TKR CRASH COURSE

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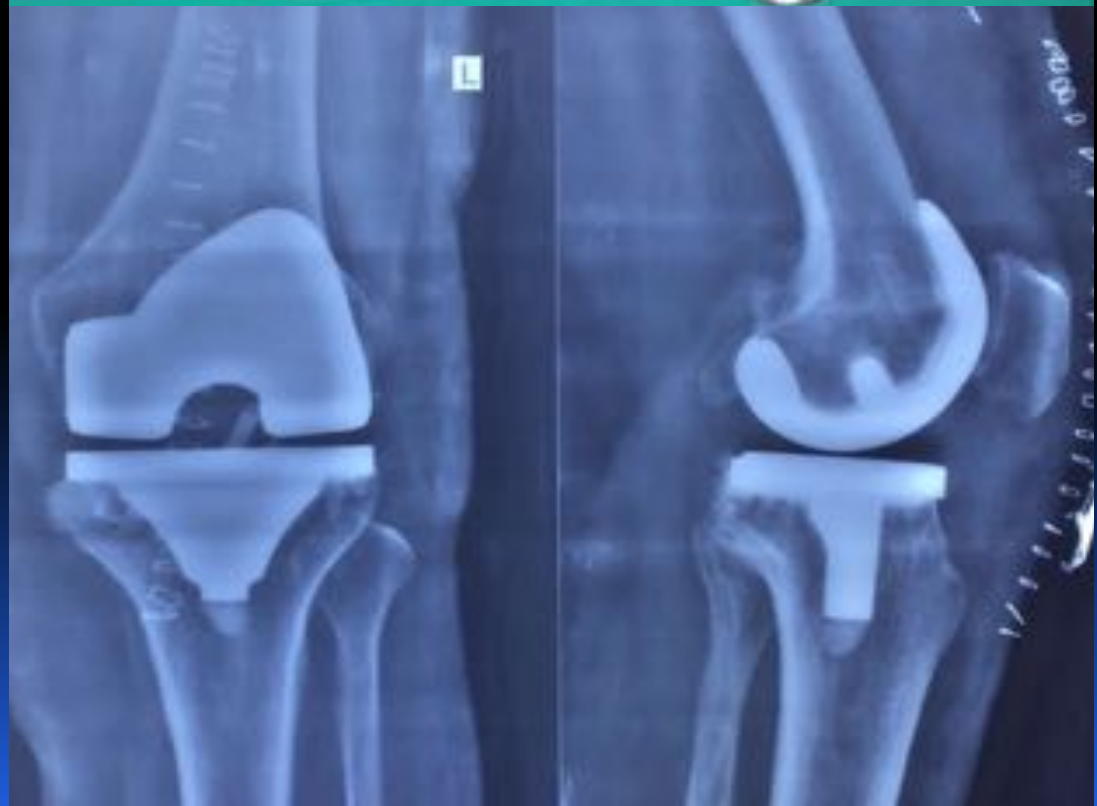
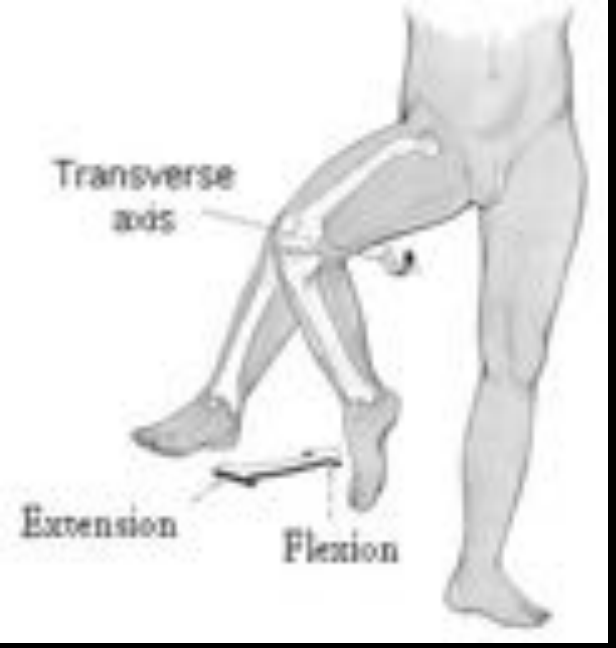
TOTAL KNEE REPLACEMENT

EASIER DONE THAN UNDERSTOOD!



KNEE JOINT MOVEMENTS

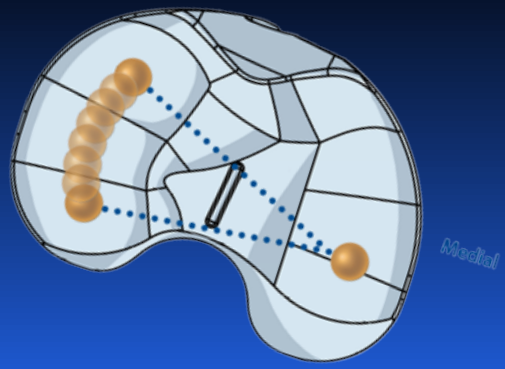


Flexion-Extension motion

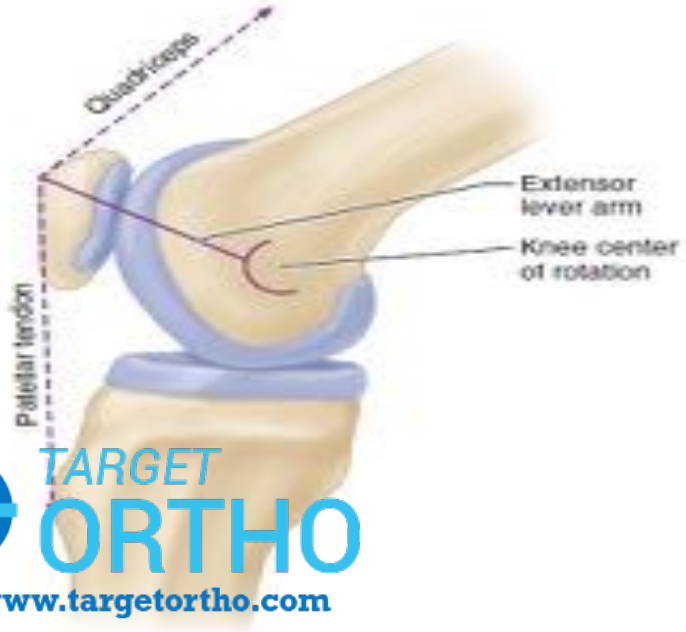
AND

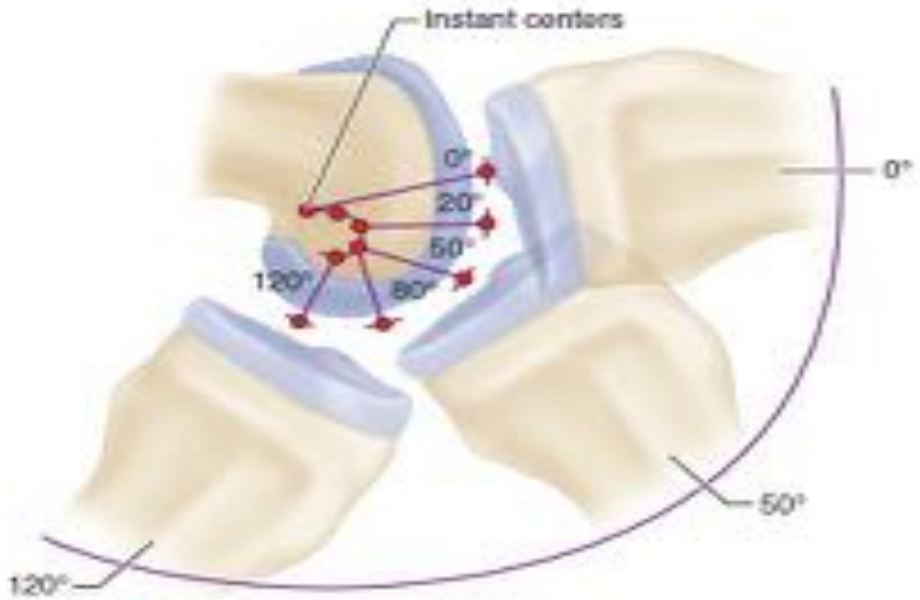
Rotations

(Screw Home Mechanism/ Locking)

