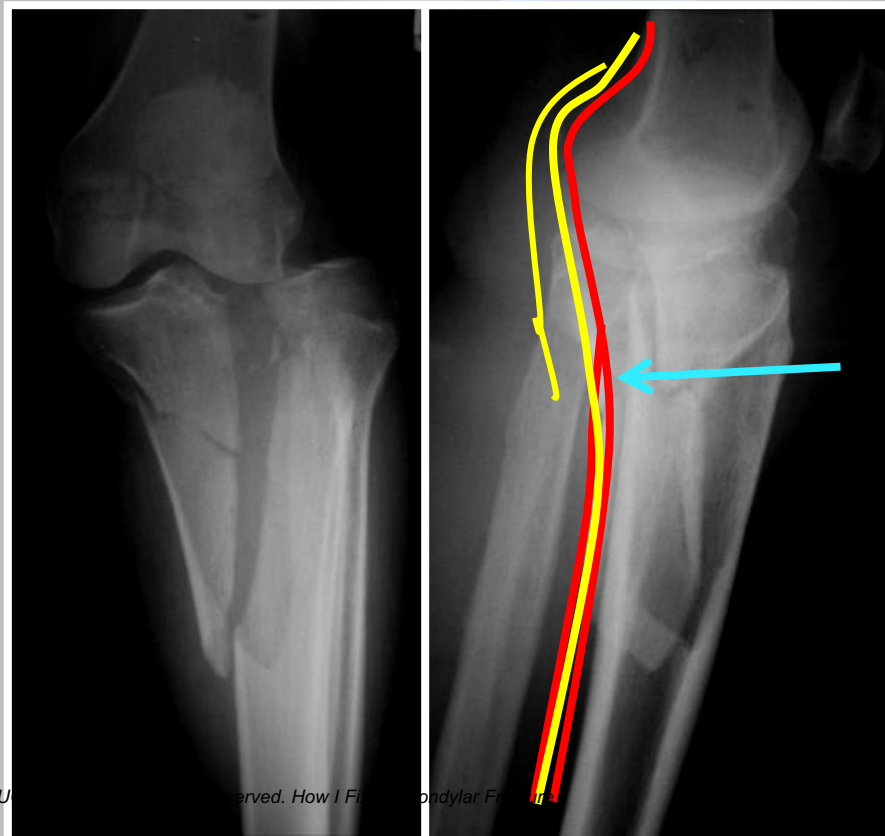


1. Neuro-Vascular



N V are at risk

Fx dislocation:
lesion of the popliteal artery
up to **37%**



Neuro-Vascular



Angiography

If there is a doubt



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https://www.youtube.com/watch?v=I_Fix_A_Bicondylar_Fracture

2. Compartment Syndrome ?

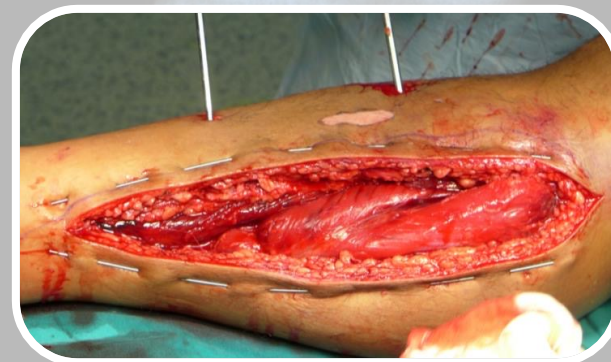
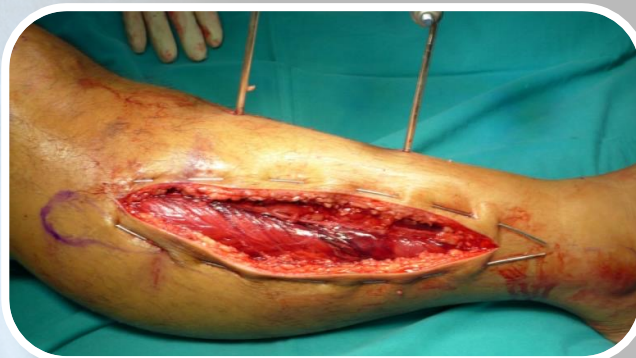


Diagnosis

- History
- Physical examination:
 - Serial assessment
 - Early Detect compartmental syndrome

Do not assume that it will not happen

If in doubt :
Fasciotomy
as soon as possible.



3. We Must Differentiate Between



Low Energy



High Energy



soft tissue condition

Whatever The Conditions ?

NV compromise ?

Compartmental Syndrome ?

Poor skin and soft tissue ?

1

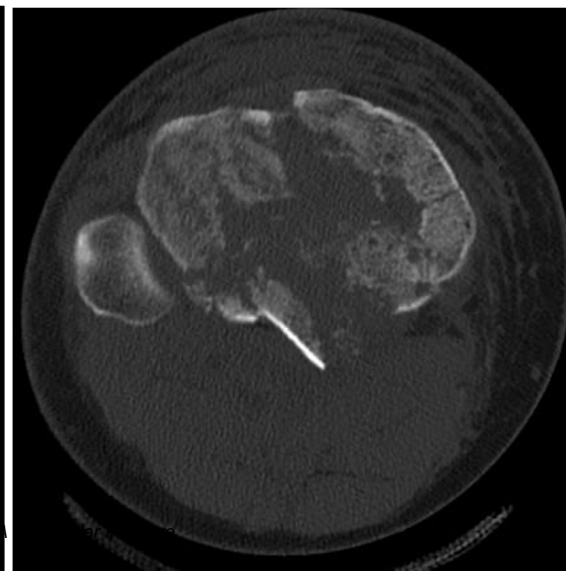
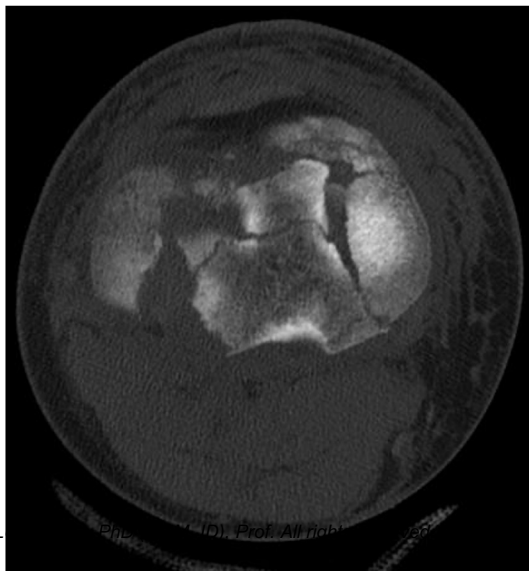
SPAN



Then you have
time to think
and classify

2

SCAN



Where are the fragments?

