

Severe Valgus Knee : Achieving Ligament Balance



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- Past President of Arthroplasty Society in Asia (ASIA) 2019 - 2022
- Past President of Asia Pacific Knee Society (APKS) 2019 - 2022
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 - DePuy Synthes, Zimmer Biomet, Gruppo Bioimpianti
- Editorial Board / Reviewer : CORR, Bone Joint Journal, J Arthroplasty, AJSM, VJSM, BJO, KSSTA, JISAKOS, Knee, OJSM, JOS, KSRR, The Hip & Knee Journal, JOSR

Fixed Valgus Deformity

Difficulties in TKA :

- Ligament balancing and changes in bone anatomy is more difficult to correct than with varus deformity
- It is less frequent than varus :
 - 10% of TKR cases
 - 1:3 (Scuderi & Insall)
 - 5% (Nelissen & Budhiparama)



What Makes the Valgus Knee a Specific Technical Challenge ?

- The inability to compensate through valgus inducing bone cuts
- The complexity of the posterolateral complex area
- The inherent risk of local dissection



The inability to compensate through valgus inducing bone cuts

- Contrary to rigid varus deformities, the tolerance for bone cut adjustments is very limited
- A neutral tibial cut is $\pm 3^\circ$, any deliberate overall anatomic alignment more $1-1.5^\circ$ in valgus is poorly tolerated by patients



The inability to compensate through valgus inducing bone cuts

The Issues

- Rigid valgus knees tend to have lax MCLs
- To fill in the medial gap with a symmetrical liner implies disproportionate and forceful wedging into the lateral compartment
- Mitigation by cuts alone almost inevitably alters the lateral joint line and may render the alignment unacceptable

Patrick A. Meere



The inability to compensate through valgus inducing bone cuts

Acceptable ??



SEVERE VALGUS TKR

Severe Valgus Knee - Introduction

Problems Posed by Severe Valgus Knee :

- Tight lateral structures
- Stretched medial side / MCL
- Lateral femur / tibia bone deficiency
- Peroneal nerve at risk



Sequence of Release - The Issues

- Despite of all the many different techniques describes, yet there is no consensus among surgeons
- Correct sequence and technique of release of the lateral structure remain controversial
- Potential complication (peroneal nerve palsy and patellar maltracking)

Sequence of Release

Author	First step	Second step	Third step	Final steps
Insall	Posterolateral corner	Ilitobial tract	LCL, LIS	CCK
Ranawat	Ilitobial tract transverse (2.5cm)	Popliteus, LCL	Posterior capsule	LIS, lateral head of gastrocnemius
Keblish	Lateral approach	Ilitobial tract multiple puncture	Posterolateral corner	Gerdy's turbeclc, tibial tubercle elevation
Buechel	Lateral approach	Ilitobial tract	LCL, popliteus	Fibular head excision
Clayton	LCL, popliteus, lateral capsule	Posterolateral capsule, lateral head gastrocnemius, LIS	Ilitobial tract	Biceps femoris tendon Z- lengthening
Whitesides	Ilitobial tract	Popliteus	LCL	Lateral head of gastrocnemius
Krackow	Ilitobial tract	Popliteus	Posterolateral capsule, popliteus	Biceps femoris tendon, lateral head of gastrocnemius; MCL advancement in Type II



Fixed Valgus Deformity - The Problems

Bone and soft-tissue deformities :

- Complicate restoration of proper alignment
- Positioning of components, attainment of joint stability
- Lateral femoral condyle or tibial plateau deficiencies
- Primary or acquired contracture of the lateral capsular and ligamentous structures
- Laxity of the medial collateral ligament

Severe Valgus Knee - Operative Approach

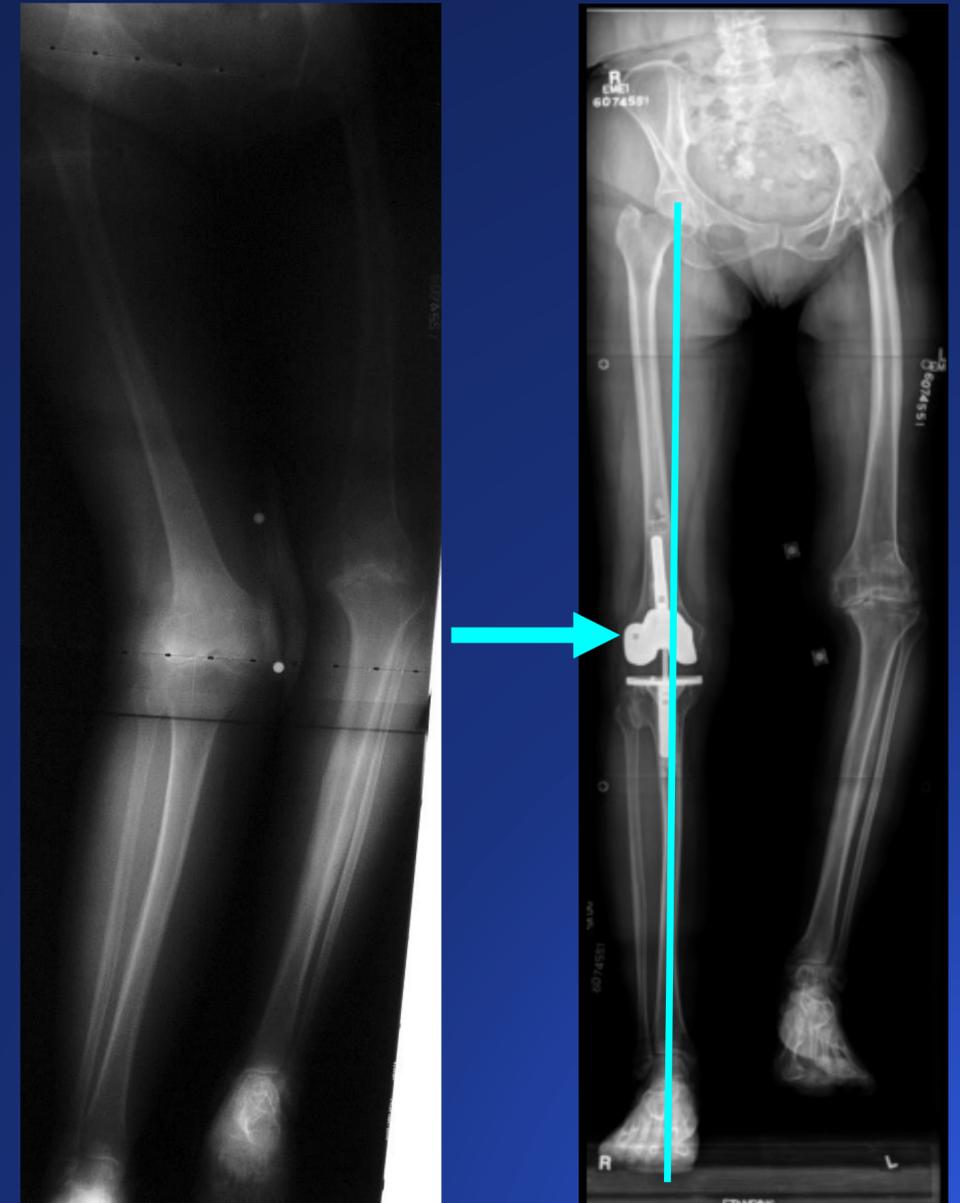
- **Most surgeons currently prefer standard medial parapatellar**
 - Tough cases
 - Familiar approach
- **Lateral approach**
 - Some theoretical advantages
 - Those expert at it make it work well



Severe Valgus Knee - Bone Preparation

Alignment :

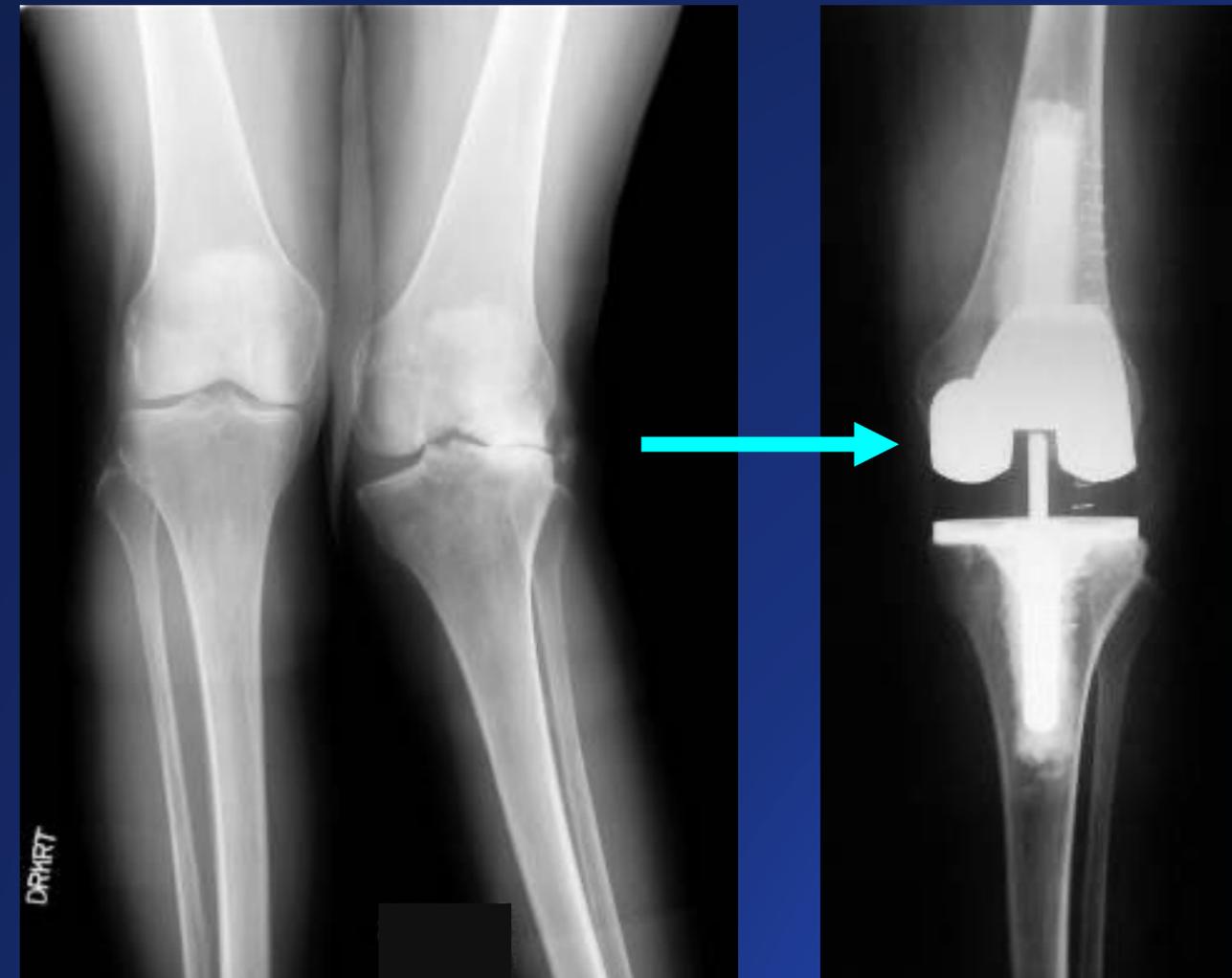
I aim for neutral mechanical alignment
(not overcorrection)