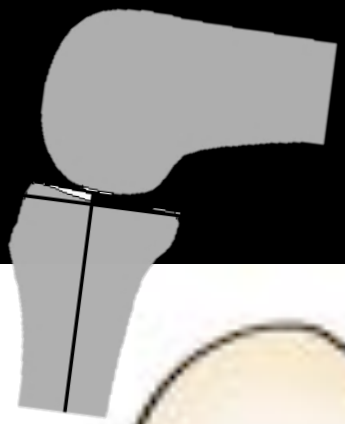


THE FLEXION – EXTENSION GAPS

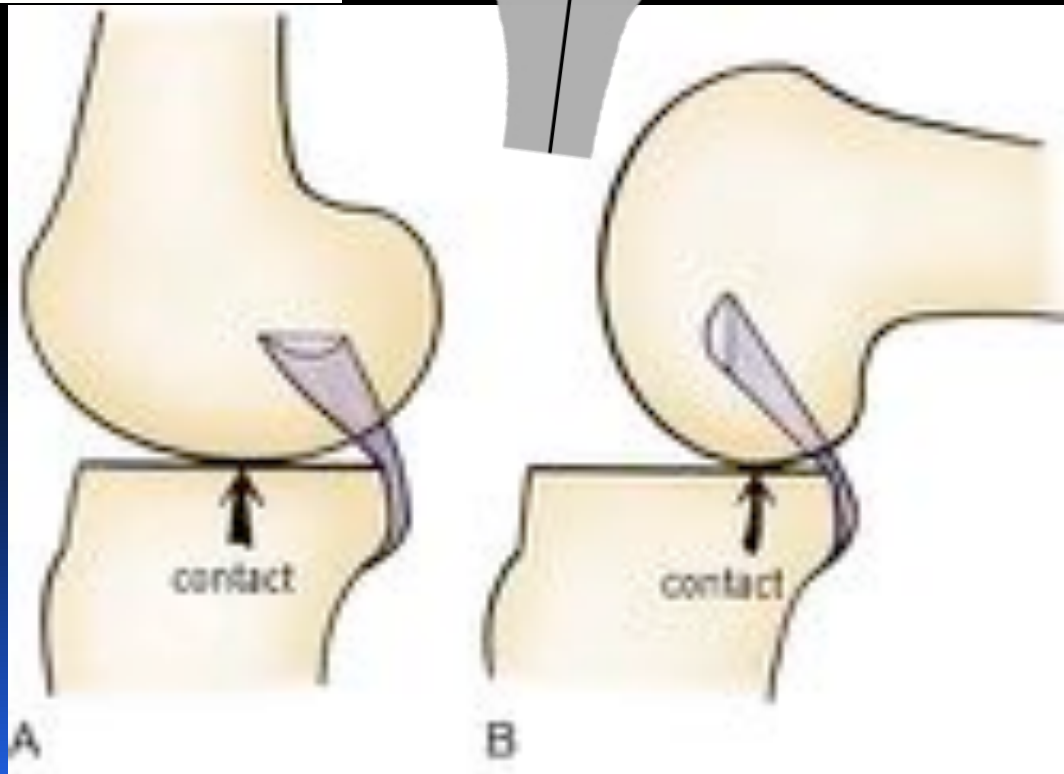


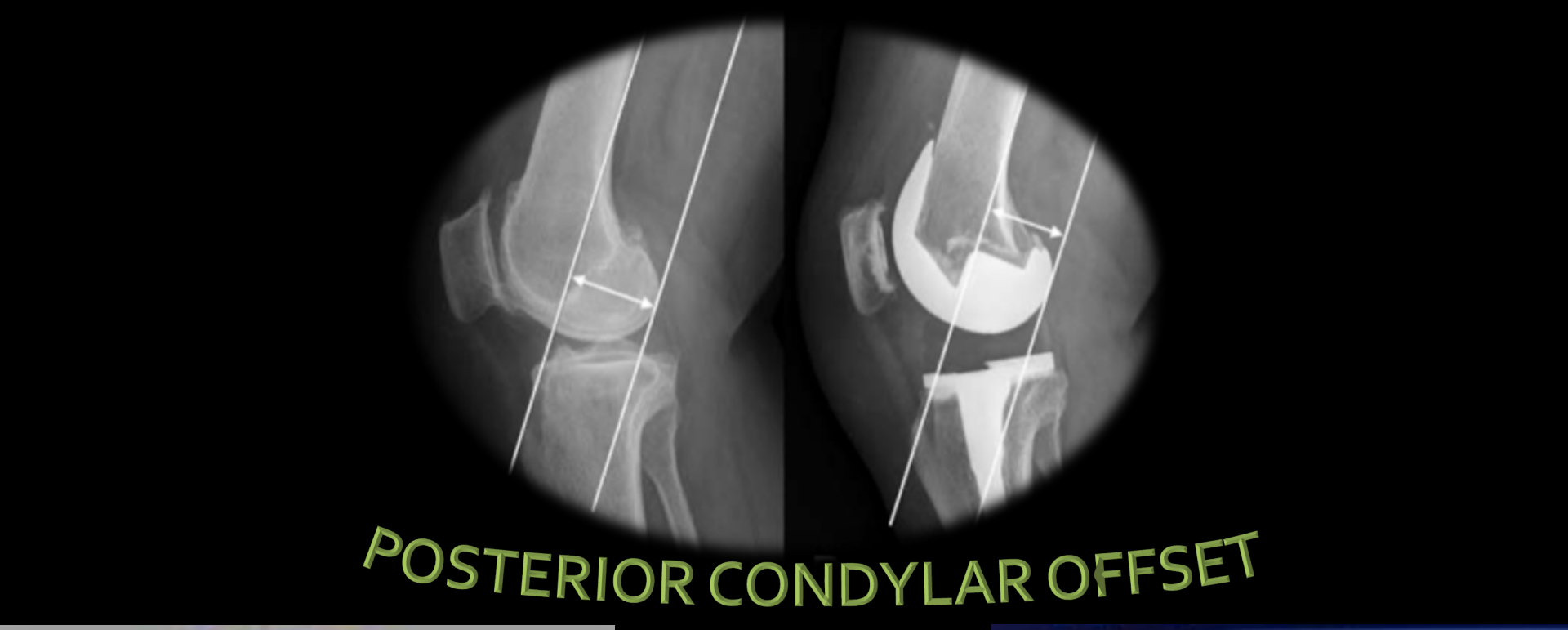


THE TIBIAL SLOPE



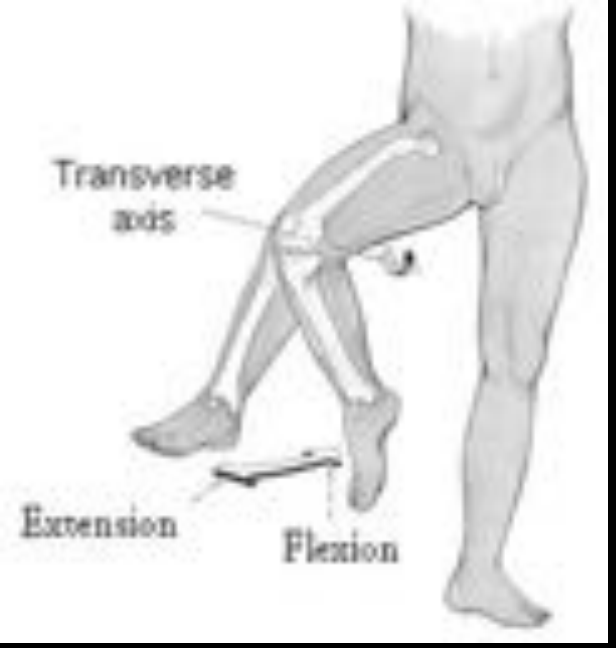
THE POSTERIOR FEMORAL ROLL BACK





POSTERIOR CONDYLAR OFFSET

KNEE JOINT MOVEMENTS

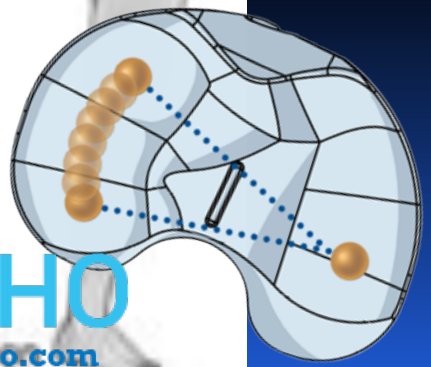


Flexion-Extension motion

Flexion-Extension gaps

Femoral Roll Back
- AP translation by PCL
- Posterior tibial slope

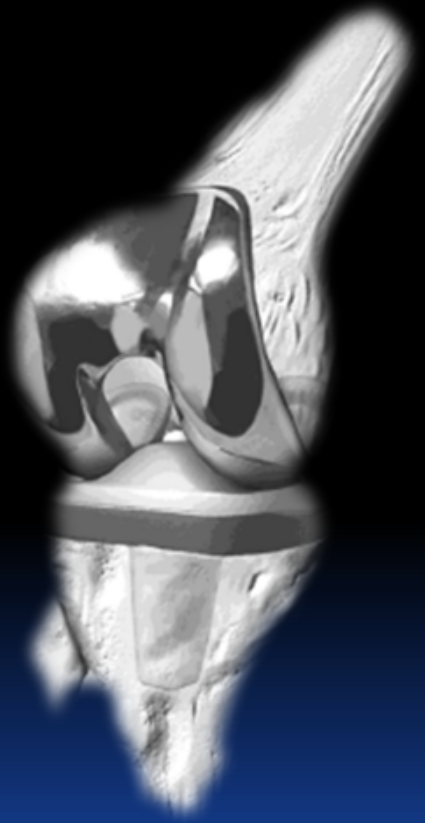
Posterior condylar offset



Rotations
(Screw Home Mechanism/ Locking)