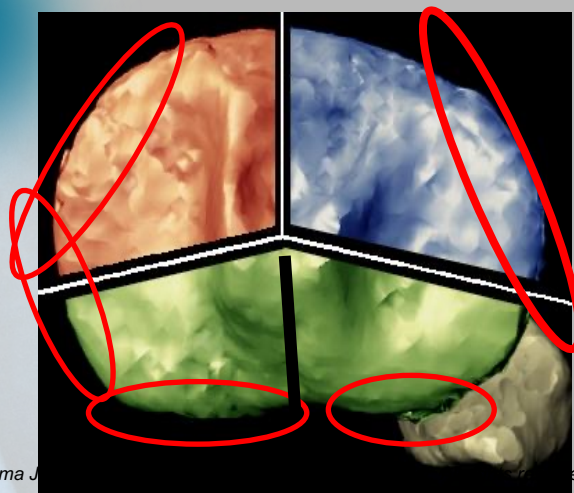
What is the direction of displacement?



Three-Column Fixation for Complex Tibial Plateau Fractures

Cong-Feng Luo, MD, PhD, Hui Sun, MD, Bo Zhang, MD, and Bing-Fang Zeng, MD

JOT, 2010





3

PLAN

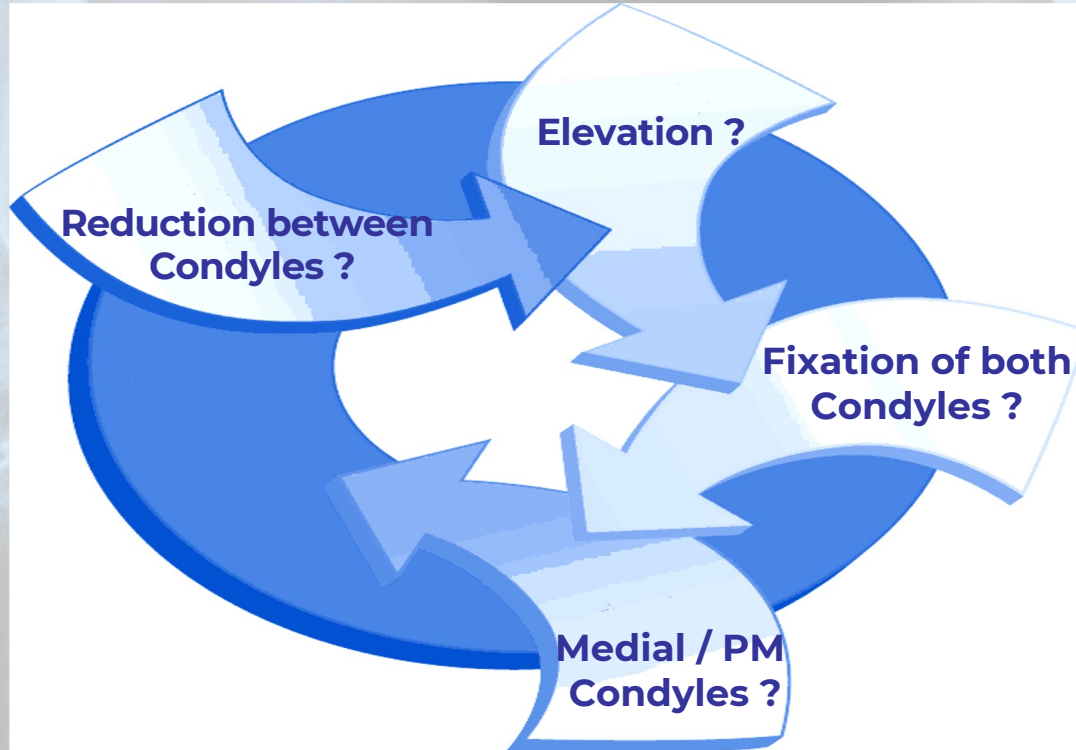
Planning after obtaining more fracture details from CT Scan