Severe Valgus Knee - Bone Preparation

Tips for Bone Cuts :

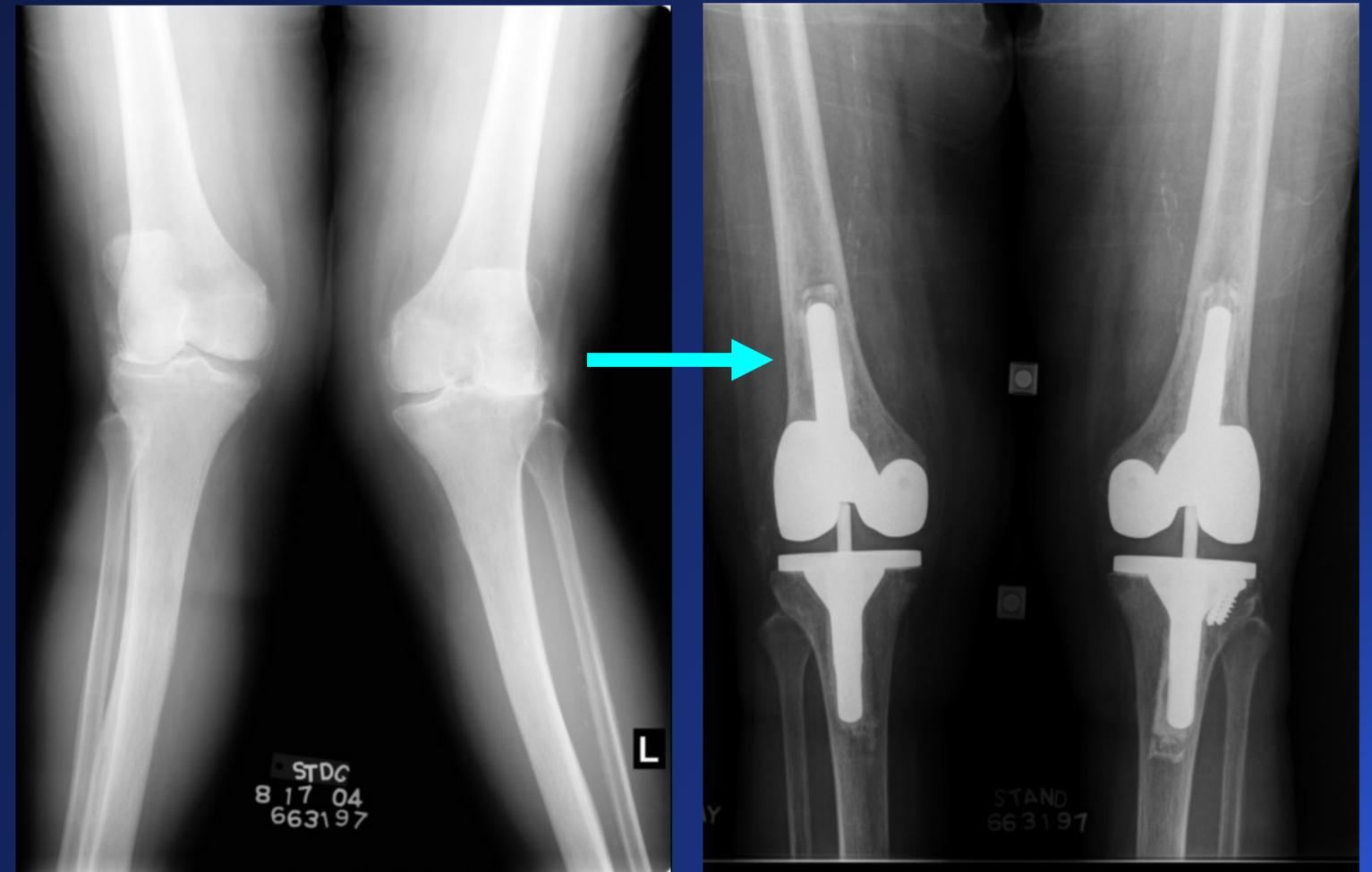
- Be a minimalist with bone cuts
- The knee will open up with lateral side releases



Severe Valgus Knee - Bone Preparation

Stems :

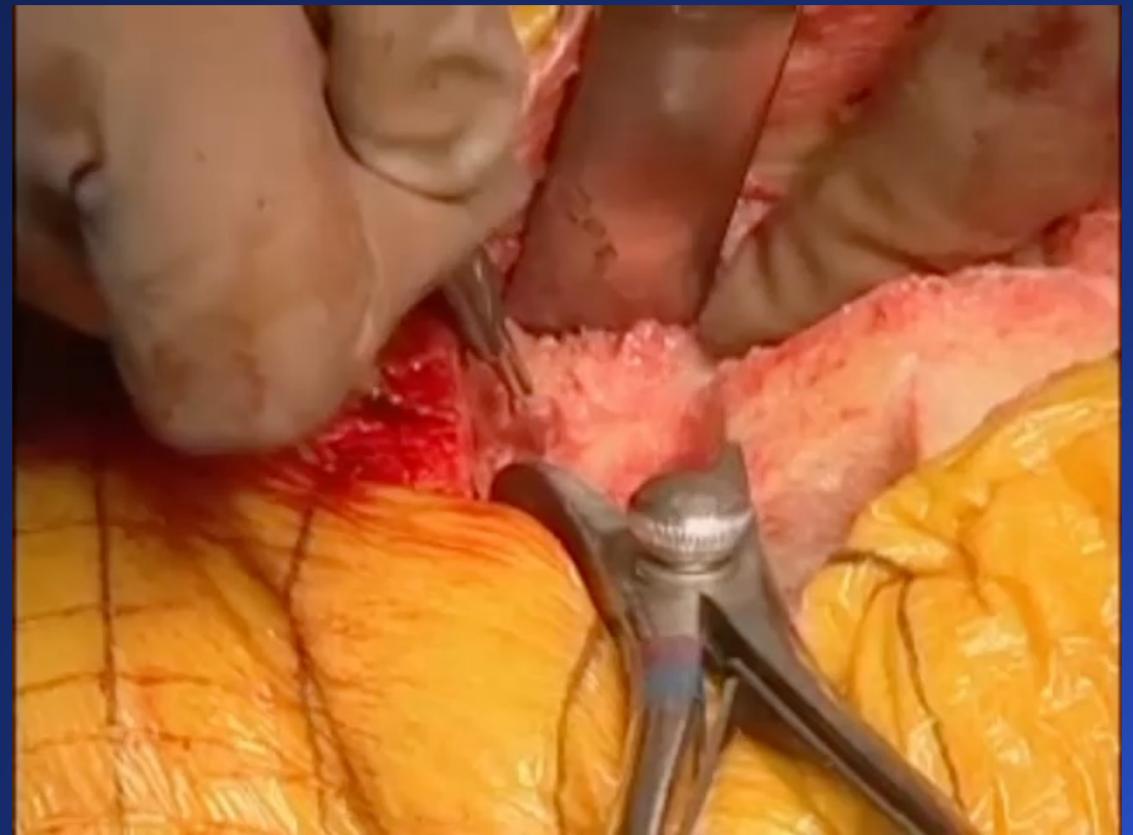
- If bone deficient :
 - Plan on stems
- If using constraint :
 - Plan on stems



Severe Valgus Knee - Ligament / Soft Tissue Management

Mild / Moderate Valgus :

- Insall's pie crusting technique lateral side of knee
 - Iterative
 - Controlled
 - Safe
 - Effective



Severe Valgus Knee - Ligament / Soft Tissue Management

More Severe Valgus, My Approach :

- Pie crust first
- If needed : release popliteus-LCL arcuate complex (wafer-suture fixation)
- Add constraint as needed to provide a stable knee



Constrained condylar



Hinge

Fixed Valgus Deformity - Soft Tissue Release

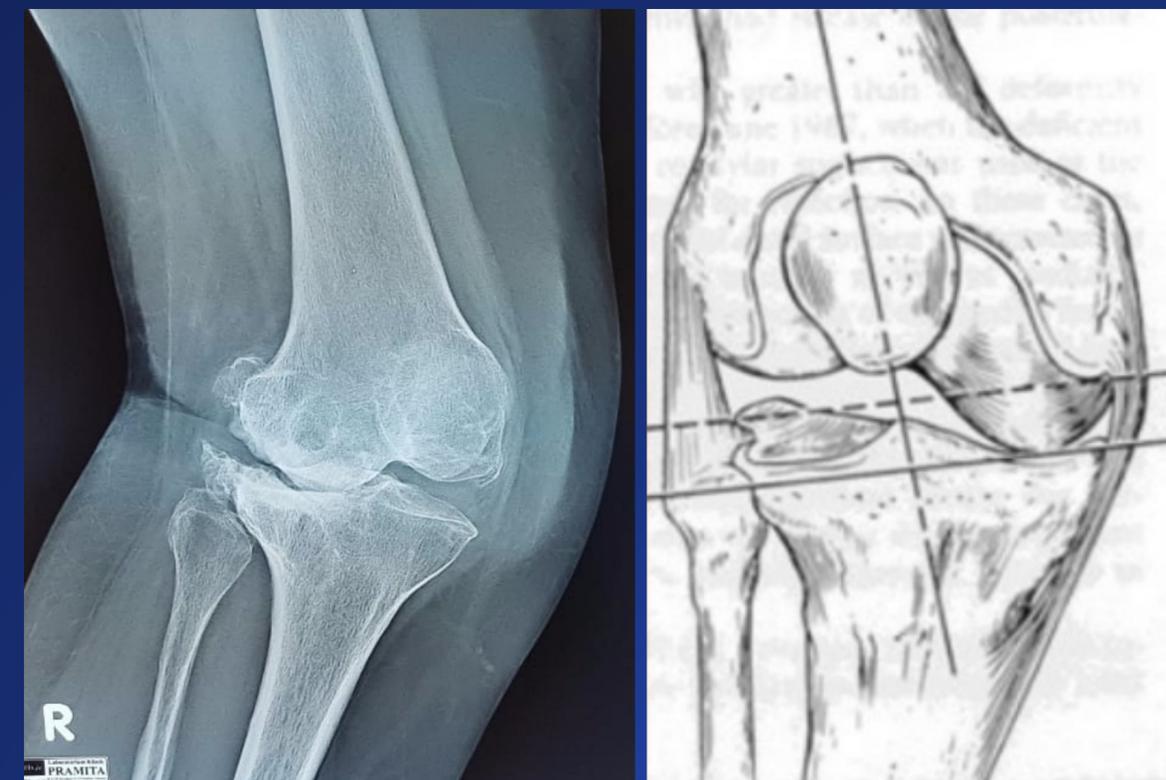
Tips :