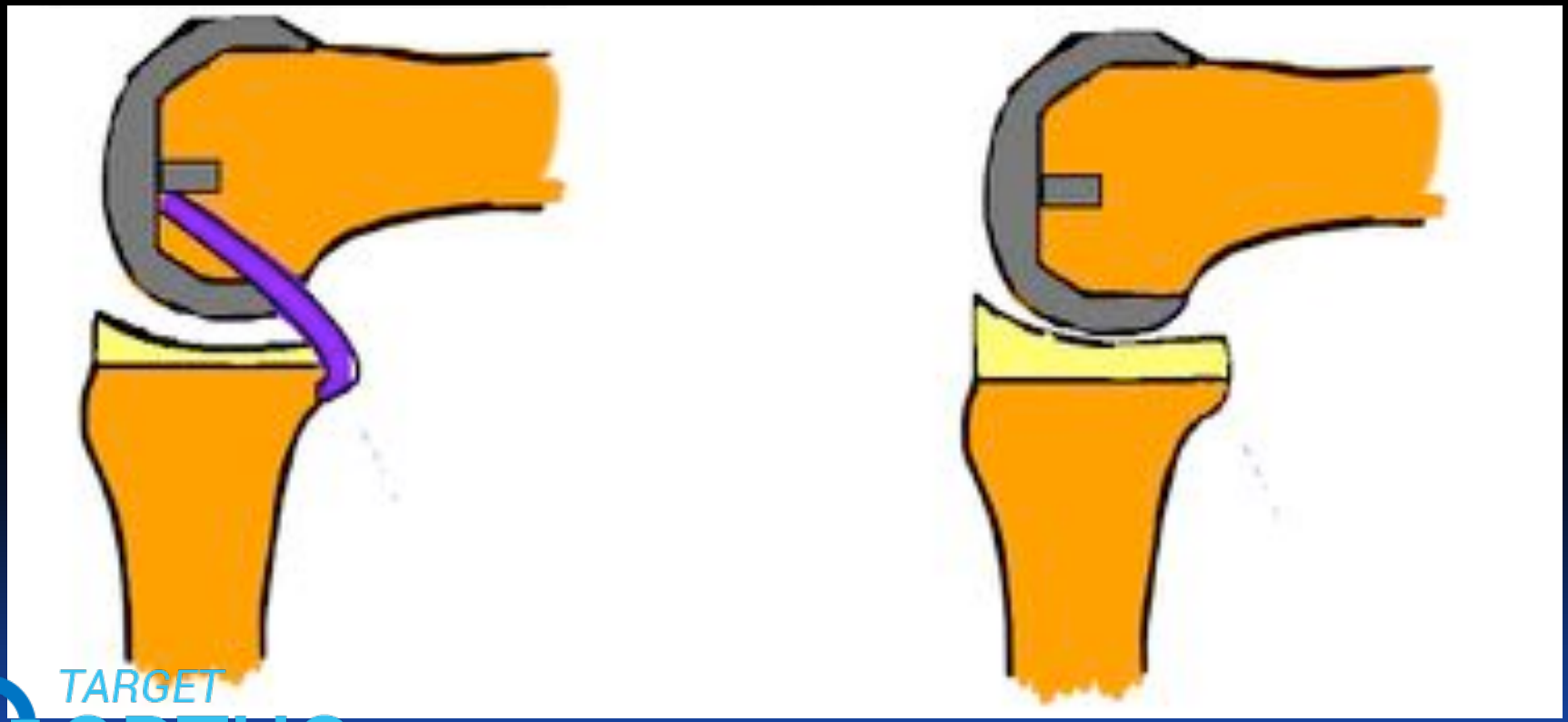
EVOLUTION OF TKR PROSTHESIS

Total Condylar design
(PCL Sacrificing)



EVOLUTION OF TKR PROSTHESIS

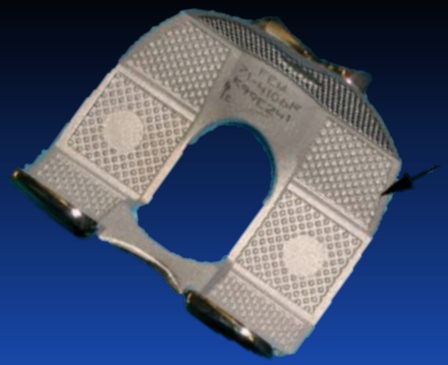
Duo-Patellar Kinematic Design
(PCL Retaining)



EVOLUTION OF TKR PROSTHESIS

Posterior Stabilized Design
(Cam-Post)

By
Insall-Burnstein



EVOLUTION OF TKR PROSTHESIS

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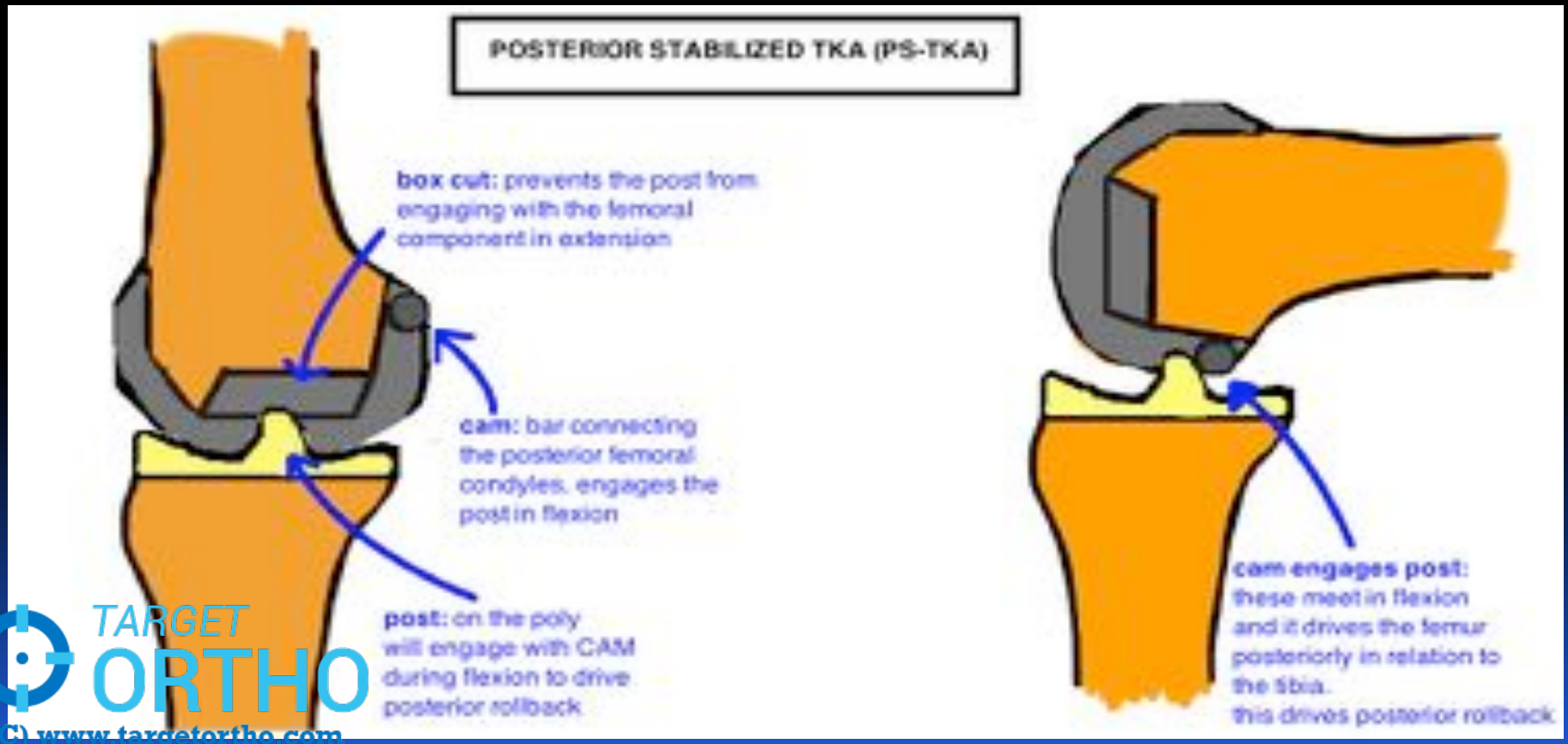