Planning how to

- Approach
- Reduce
- Fix



Surgical Planning



Principles of Fixation of The Plateau

1. Articular fractures

- **Rim integrity**
Rim requires “Cortical Containment”
- **Depressed or not ?**

2. Metaphyseal fractures

3. All need **stability**

Joseph Schatzker



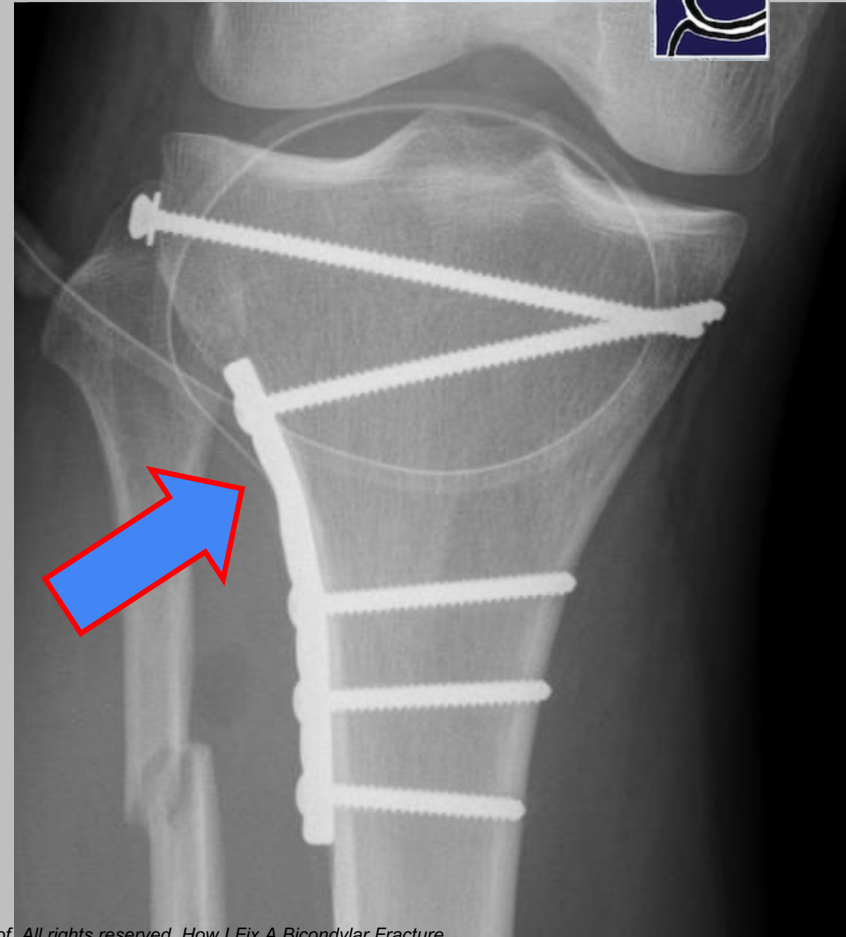


1. Articular fractures

- **Rim integrity**
 - Rim requires “Cortical Containment”
 - Split wedge requires “Buttressing”
- **Depressed or not ?**
 - Requires elevation + support

2. Metaphyseal fractures

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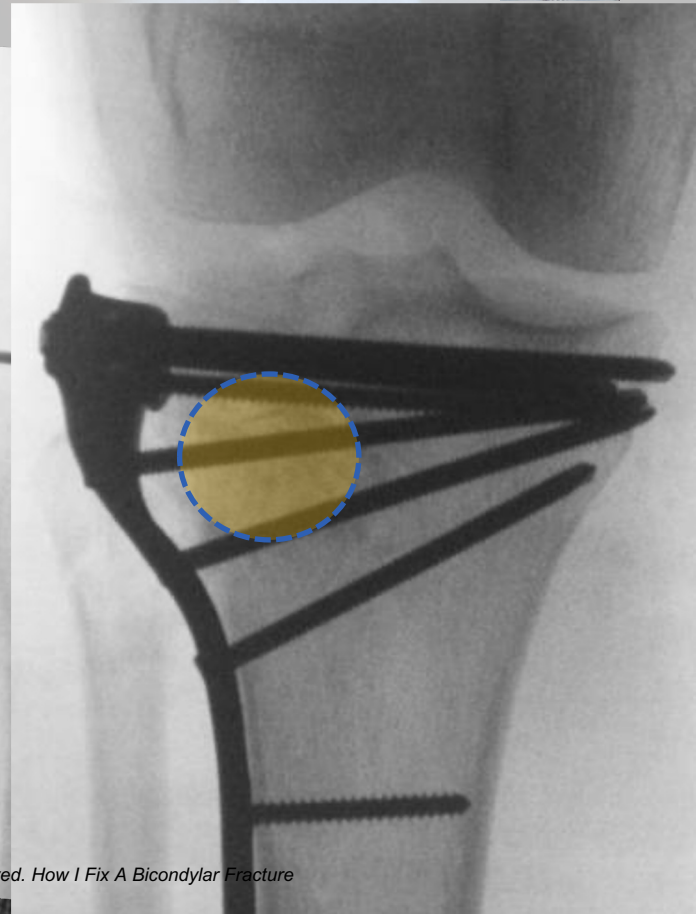
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Joseph Schatzker





1. Articular fractures

- **Rim integrity**
 - Rim requires “Cortical Containment”
 - Split wedge requires “Buttressing”
- **Depressed or not ?**
 - Requires elevation + support