- Knees that are tight laterally in flexion and extension should have release of either popliteus tendon posterolateral corner capsule or lateral collateral ligament
- Knees that are tight in extension only should have a release of the posterior capsule or iliotibial band

Fixed Valgus Deformity

Typical findings in valgus knee:

- Hypoplastic lateral femoral condyle
- External rotation deformities of the tibia
- Internal rotation of the femur
- Tight IT band
- Posterolateral joint contractures



Severe Valgus Knee - Bone & Soft Tissue Management

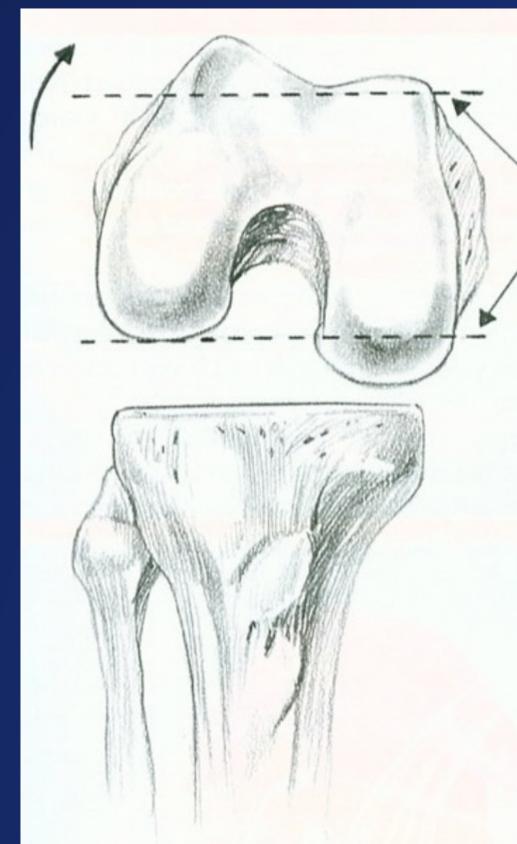
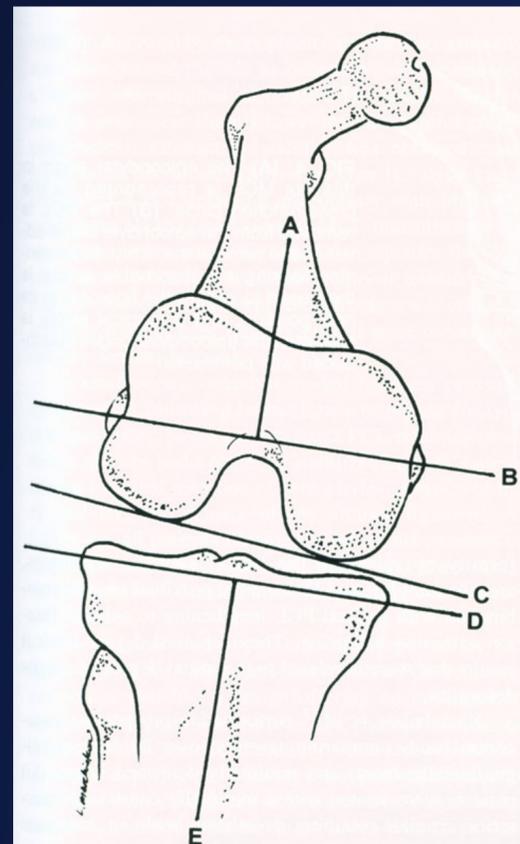
- Hypoplastic lateral femoral condyle and secondary laxity of the medial structures
- Deforming structures - LL, ITB, Popliteous (major)
- Posterolateral capsule + biceps (minor)
- Inside-out vs outside-in
- Try to preserve popliteus (maintains lateral stability in flexion)



Component Position

Tips :

- Avoid an excessively valgus distal femoral cut
- Avoid internal rotation of the femoral component

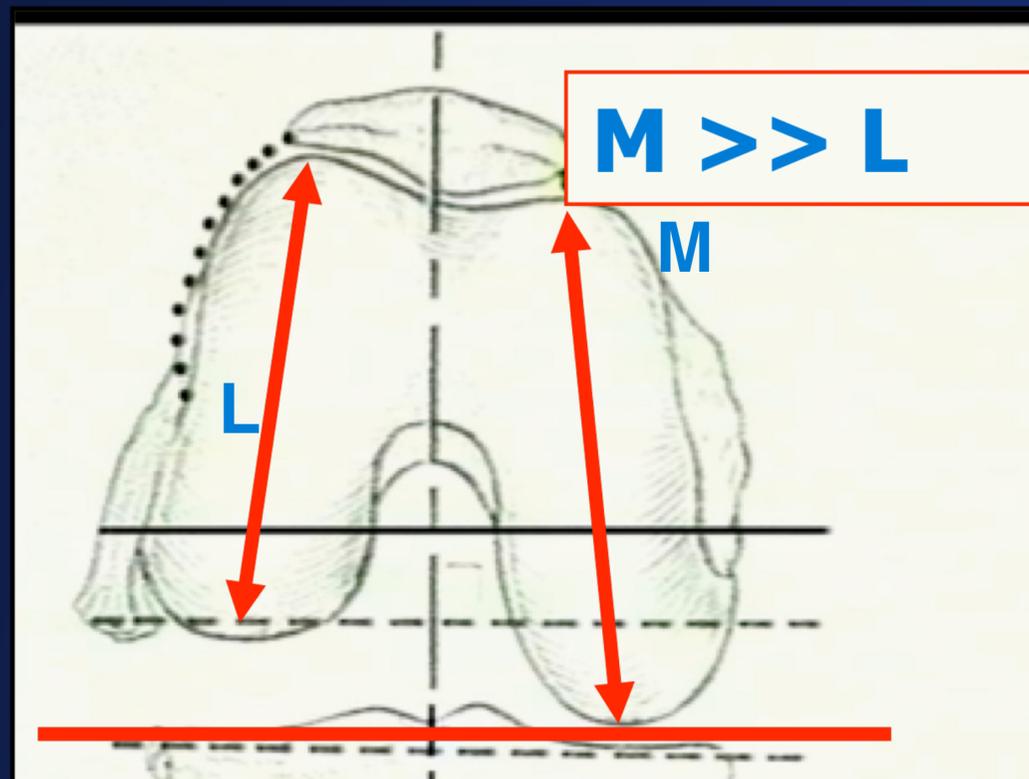


Bone cuts will correct the bone deformity in extension but will create a large medial space

Tips :

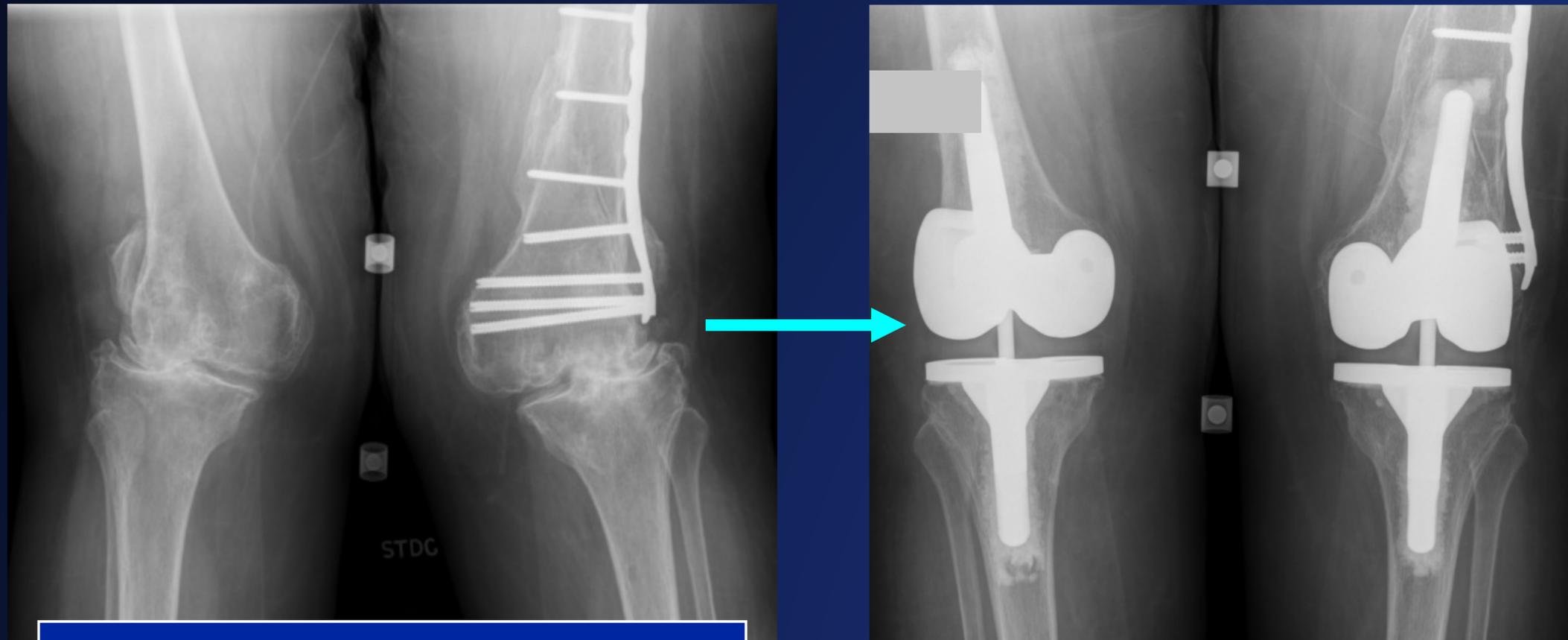
Sizing of the Femur in valgus knees :