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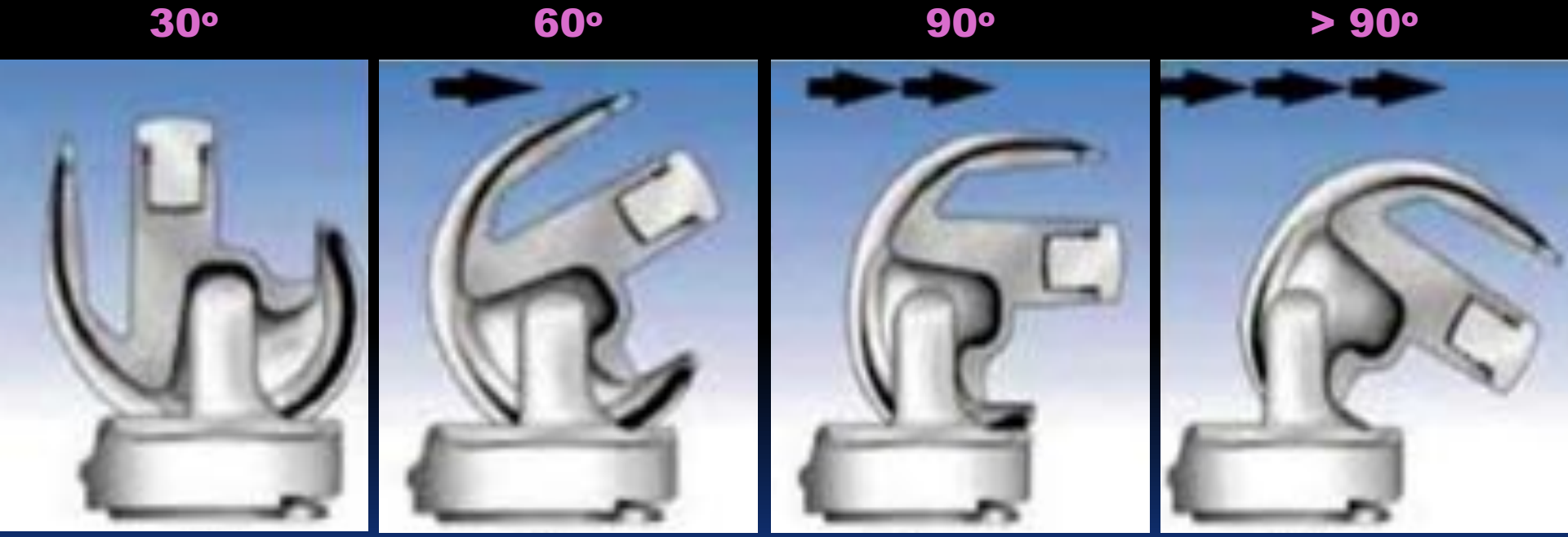
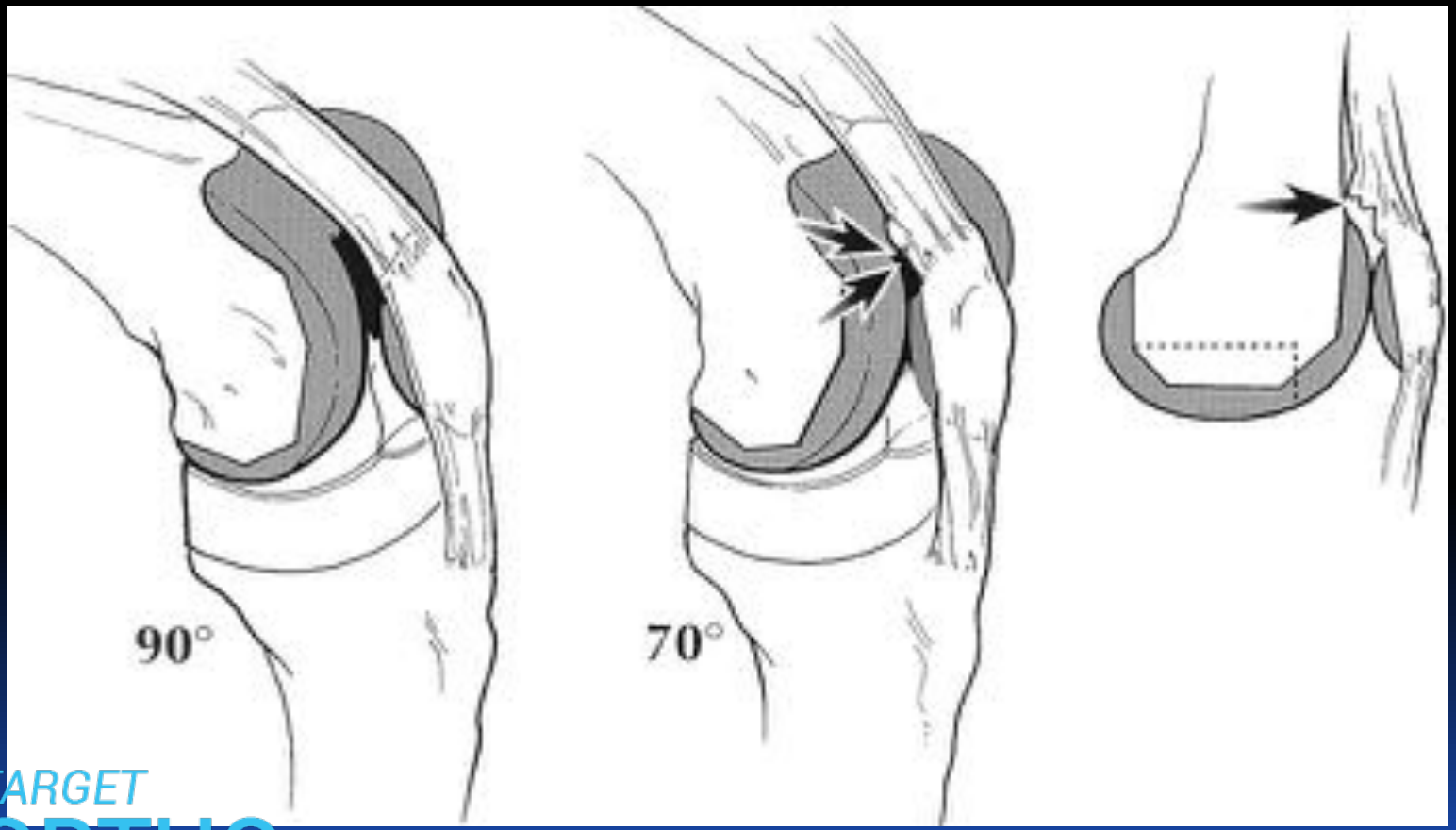


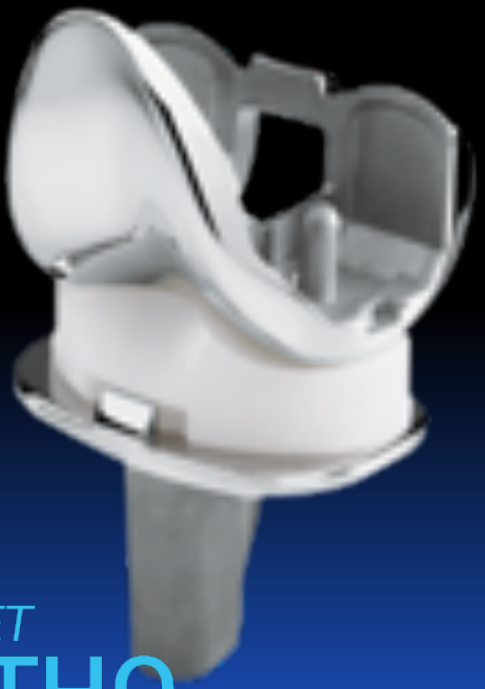
PATELLAR CLUNK SYNDROME



EVOLUTION OF TKR PROSTHESIS

Rotating Platform Design
(Low contact stress; Meniscal bearing)
Rotational motion of tibial PE

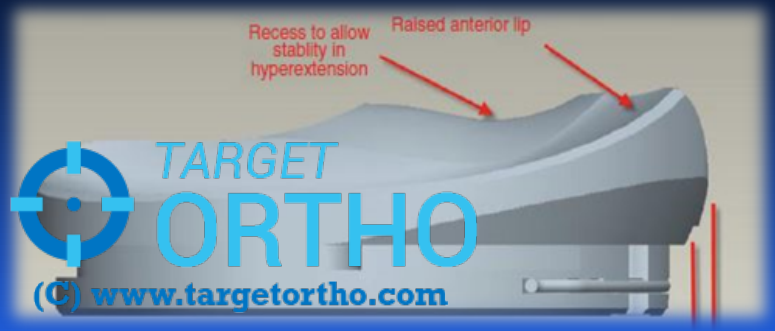
Medial Pivot Knee



MODERN DAY
CATEGORIZATION OF TKR PROSTHESIS

- UN / SEMI-CONSTRAINED TYPE
  - CR type
  - CS type
    - Ultra Congruent (Deep Dish) type
    - PS type (Cam-Post)
    - LCS (Rotating platform)
  - Medial Pivot Knee
- CONSTRAINED TYPE