2. Metaphyseal fractures

- **Axial alignment**

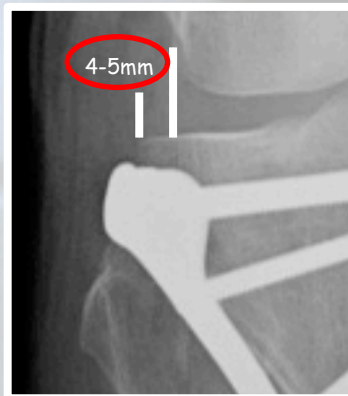
3. All need **stability**



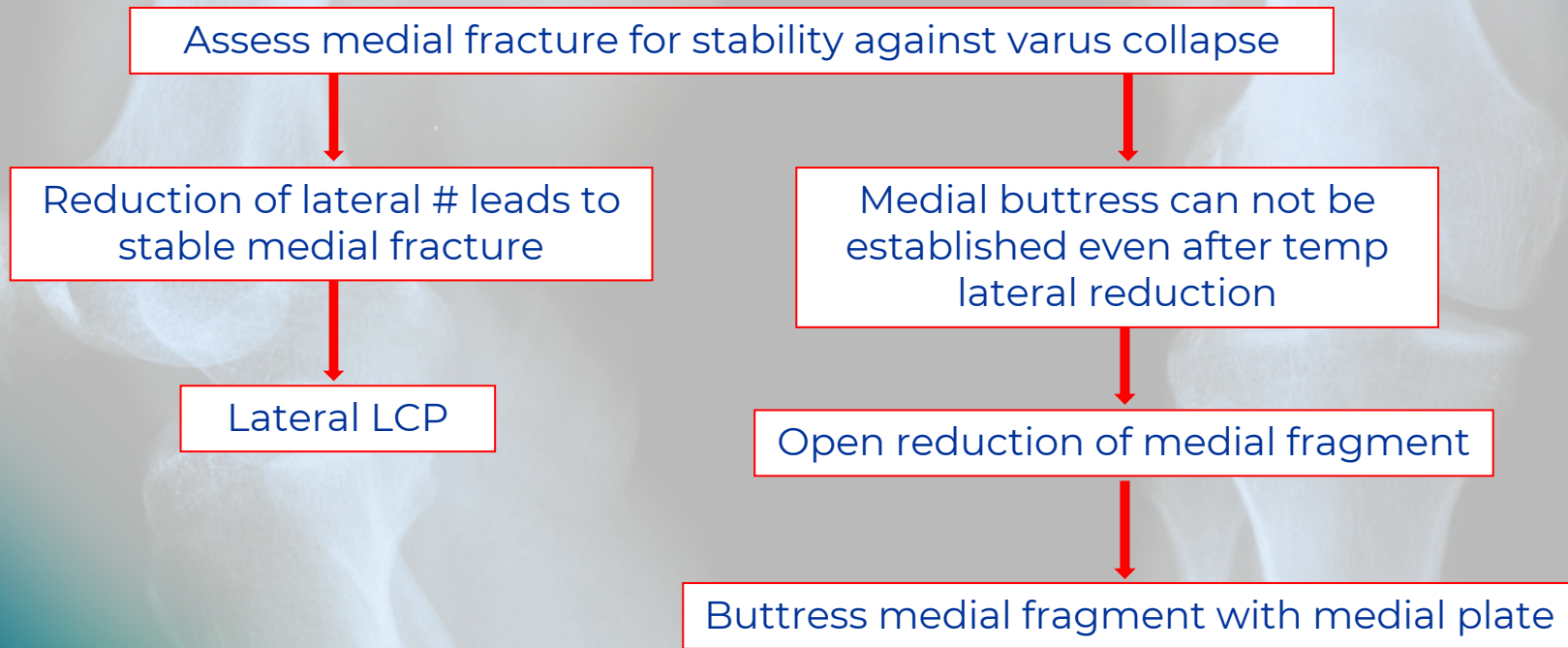
Surgical Indications



- ✓ Articular step of $> 3\text{mm}$
- ✓ Condylar widening $> 5\text{mm}$
- ✓ Varus / Valgus instability
- ✓ All medial plateau fractures
- ✓ All Bicondylar Fractures



Protocol for Bicondylar Fracture



Controversies :

What Sizes of Gaps and Step-offs can be Accepted ?



Clin Orthop Relat Res (2022) 480:2288-2295
DOI 10.1097/CORR.0000000000002266

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Clinical Research

OPEN

Functional Outcome After Nonoperative Management of Tibial Plateau Fractures in Skeletally Mature Patients: What Sizes of Gaps and Stepoffs Can be Accepted?

Thijs P. Vaartjes BSc¹, Nick Assink MSc¹, Robert J. Nijveldt MD, PhD², Svenhjalmar H. van Helden MD, PhD², Eelke Bosma MD, PhD¹, Mostafa El Moumni MD, PhD¹, Kaj ten Duis MD¹, Mike Hogervorst MD¹, Job N. Doornberg MD, PhD¹, Jean-Paul P. M. de Vries MD, PhD¹, Harm Hoekstra MD, PhD³, Frank F. A. IJpma MD, PhD¹

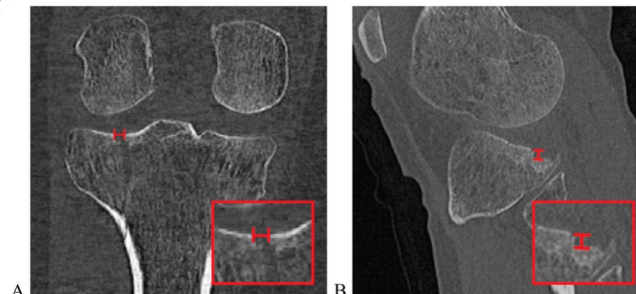
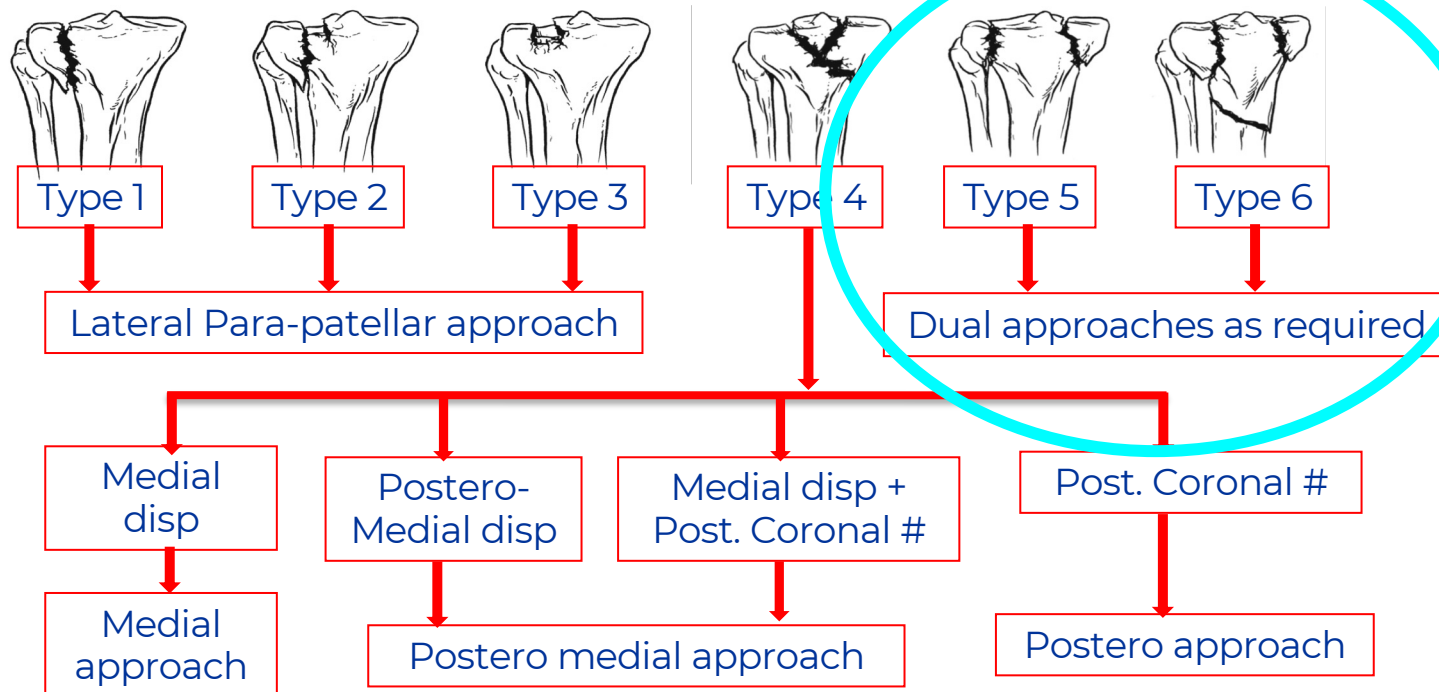


Fig. 1 A-B The measurements of the fracture displacement are displayed in the (A) coronal (gap 3.7 mm) and (B) sagittal (stepoff 3.8 mm) views.