- The lateral condyle is often too small
- Rely on the medial condyle only



Severe Valgus Knee - Ligament / Soft Tissue Management

Moderate Deformity : Constrained Condylar



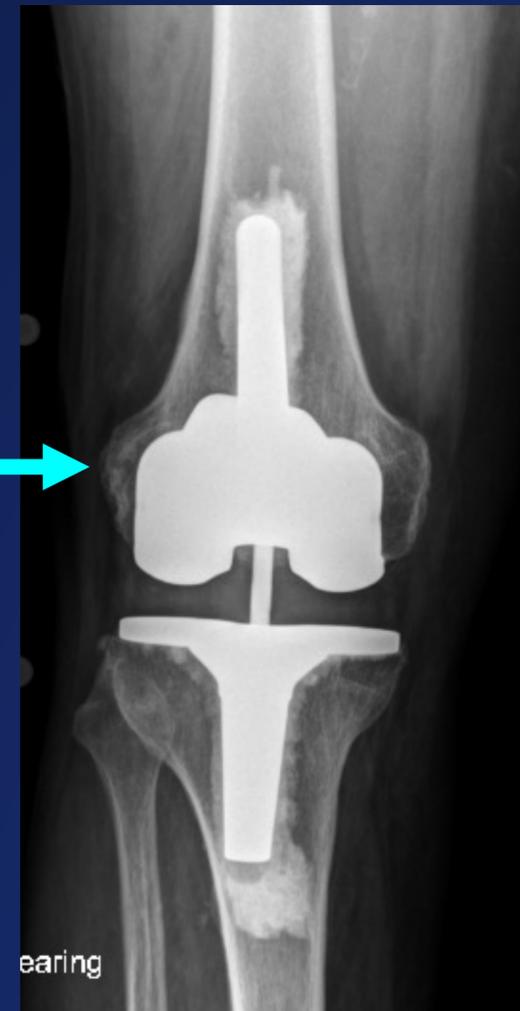
Severe Deformity, Older Patient

Severe Valgus Knee - Extra-Articular Deformity

Moderate Deformity: Constrained Condylar

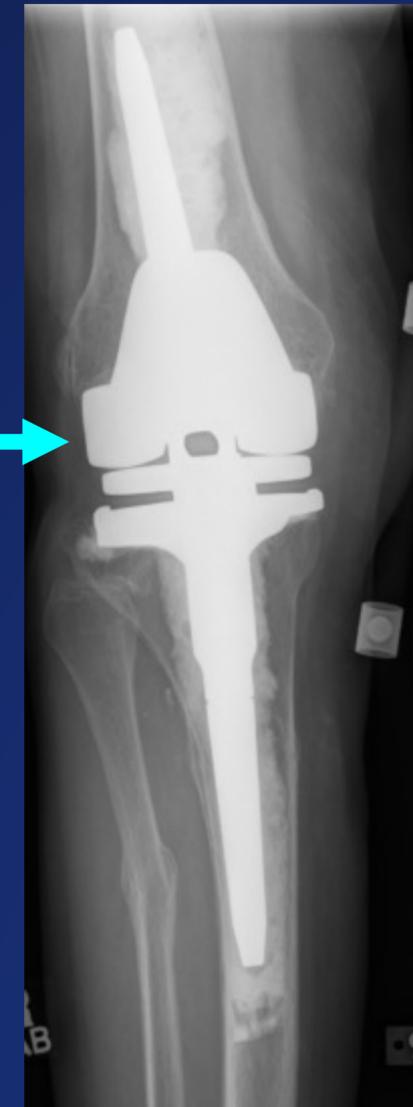
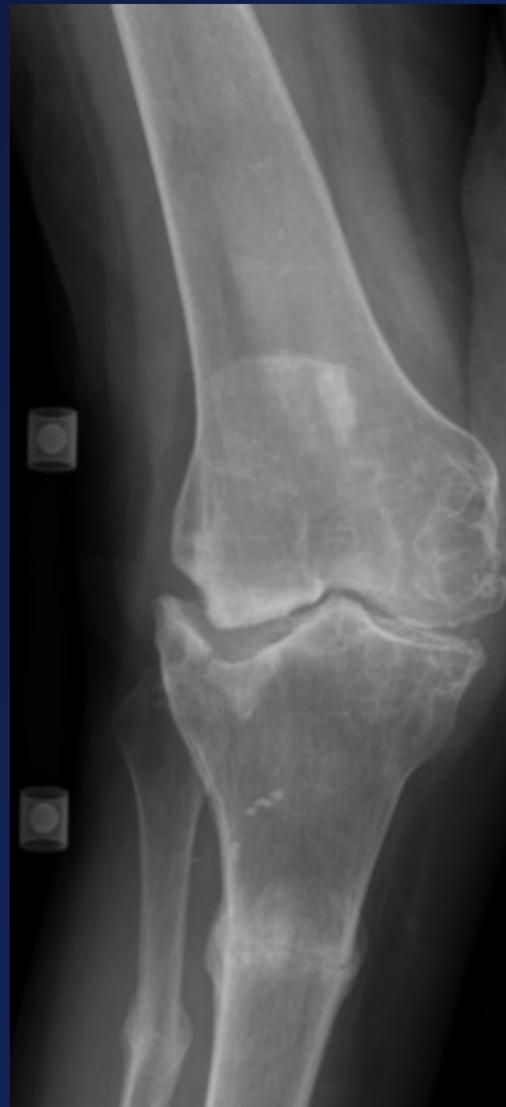


Extra-Articular Deformity



Severe Valgus Knee - Ligament / Soft Tissue Management

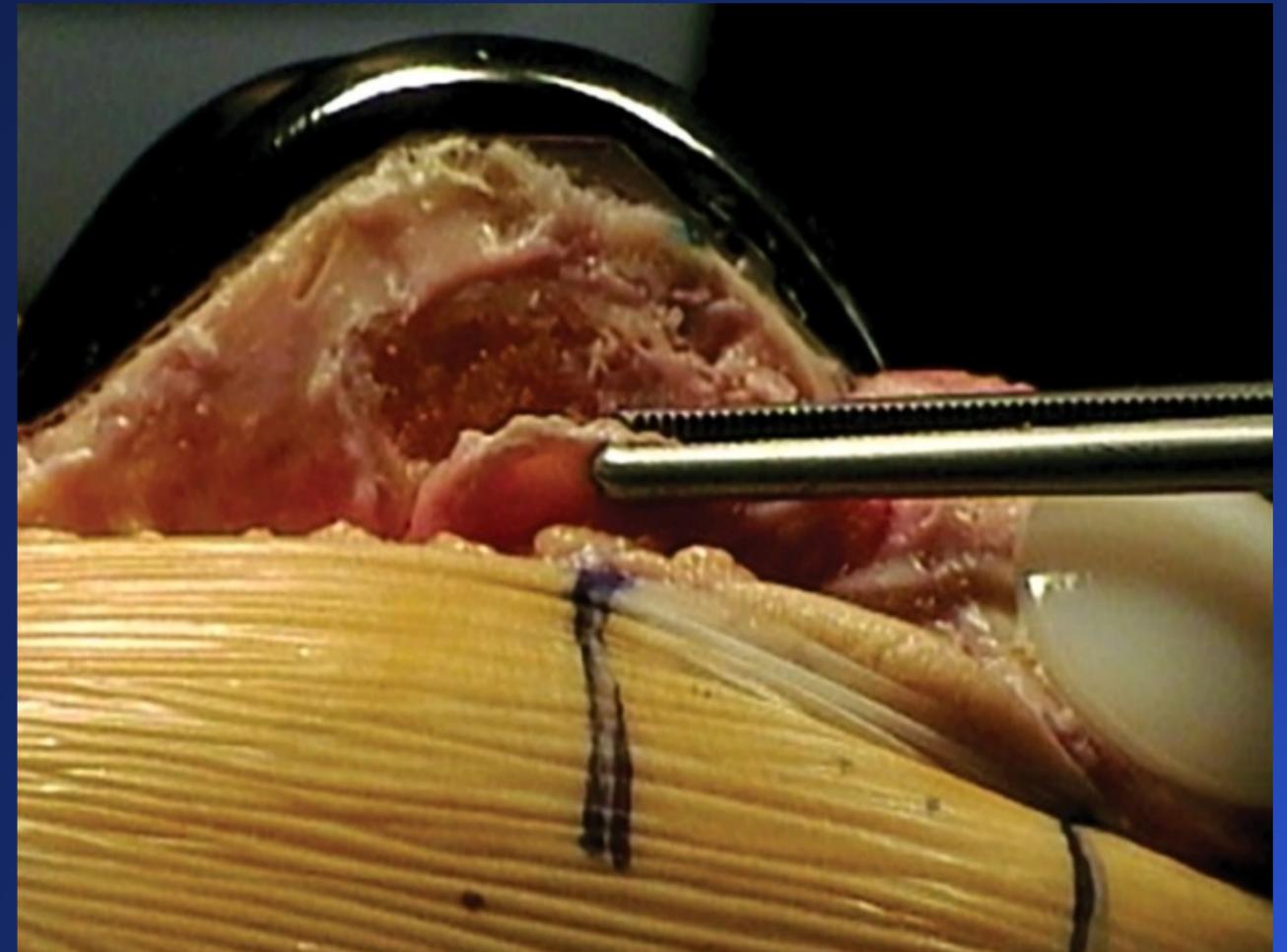
Severe Deformity / Older Patient : Hinge



Severe Valgus Knee - Other Methods

Perhaps in Very Young : Use Less Constraint (?) :

- Lateral side distal advancement (Mulaji)
- MCL advancement
 - distal (Krackow)
 - proximal (Siliski / Healy)