Non functioning collaterals



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Cruciate retaining and cruciate substituting ultra-congruent insert

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Abstract

Go to:

The posterior cruciate ligament (PCL) conservation and the polyethylene insert constraint in total knee arthroplasty (TKA) are still debated. The PCL is one of the primary stabilizers of the joint, but cruciate retaining (CR) implants have the disadvantage of a difficult balancing of the PCL. Postero-stabilized (PS) implants were introduced to reduce this problem. However, also the PS implants have some disadvantages, due to the cam-mechanism, such as high risk of cam-mechanism polyethylene wear. To minimize the polyethylene wear of the cam-mechanism and the bone sacrifice due to the intercondylar box, different types of inserts were developed, trying to increase the implant conformity and to reduce stresses on the bone-implant interface. In this scenario ultra-congruent (UC) inserts were developed. Those inserts are characterized by a high anterior wall and a deep-dished plate. This conformation should guarantee a good stability without the posterior cam. Few studies on both kinematic and clinical outcomes of UC inserts are available. Clinical and radiological outcomes, as well as kinematic data are similar between UC mobile bearing (MB) and standard PS MB inserts at short to mid-term follow-up. In this manuscript biomechanics and clinical outcomes of UC inserts will be described, and they will be compared to standard PS or CR inserts.

Keywords: Total knee arthroplasty (TKA), polyethylene insert, posterior cruciate ligament (PCL), ultra-congruent (UC) insert, total knee arthroplasty kinematics

SELECTING YOUR IMPLANT DESIGN

Scorpio NRG (Stryker, Mahwah, NJ)

Nexgen (Zimmer, Warsaw, IN)

Triathlon (Stryker, Mahwah, NJ)

Gainesville, FL)

PFC singma (J&J, Raynham, MA)

Genesis (S&N, Richards, TN)

Choosing Implant Material !!

INSERT / SPACER

Sixth Generation
Highly cross linked
Ultra High MW
Vitamin E soaked
Polyethylene (PE)

Produced by Annealing or Remelting

Sterlized by gamma irradiation under vacuum

COMPONENTS

Ceramic

Tantalum

Zirconium — Gold

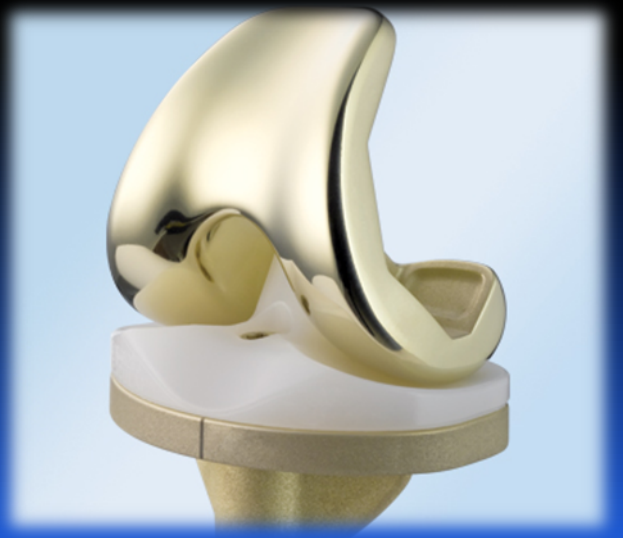
Cobalt Chromium

Titanium

Stainless Steel

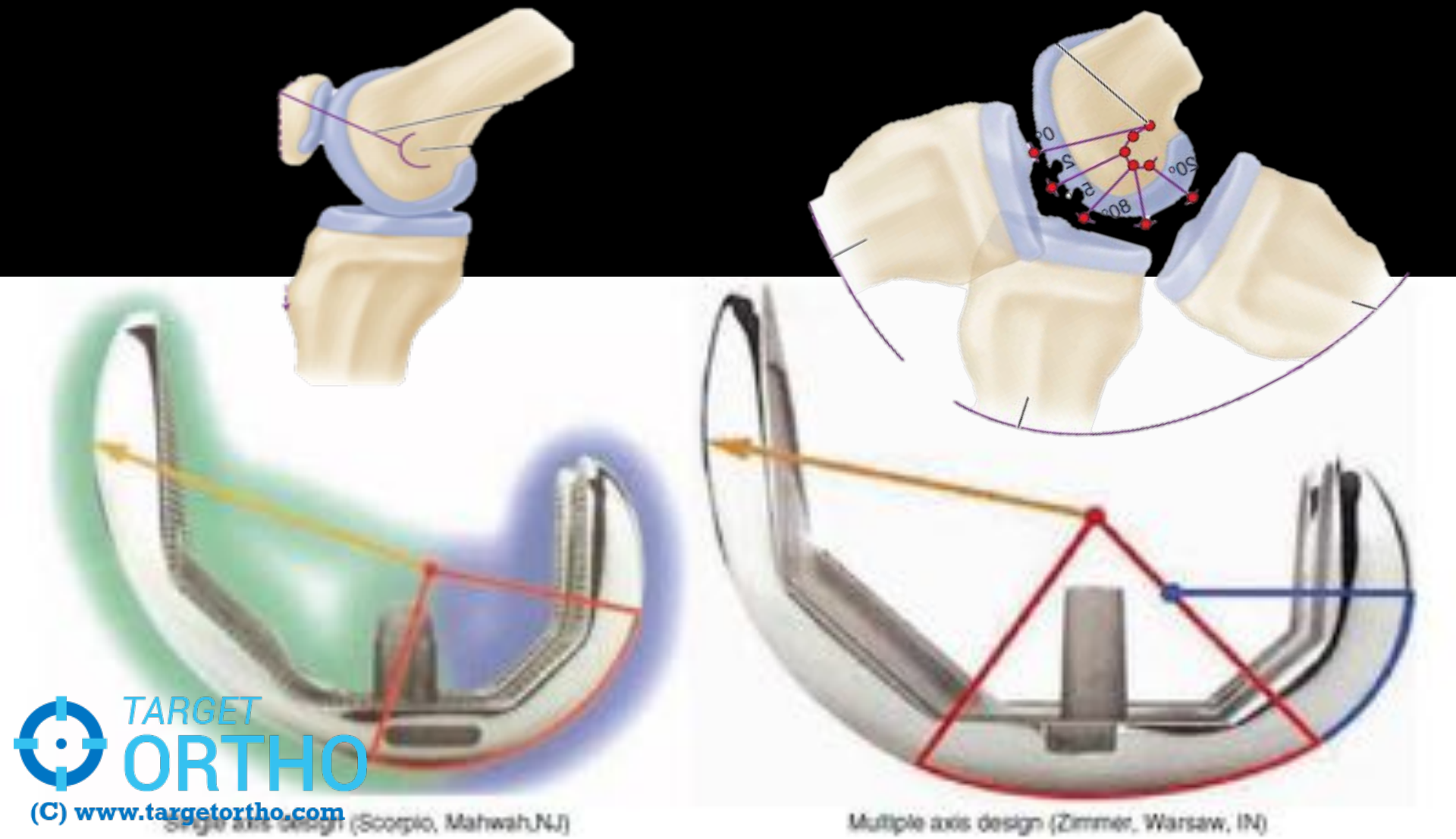
CEMENT TYPE

Simplex
Vs
Palacos



Choosing Implant Design !!

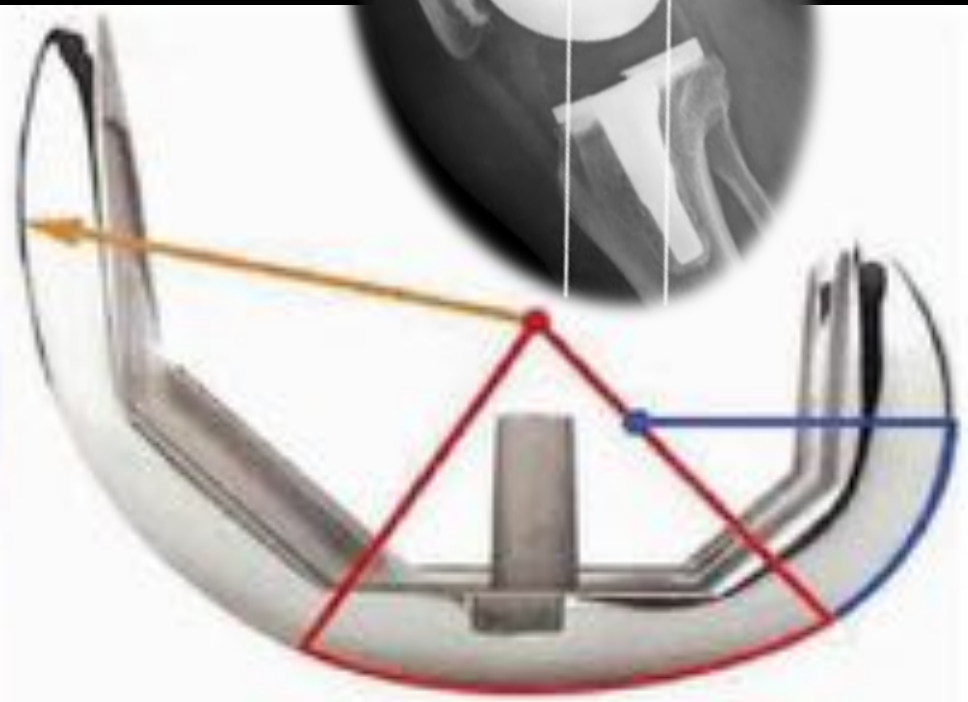
Femoral Component



Multiple axis design (Zimmer, Warsaw, IN)

Choosing Implant Design !!