- **Gaps or step-offs up to 4 mm on CT could result in good functional outcome with nonoperative treatment**
- The **arbitrary 2-mm limit of gaps** and step-offs for tibial plateau fractures could be revisited
- The survivorship of the native knee **free from conversion to a total knee prosthesis was high (97%)**

Approach



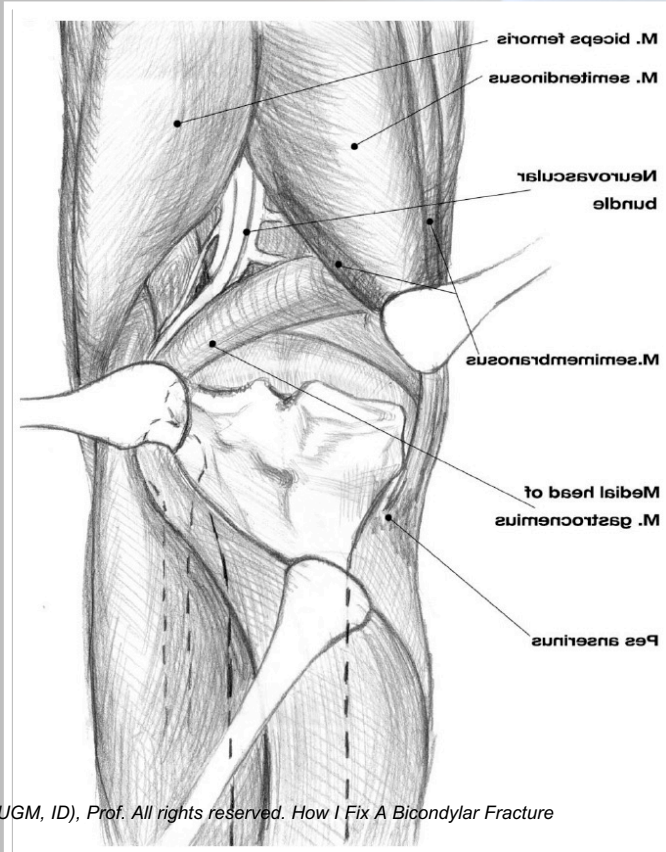


Surgical Approaches : ***Do we accept one “Midline Incision” ?***

This is “Outdated” Choice of Incision



Posterior Approach



Surgical Approach in Bicondylar Fracture



Trauma Case Reports 25 (2020) 100256

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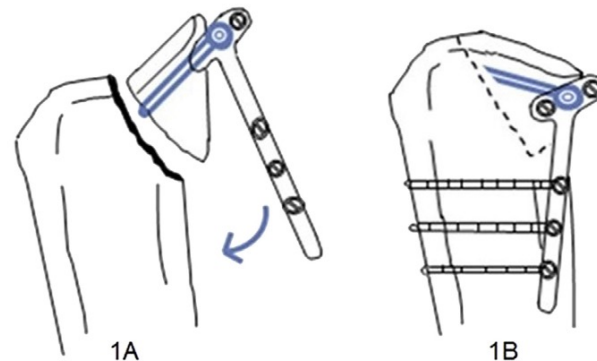
Case Report

Complex bicondylar tibial plateau fractures with reversed tibial slope - Our experience with a fracture-specific correction strategy

Devendra Kumar Chouhan^a, Uttam Chand Saini^{a,*}, Rajesh Kumar Rajnish^a, Mahesh Prakash^b

^a Department of Orthopaedics, Post Graduate Institute of Medical Education and Research (PGIMER), Chandigarh, India

^b Department of Radio-diagnosis and Imaging, Post Graduate Institute of Medical Education and Research (PGIMER), Chandigarh, India



The fracture was accessed via a posterior approach

Gives direct access to the fracture apex, which eases fracture reduction and fixation to correct the sagittal malalignment

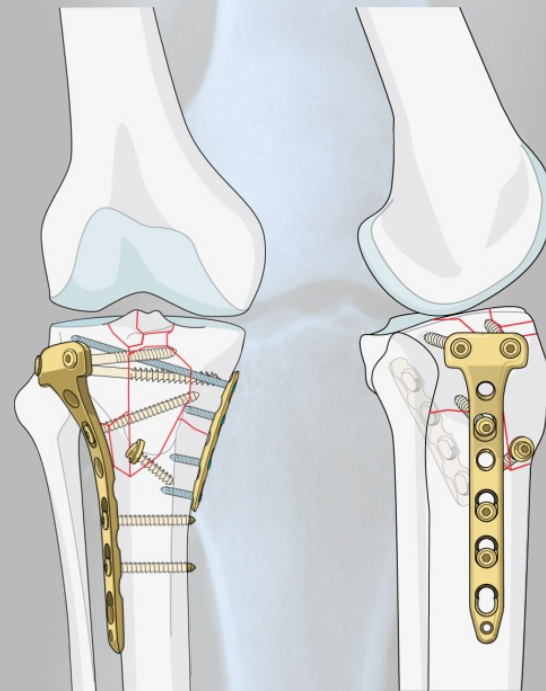
Dual Plating - Indications



Coronal fractures with a postero-medial fragment needs to be buttressed

Medial articular involvement

Displacement of medial column / separation of medial plateau



Staged Treatment in Bicondylar Fracture



> Eur J Trauma Emerg Surg. 2024 Jun;50(3):1033-1041. doi: 10.1007/s00068-023-02411-9. Epub 2023 Dec 18.