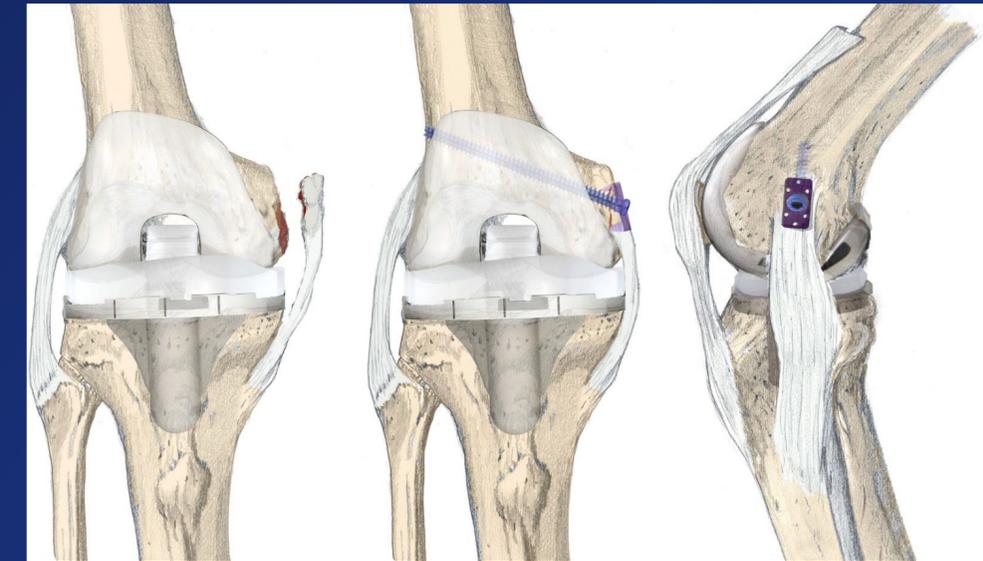
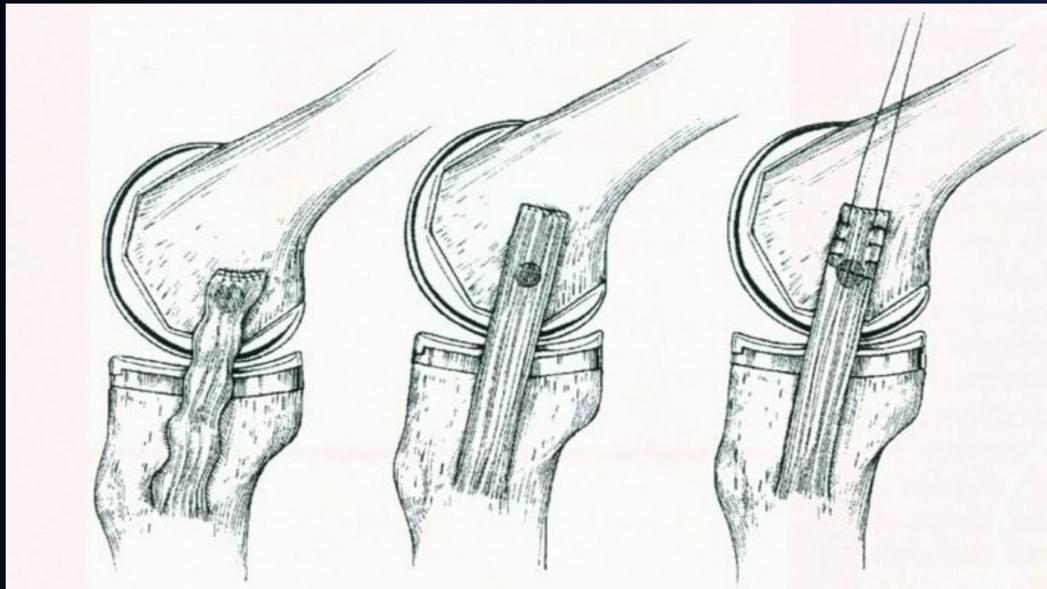
Ligament Balance

Tips :

- Avoid constrained devices
- It is not sufficient to have one soft tissue releasing technique that would work for every case
- Beware of the common peroneal nerve
- The medial collateral ligament cannot be left incompetent
- The posterior cruciate ligament (PCL) ???

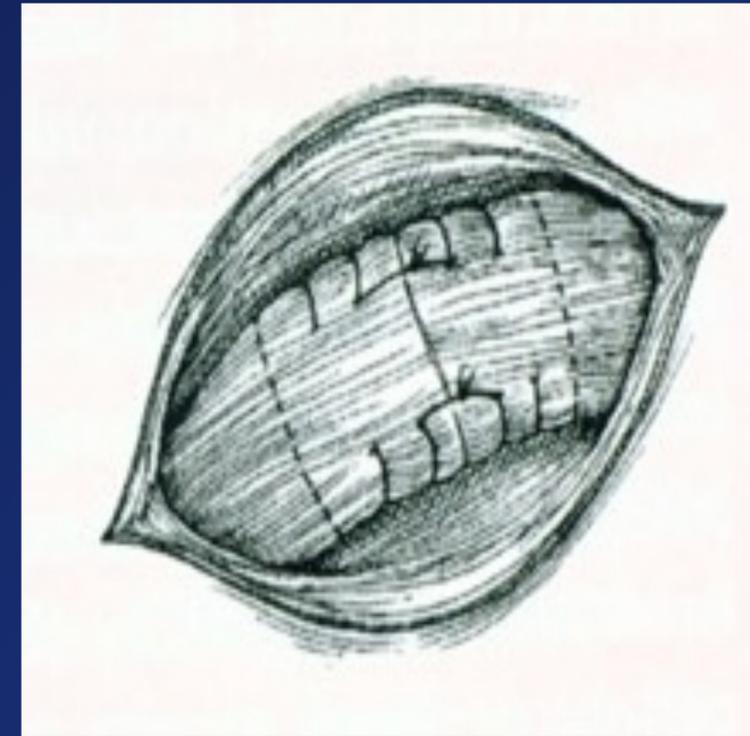
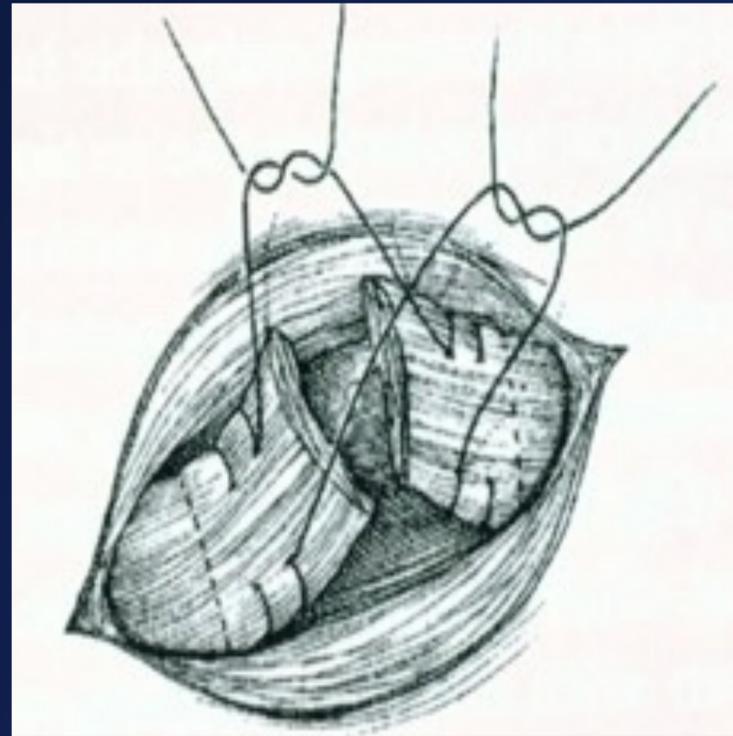
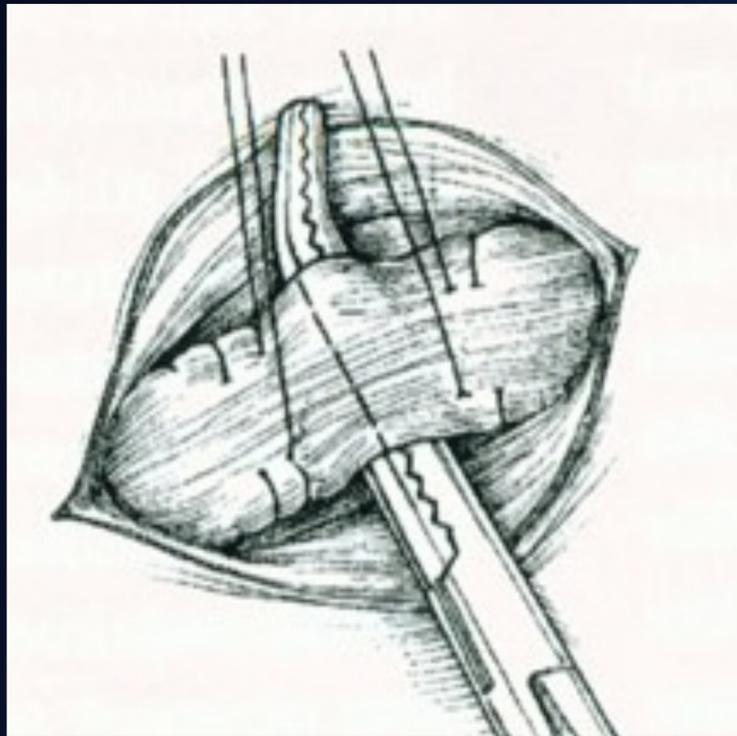
The MCL cannot be left incompetent