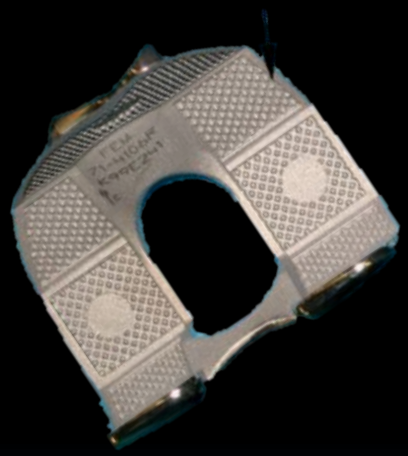
Femoral Component



Multiple axis design (Zimmer, Warsaw, IN)

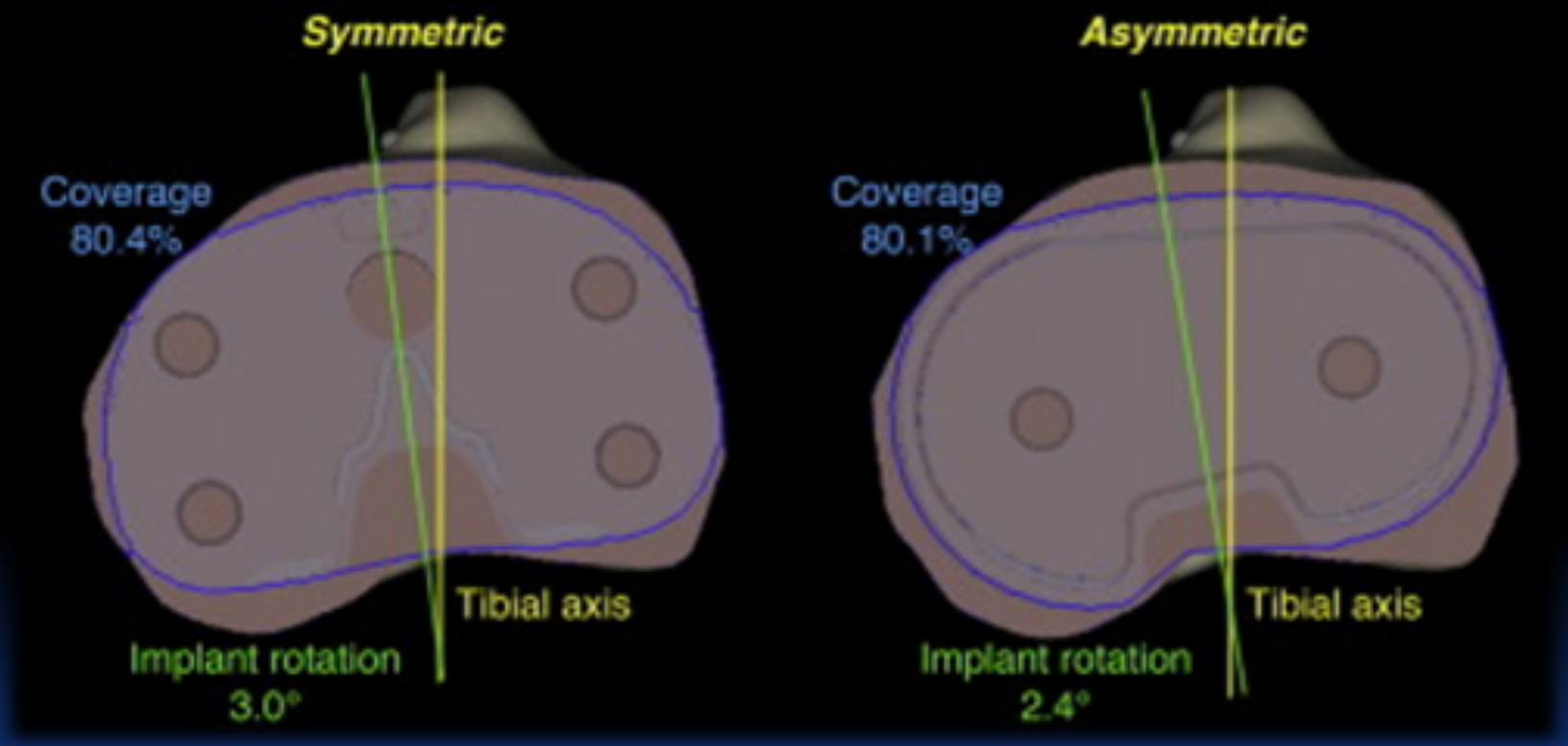
Choosing Implant Design !!

Femoral Component



Choosing Implant Design !!

Tibial Component

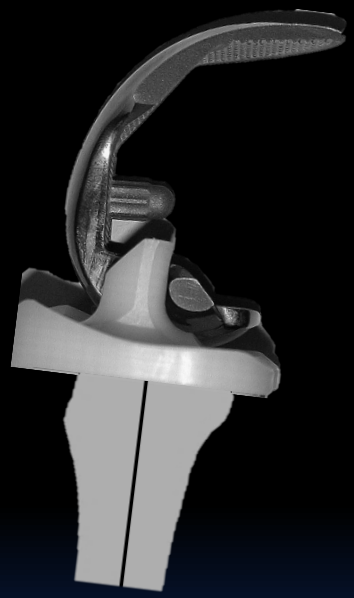


Choosing Implant Design !!

Tibial Component

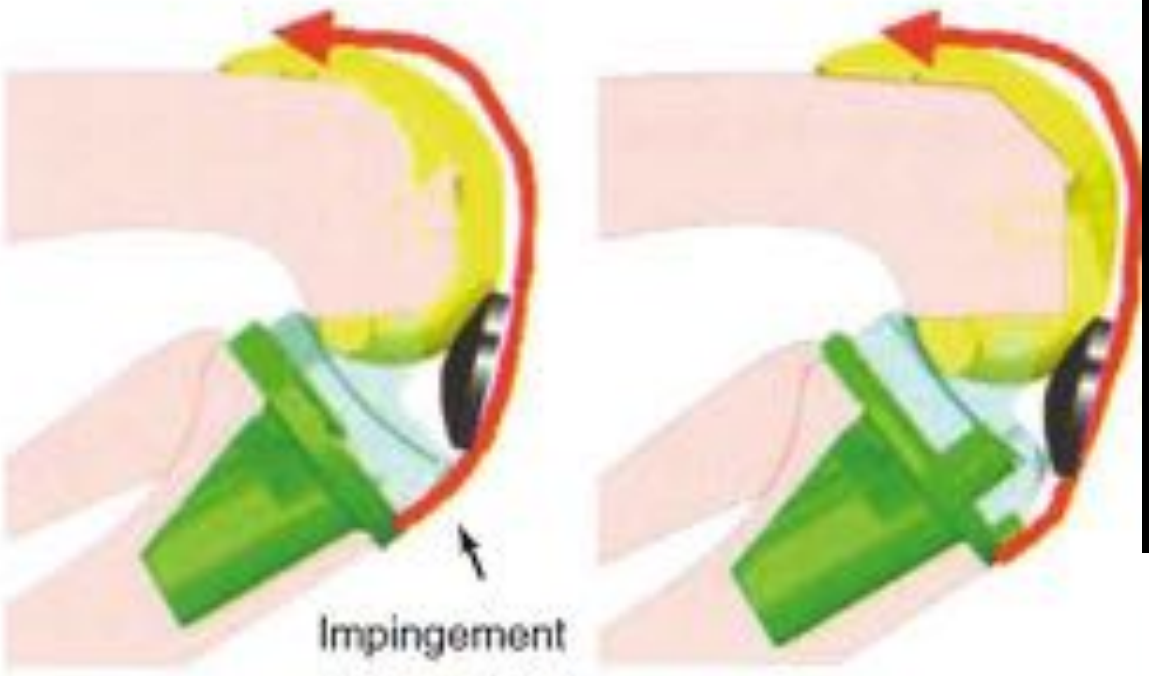
Choosing Implant Design !!