Staged treatment of bicondylar tibial plateau fractures: influence of frame configuration and quality of reduction on outcomes

Rafael Oleo-Taltavull ¹, Sebastián Corró ², Jordi Tomàs-Hernández ^{1 3}, Jordi Teixidor-Serra ^{1 3}, Jordi Selga-Marsà ^{1 3}, Juan Antonio Porcel-Vázquez ², Carlos Alberto Piedra-Calle ^{1 3}, Yaiza García-Sánchez ³, Ernesto Melchor Guerra-Farfán ^{1 3}, José Vicente Andrés-Peiró ^{4 5}

Conclusion

- **High-energy TPF management is challenging and prone to complications**
- **Staged treatment protocols may improve outcomes**
- 27.9% of patients had postoperative complications (infection and stiffness)

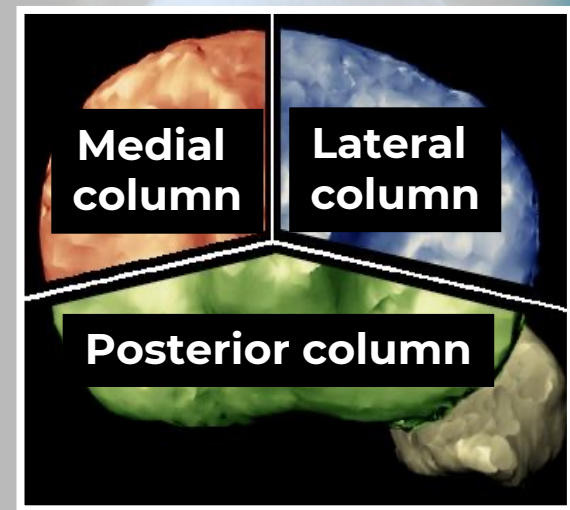
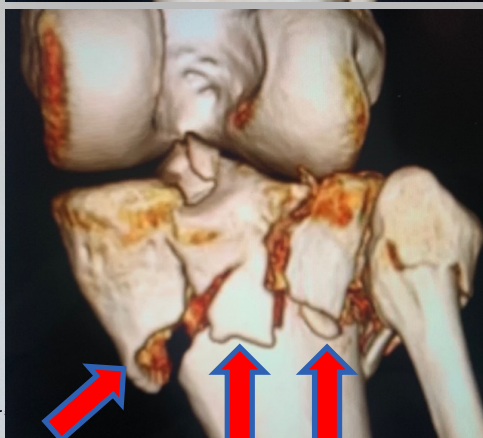
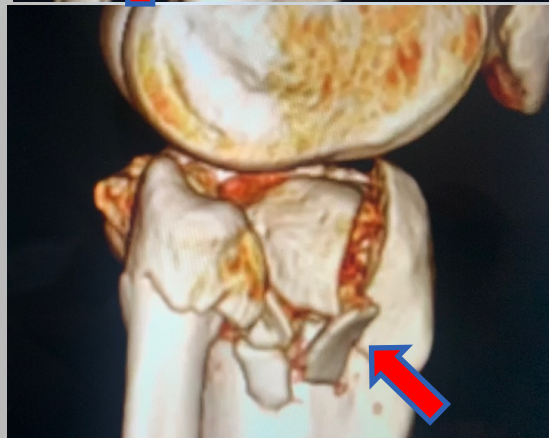
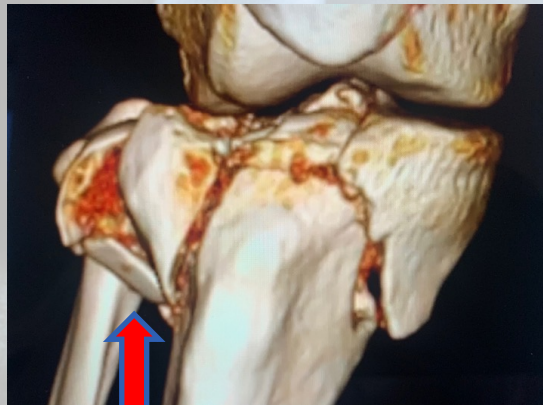
CASE