Medial Advancement

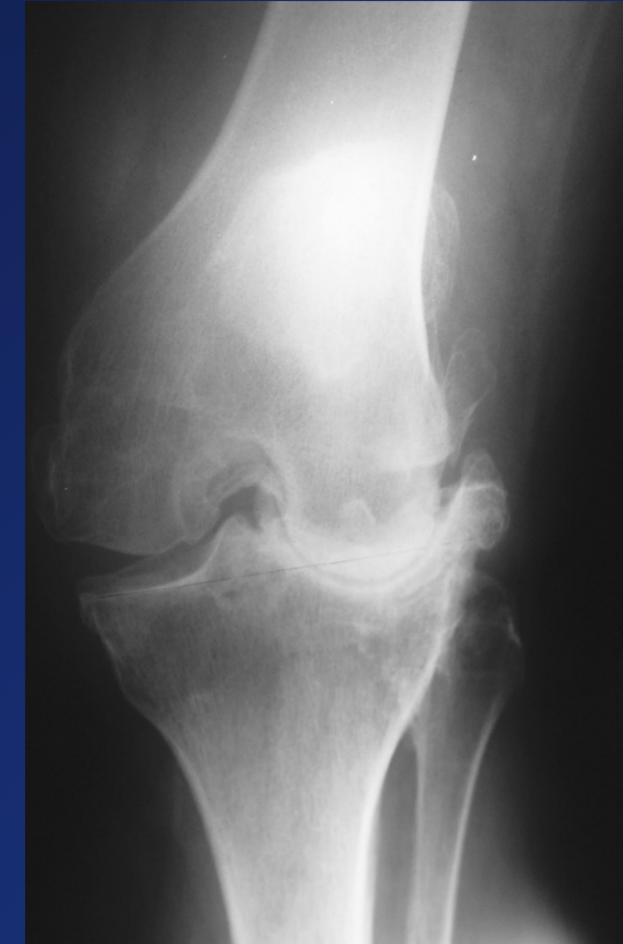
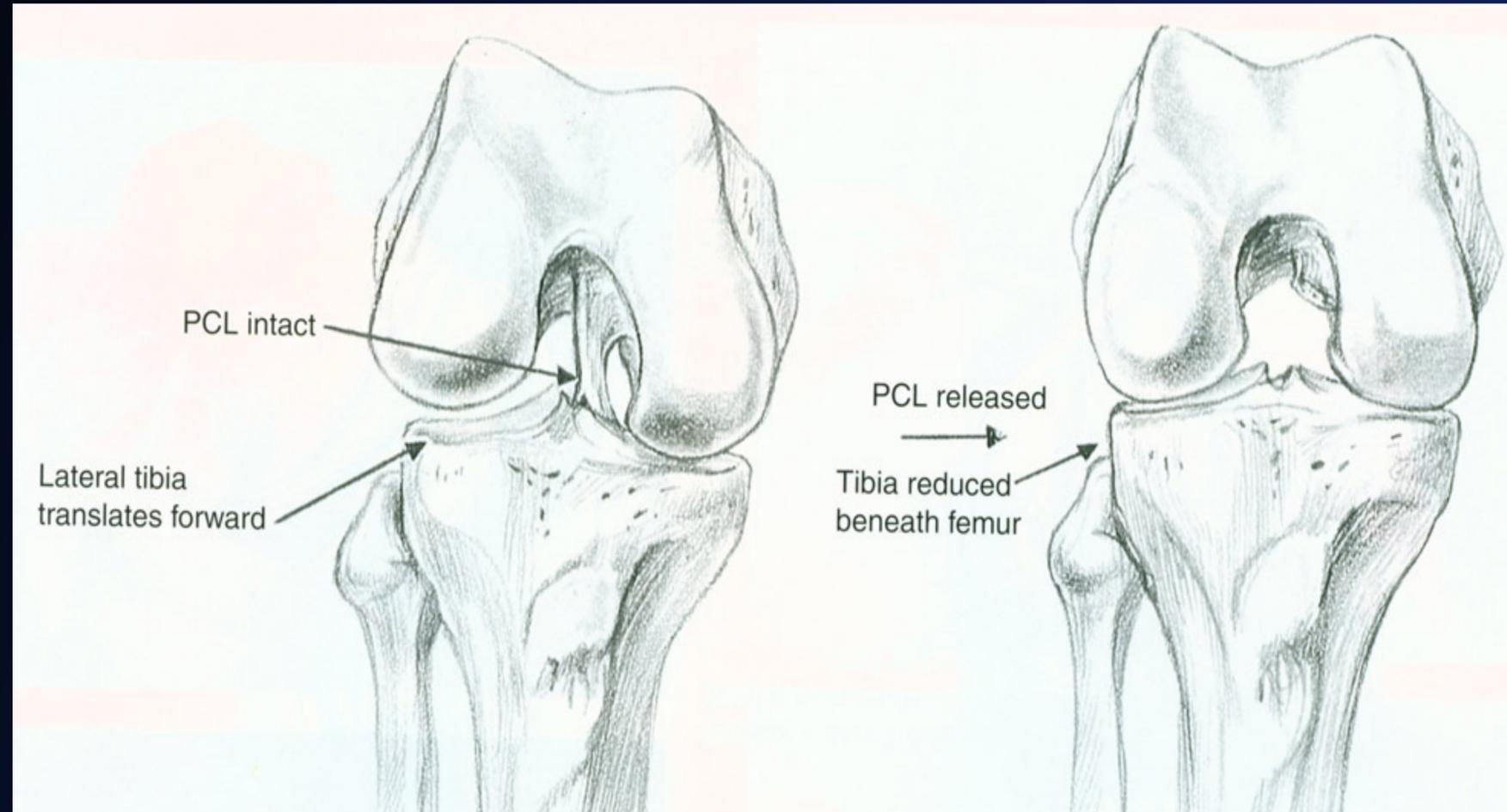


The MCL cannot be left incompetent

Imbrication of the MCL



Do We Need to Resect the PCL ?



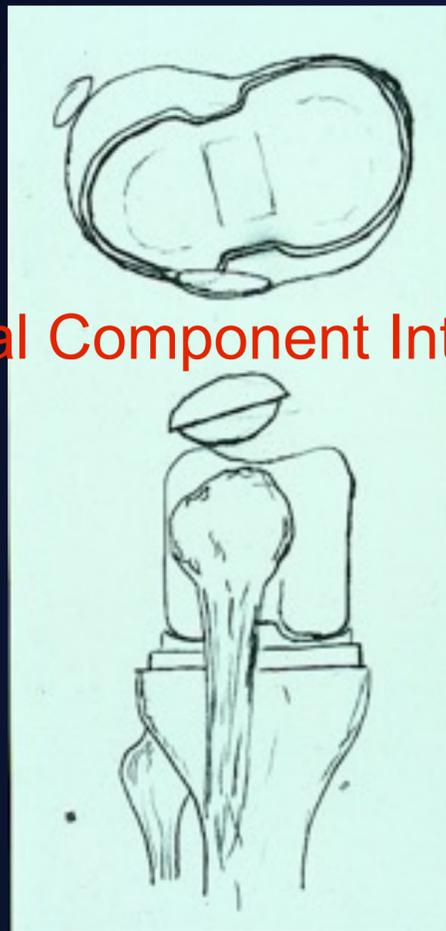
“A fixed valgus deformity greater than 15° that appeared to do clinical better with PCL sacrificing components”

Laskin et al

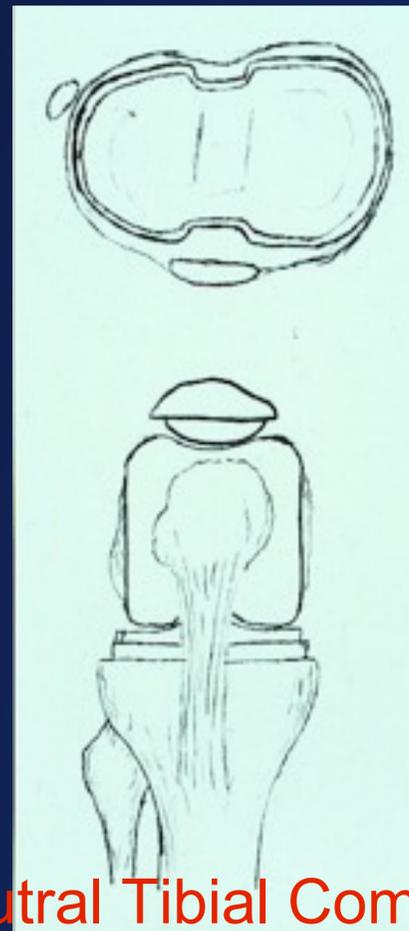
When to Perform Lateral Release ?

Assess Tracking

- A lateral retinacular release
- Preserving of the lateral superior geniculate vessels



Tibial Component Internal



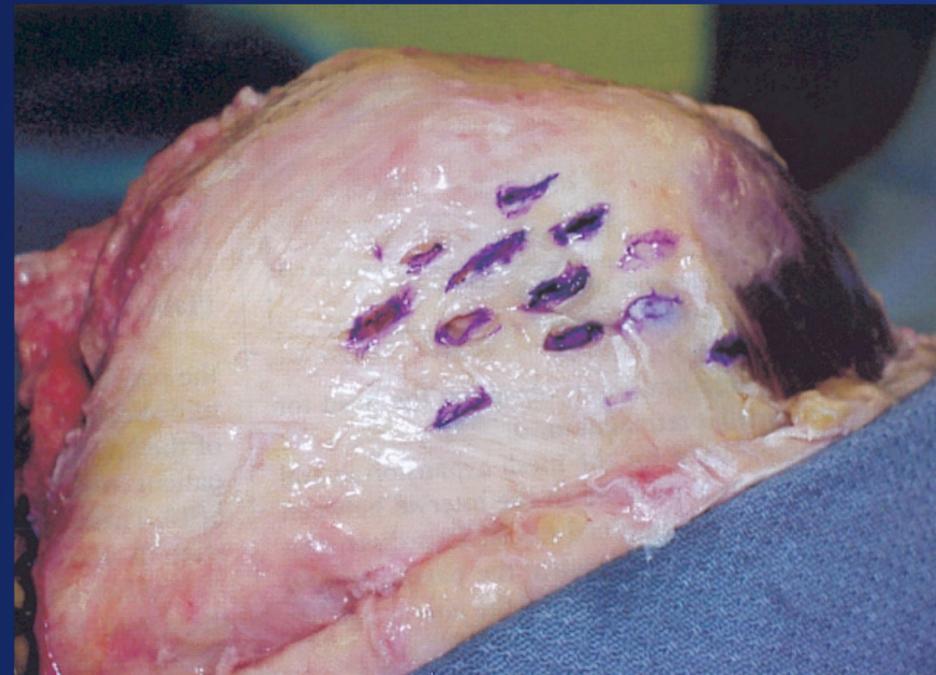
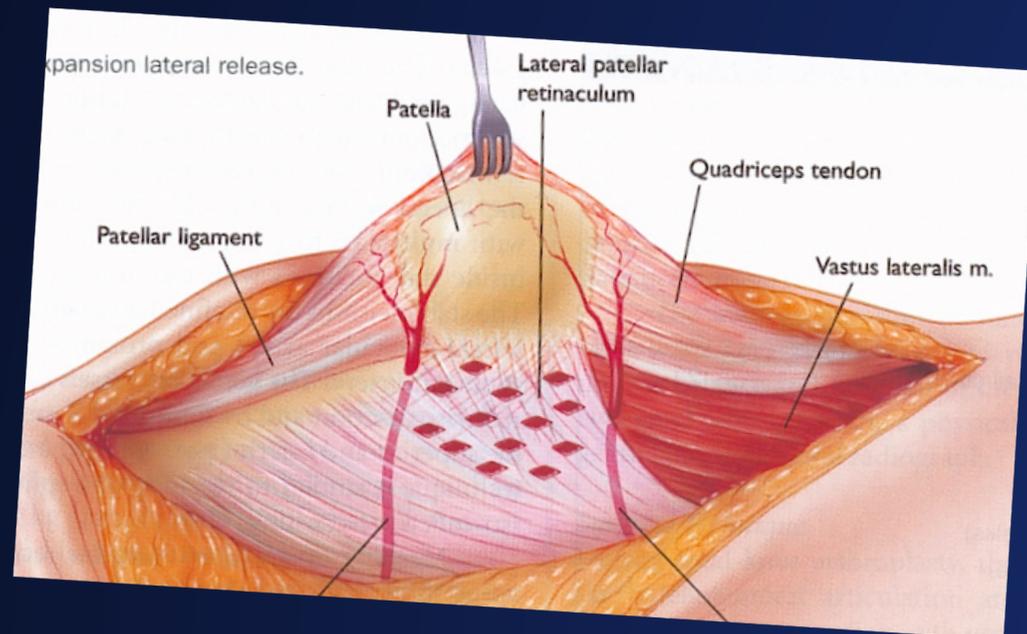
Neutral Tibial Component