Tibial Component

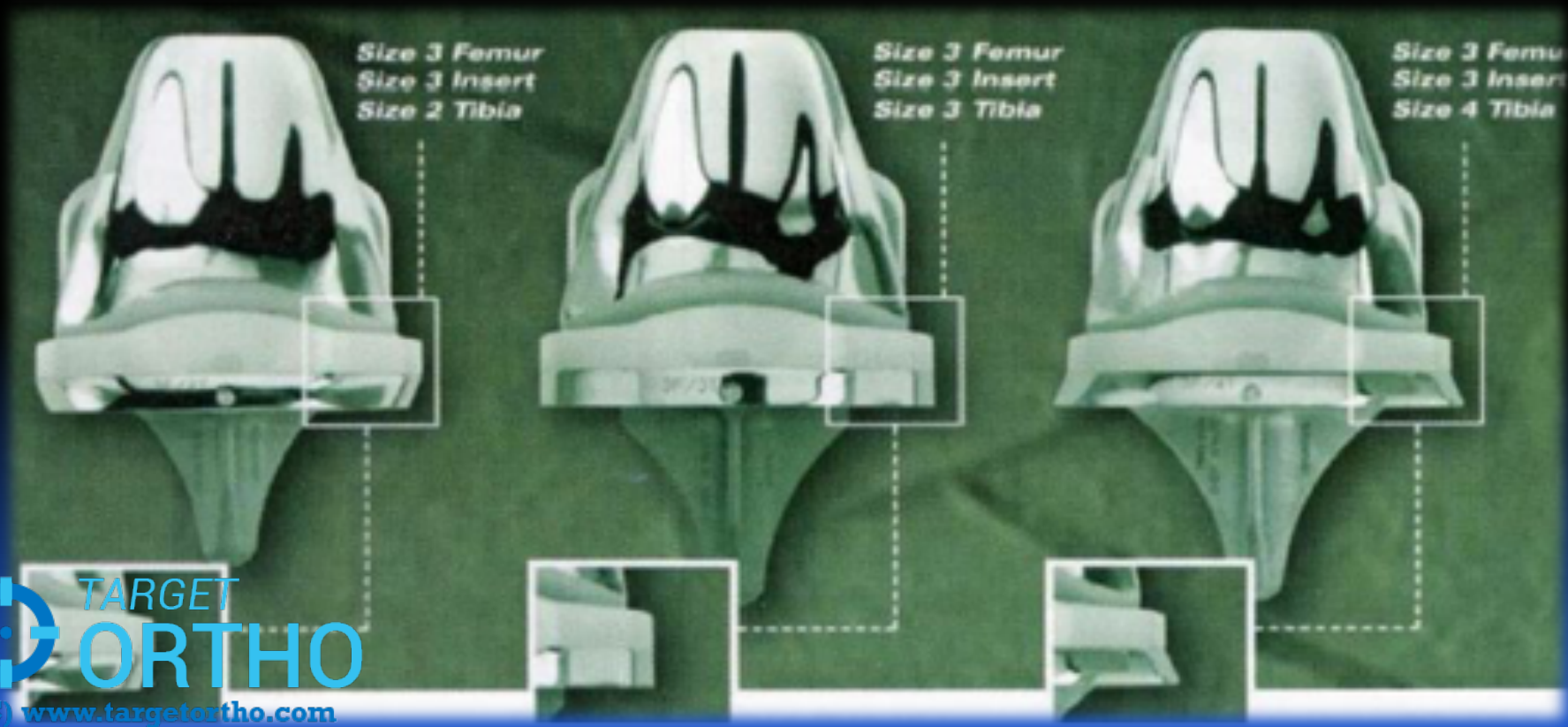


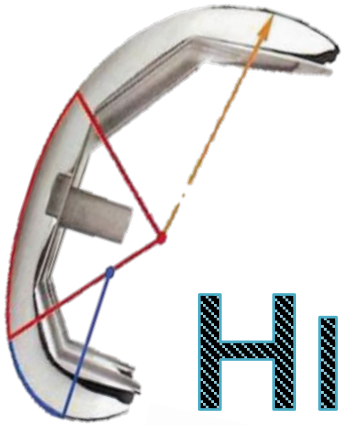
Choosing Implant Design !!

PE Spacer



Size Matching !!!