**30-years-old
woman MCA**



CASE



CASE



**Day 10
after
external
fixator
before
operation**



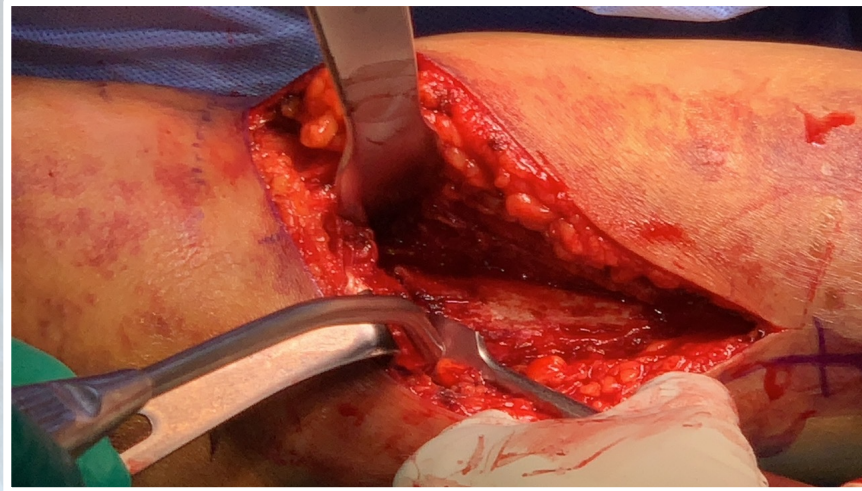
CASE



Lateral



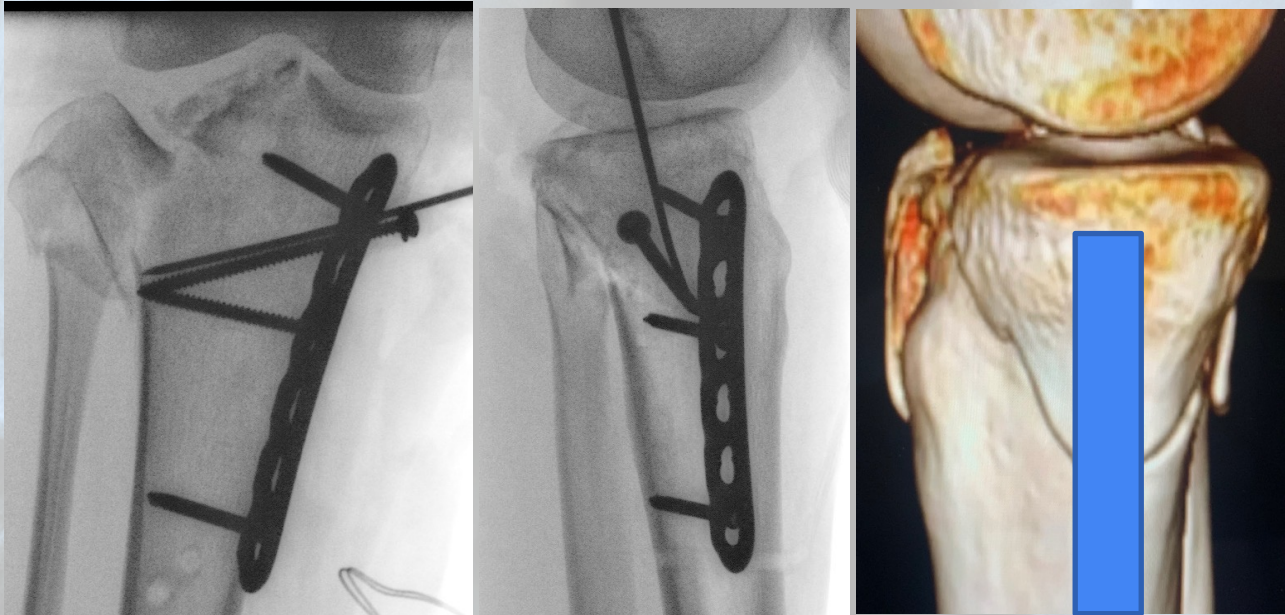
CASE



The medial head of the gastrocnemius muscle is retracted laterally to expose the posterior column

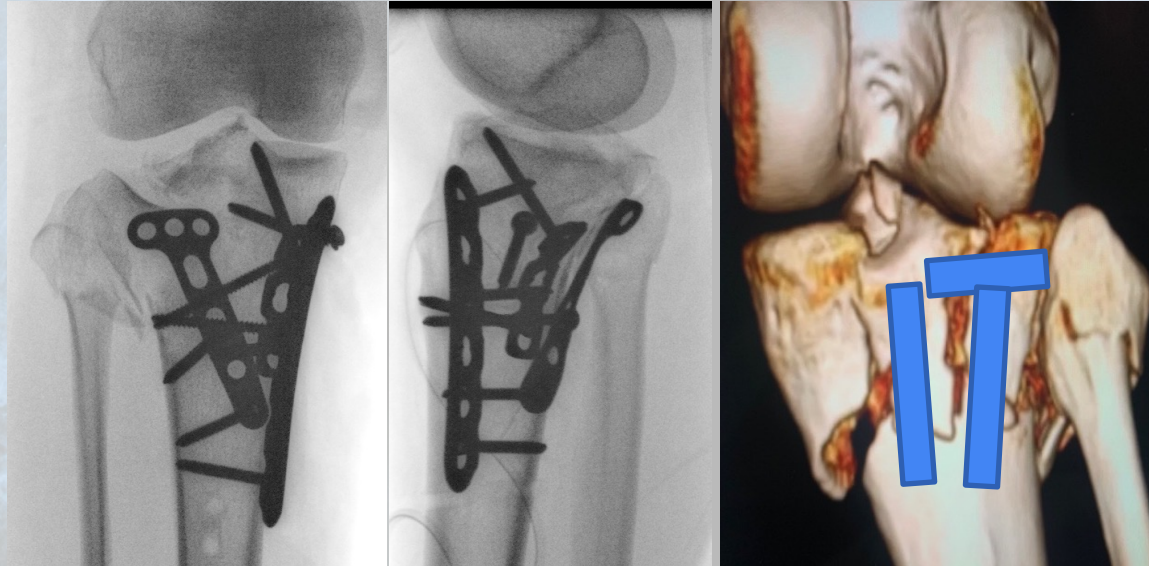
To avoid neurovascular injury in the popliteal fossa, all dissection from medial to lateral should be performed beneath the muscle in the proximal part

CASE



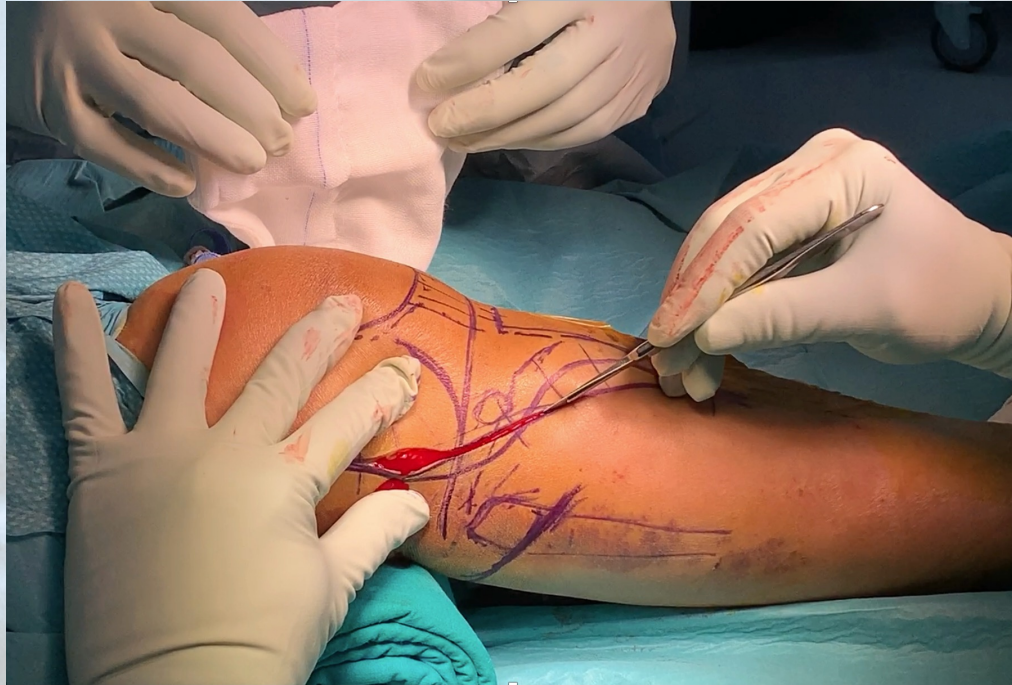
With this approach, a small LCP was applied to the posteromedial of tibia with one screw