Tibial Component External

Lateral Release Concerns

- Increased post operative pain
- Wound healing complications
- Longer rehabilitation times
- Compromised patellar blood flow (risk of avascular necrosis or fracture)



Complication

- Asymmetric instability
- Patellar instability
- Avulsion of the tibial tubercle
- Peroneal nerve injury



Severe Valgus Knee - Postop

Protect the Peroneal Nerve :

- Send to HCU with knee flexed
- Gradually extend knee over next several days, monitoring nerve function



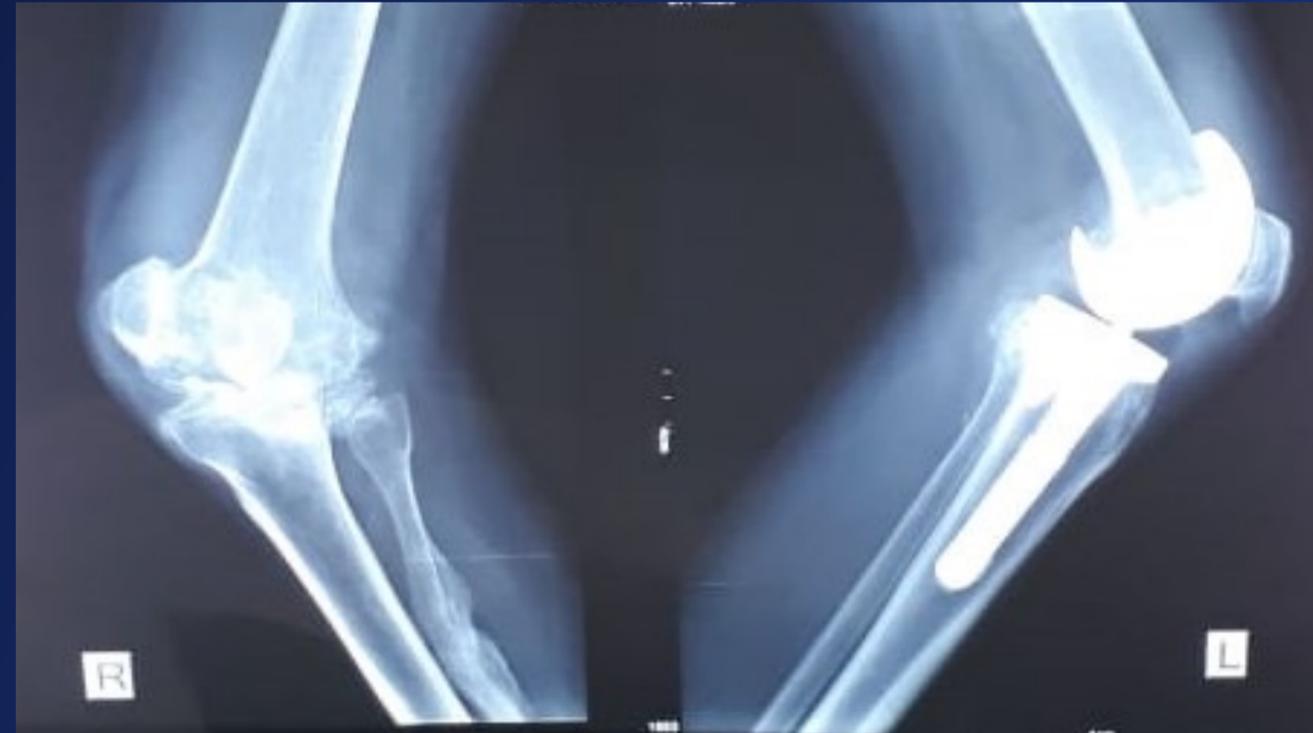
Case 1

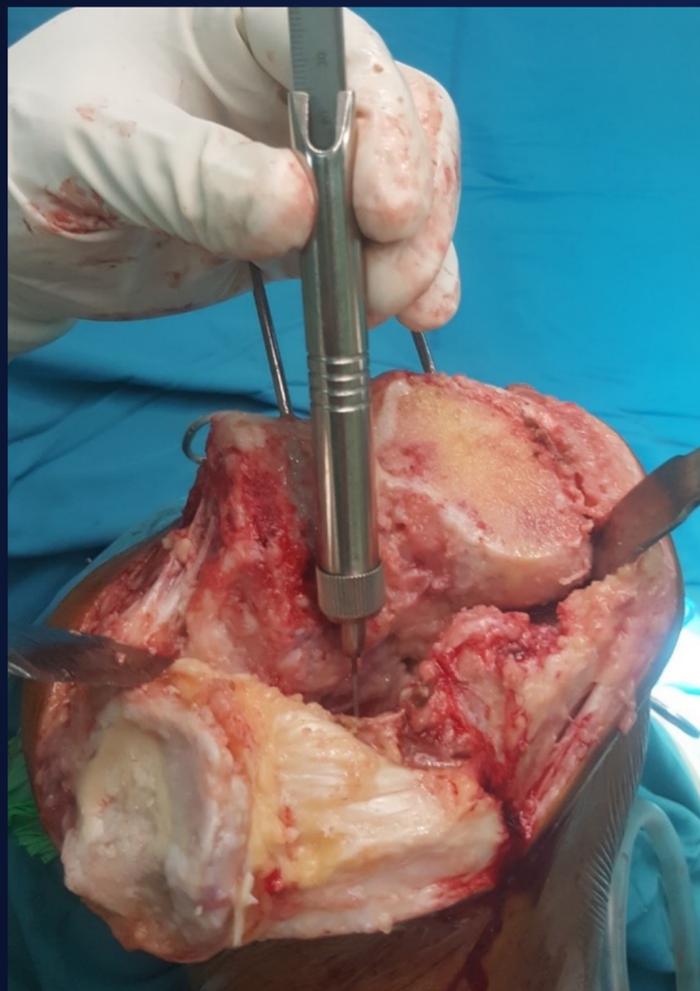
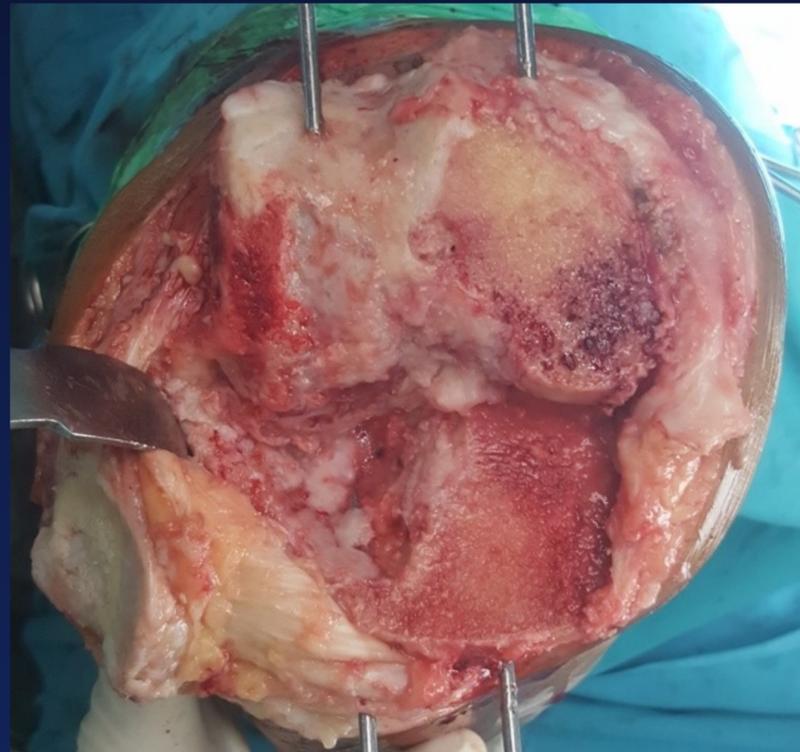