CASE



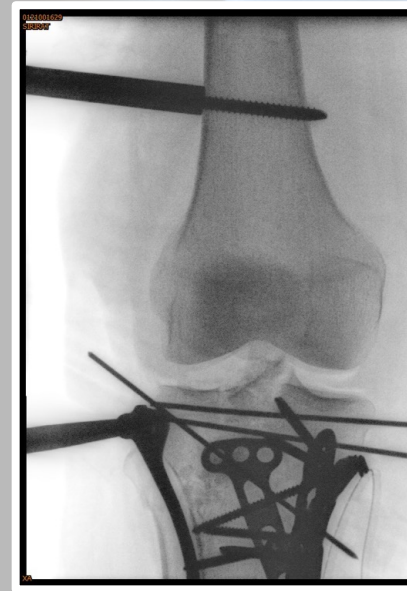
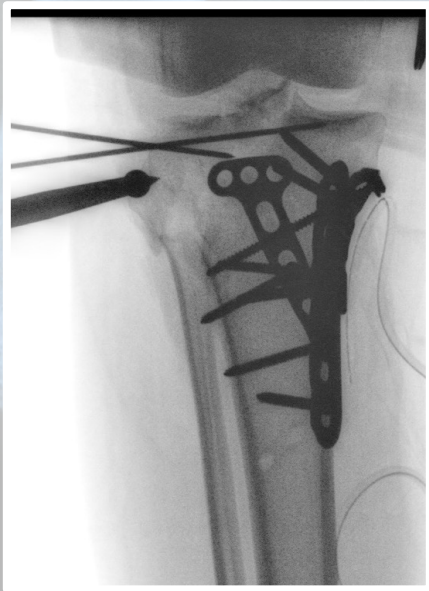
With the same approach, a small T-plate was applied at the posterolateral of tibia

CASE



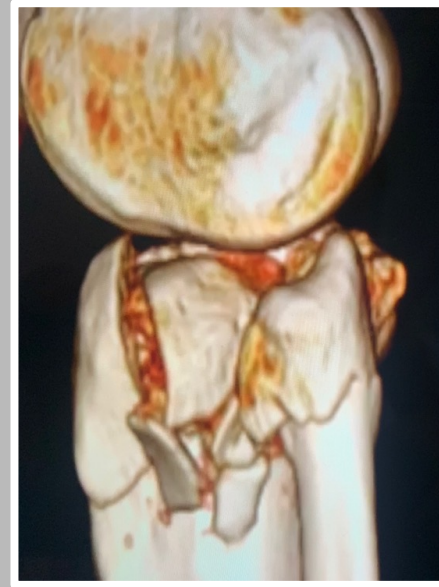
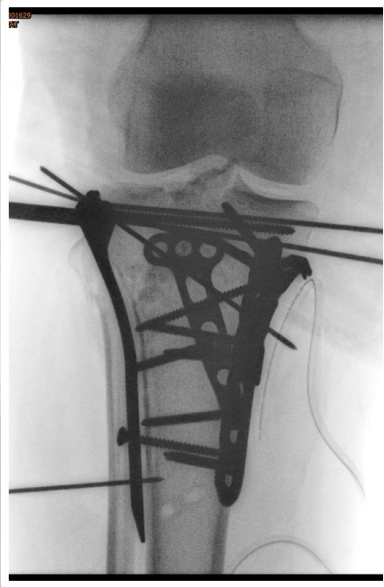
Continue with anterolateral approach

CASE



**Direct reduction of the lateral tibial plateau,
check X-ray & temporary fixation with K -wire**

CASE



**Check the plate position in both AP & lateral
and the direction of the screw**

CASE



Pre-Op



Post-Op



Pre-Op



Post-Op



CASE



Rehabilitation



- Early mobilization and ROM exercises
- When internal fixation is stable, ROM can begin on the 2nd post op day

NWB = 6 weeks

PWB = 9 - 10 weeks



Joint reduction

Typically, we reduce it from the anterior

Wall fragment (may not go posterior if)

- **Small**
- **Not pushing mechanism**
- **Depression fragment is big and adequate with rafting**
- **Or if belt plate is fine**

Take Home Messages



- **Learn how to expose posterior column**
- **Evaluate the fractures, then you have no limitation to select the approaches**
- **Position : select the most convenient but not create a problem of reduction complex fractures**

Rationale for 1 Revision Risk for NRS

DAIR Success Rate

Highly variable due to :

- Lack of consistency for definition of acute infection
- No consecutive series
- Multiple surgeons in a single study

| Author | Number of patients | Revisions in original | Revisions in DAIR |
|---------------------------|--------------------|-----------------------|-------------------|
| Parvizi et al., 1999 (1) | 33 | 23 (69.7%) | 2 (6.1%) |
| Parvizi et al., 1999 (2) | 39 | 14 (35.9%) | 7 (17.9%) |
| Van and Chen, 2007 (3) | 40 | 23 (57.5%) | 4 (10%) |
| Corcos et al., 2007 (4) | 31 | 10 (32.3%) | 2 (6.5%) |
| Smith et al., 1997 (5) | 24 | 10 (41.7%) | 2 (8.3%) |
| Stoney et al., 1999 (6) | 68 | 23 (33.8%) | 8 (11.8%) |
| East et al., 1997 (7) | 118 | 18 (15.3%) | 9 (7.6%) |
| Parvizi et al., 1999 (8) | 40 | 10 (25%) | 2 (5%) |
| Parvizi et al., 1999 (9) | 40 | 10 (25%) | 2 (5%) |
| Parvizi et al., 1999 (10) | 40 | 10 (25%) | 2 (5%) |

SINGLE STAGE REVISION / DAIR: WHO AND HOW ?



Thank You For Your Attention