SEVERE VALGUS TKR

Case 1

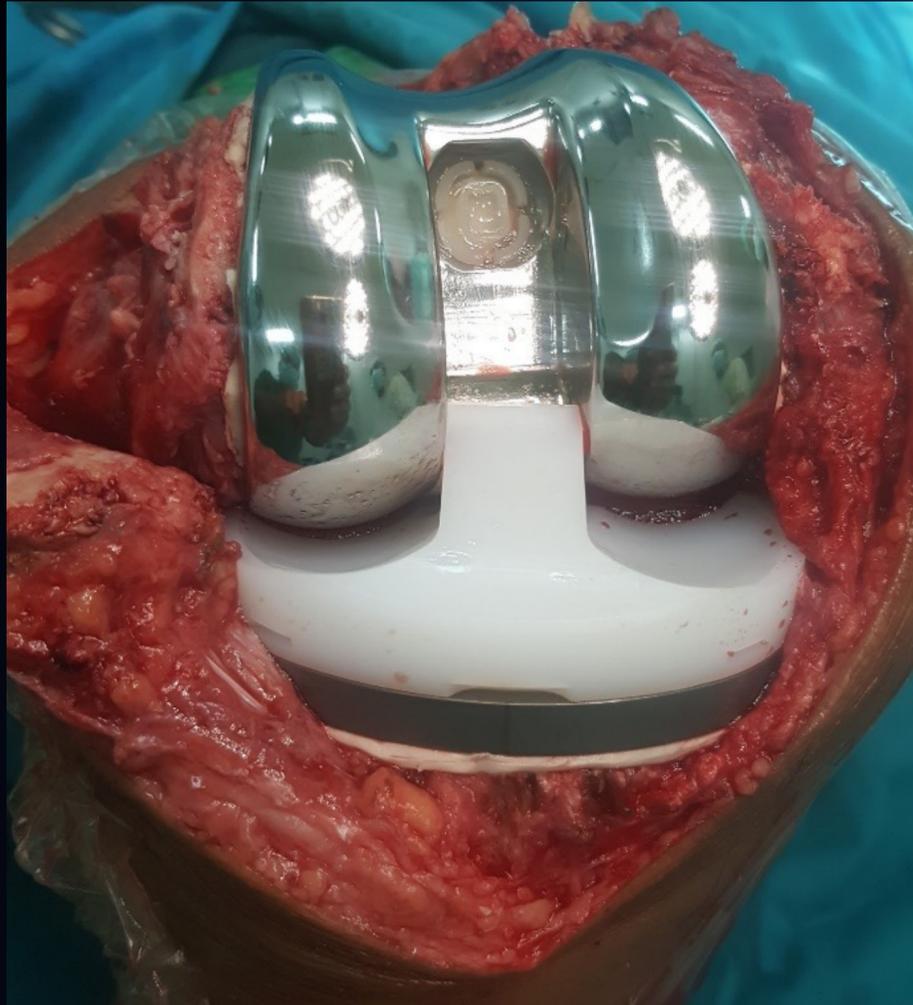
Xray





SEVERE VALGUS TKR





SEVERE VALGUS TKR



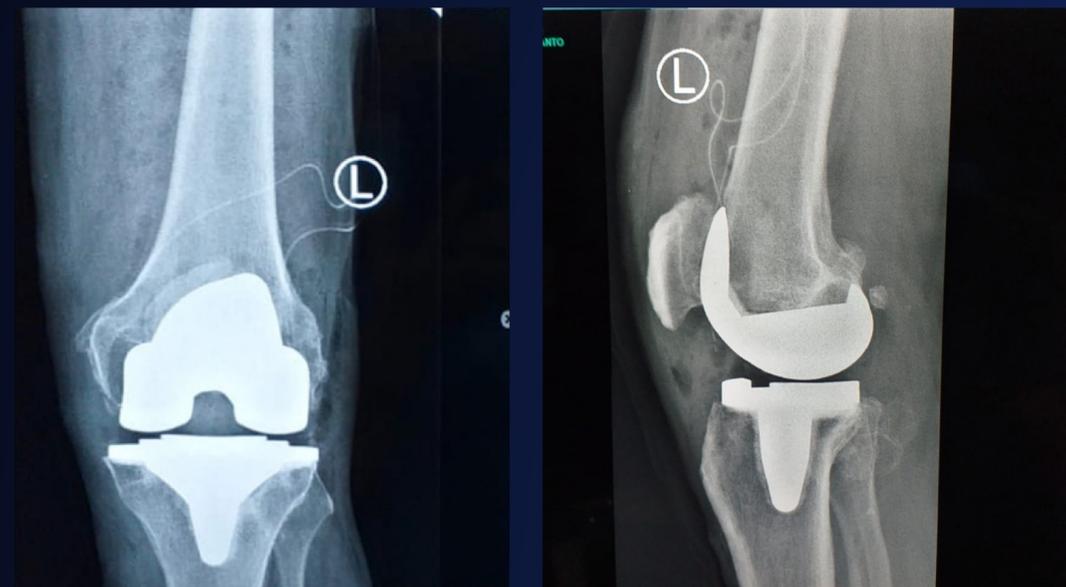
7 years postop



SEVERE VALGUS TKR



Case 2



SEVERE VALGUS TKR



Case 3



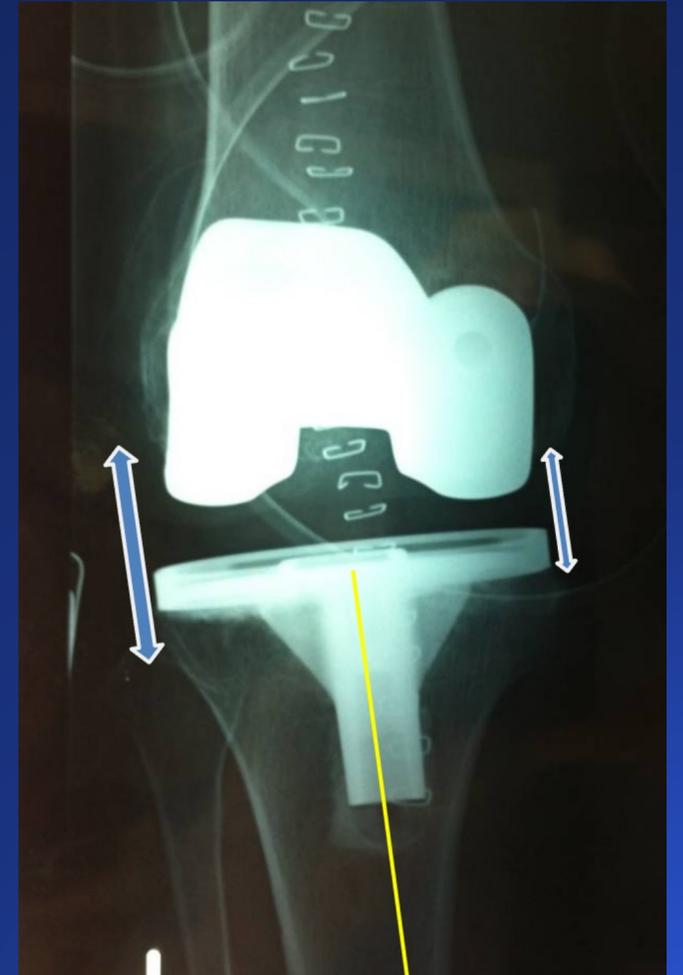
SEVERE VALGUS TKR



Surgical Challenges

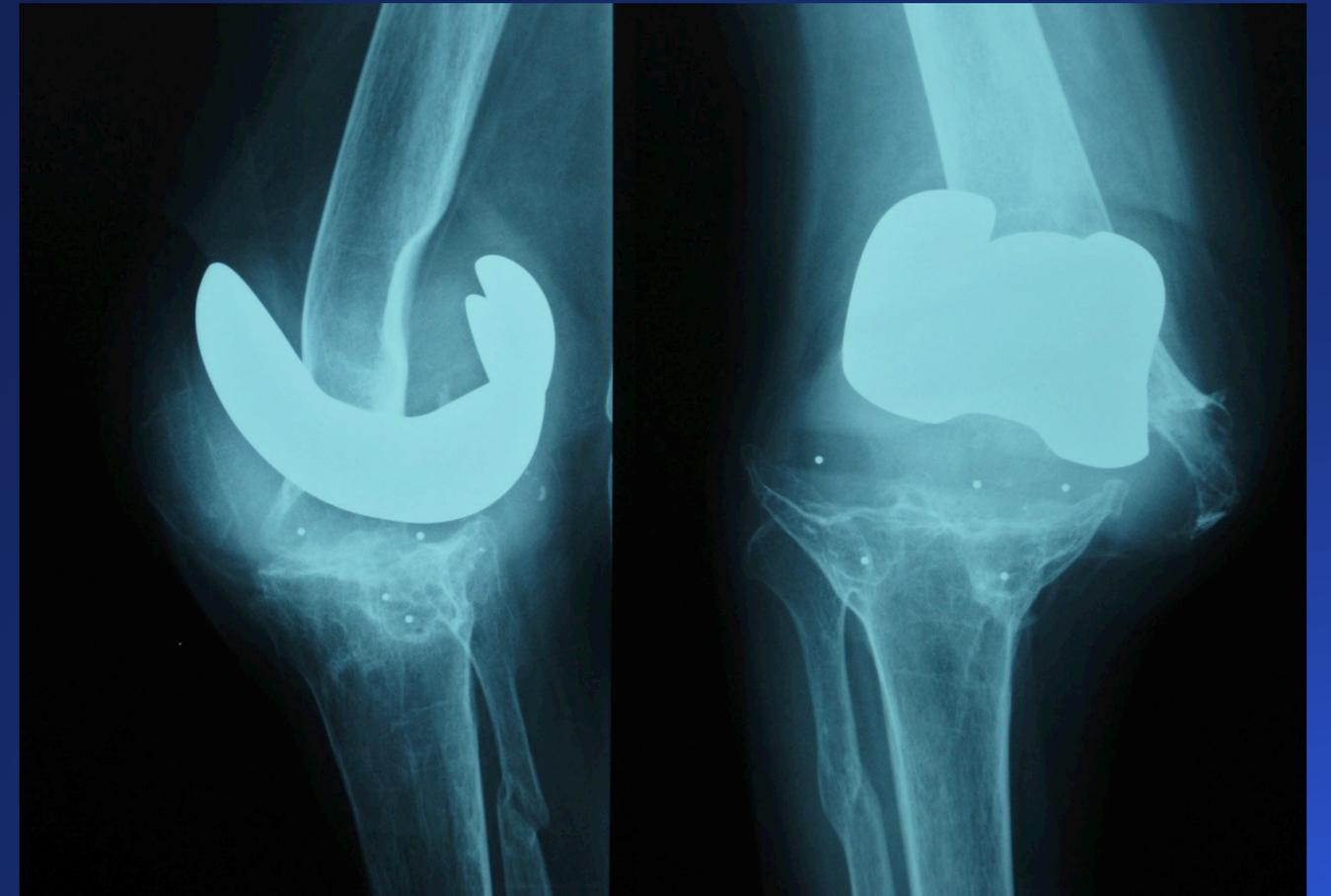
Lateral release is difficult

- You can't always do a release step by step like in a varus knee
- Too tight in extension release....., too tight, re-release....too tight, re-re-release.... and suddenly !
- **Too loose, often in flexion**



Take Home Messages

- Long standing film
- Minimalist bone cuts
- Neutral alignment
- Iterative soft tissue releases
- Constraint as needed to provide stable knee
- The surgical key is to appropriately gauge and release the posterolateral complex





Thank You For Your Attention