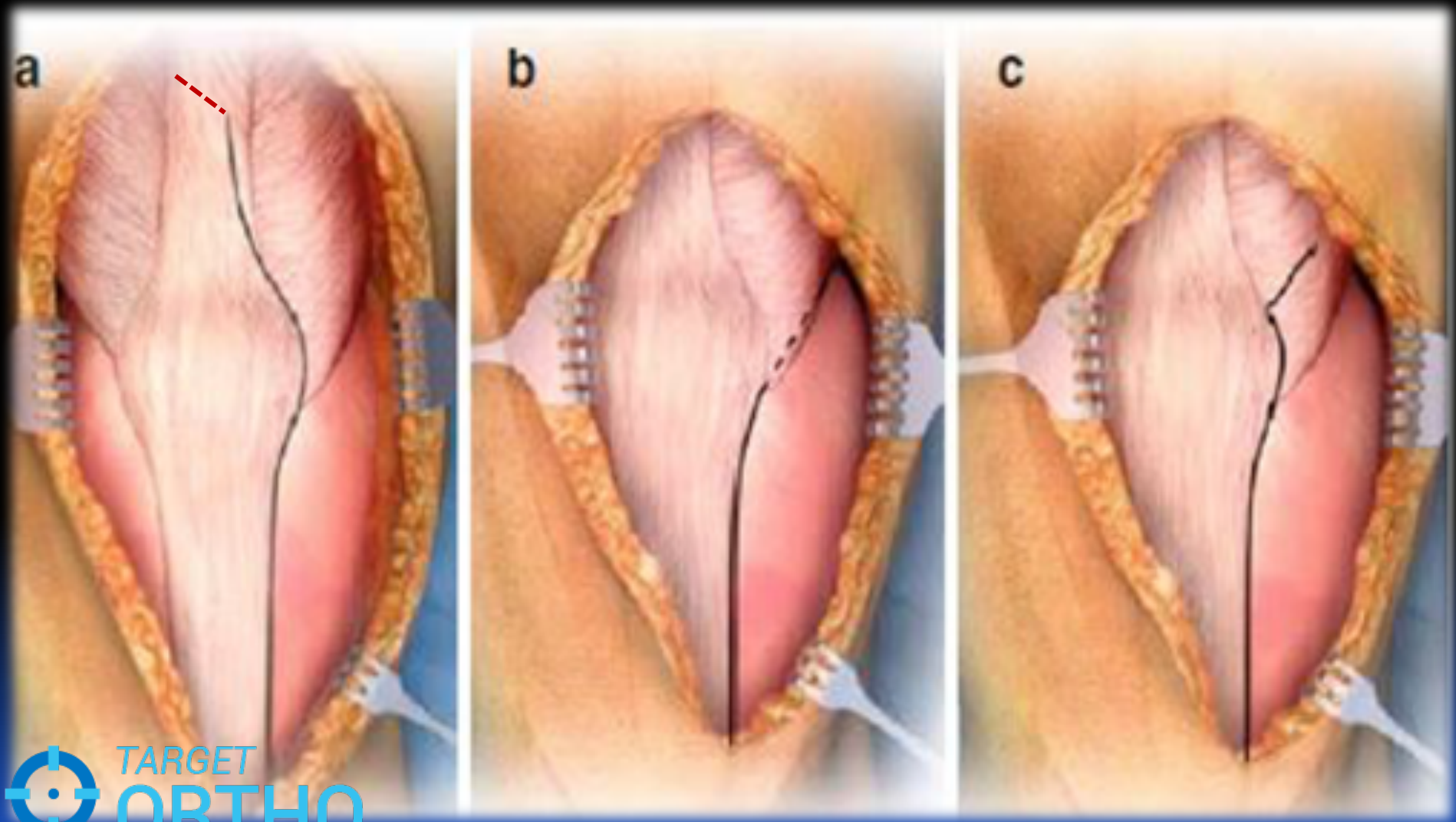
High Flex Knee

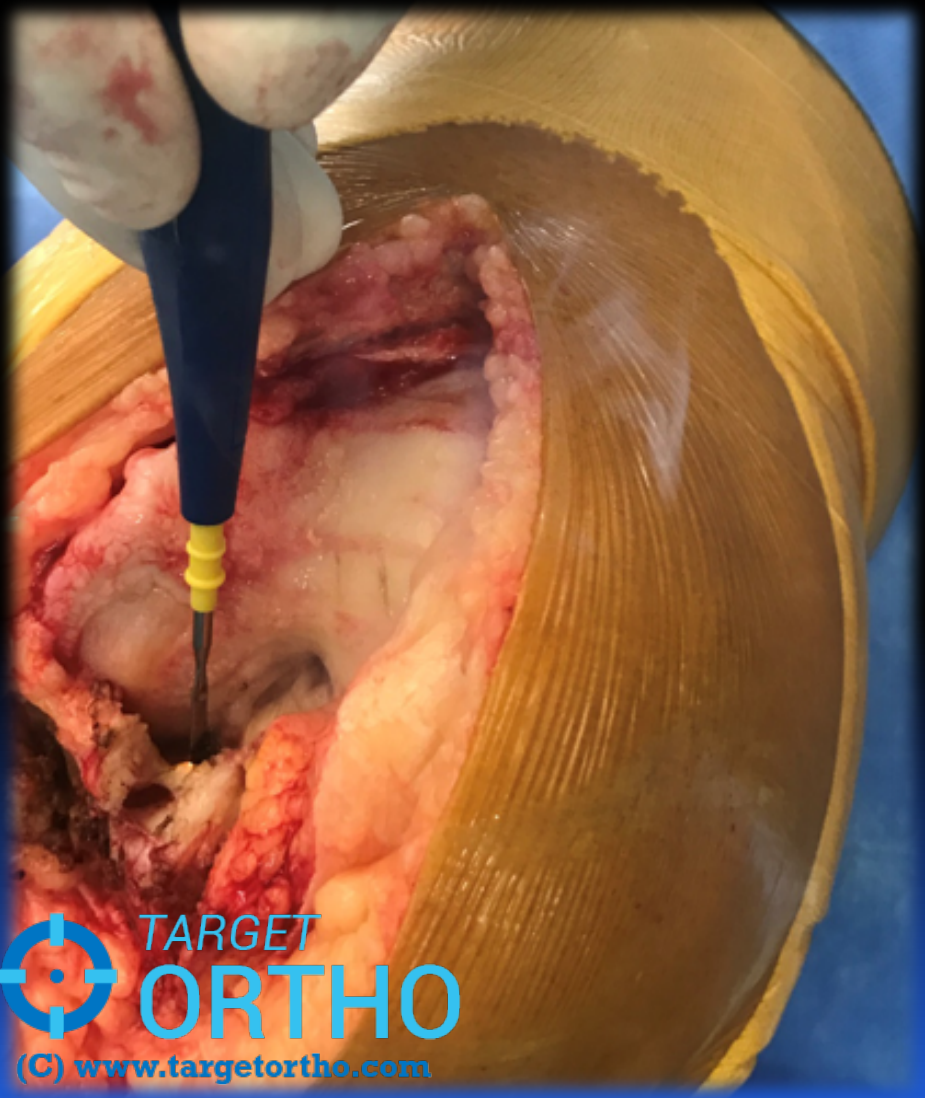
TOTAL KNEE REPLACEMENT

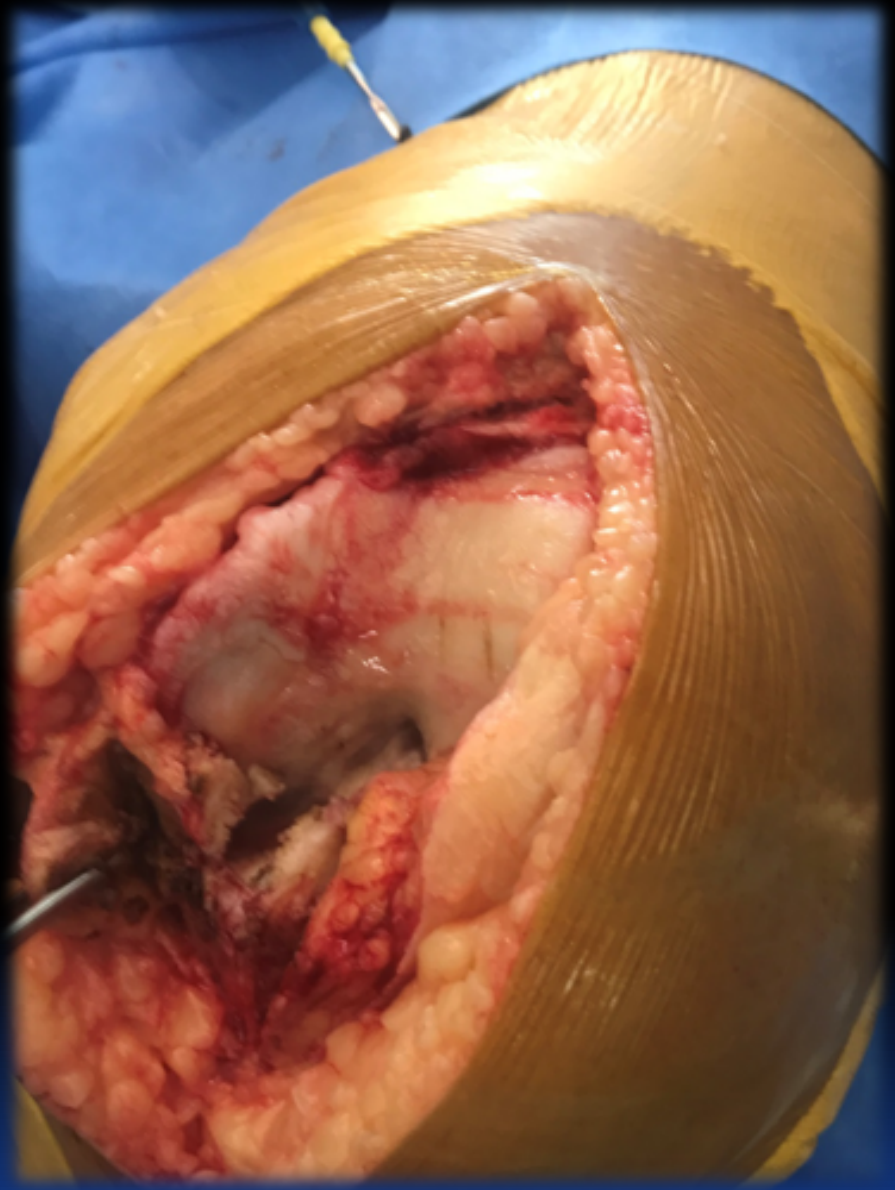
THE SURGICAL TECHNIQUE !!

SURGICAL APPROACH !!

SURGICAL APPROACH !!







Raise Medial periosteal sleeve

↓

Remove Patellar Fat Pad

↓

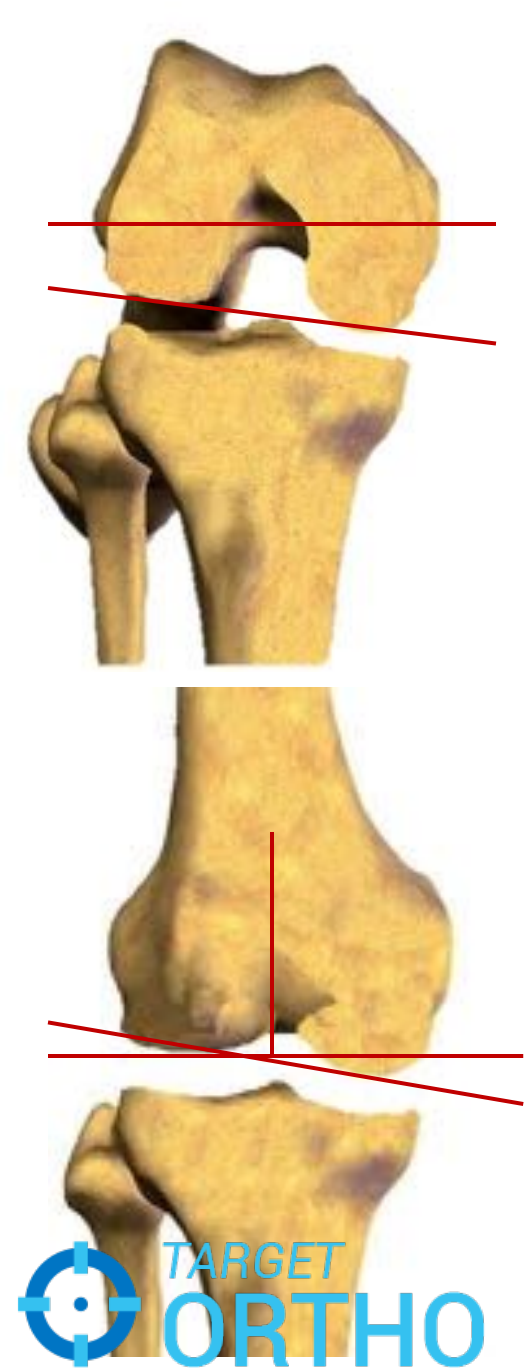
Strip off tissue from Lateral femoral condyle

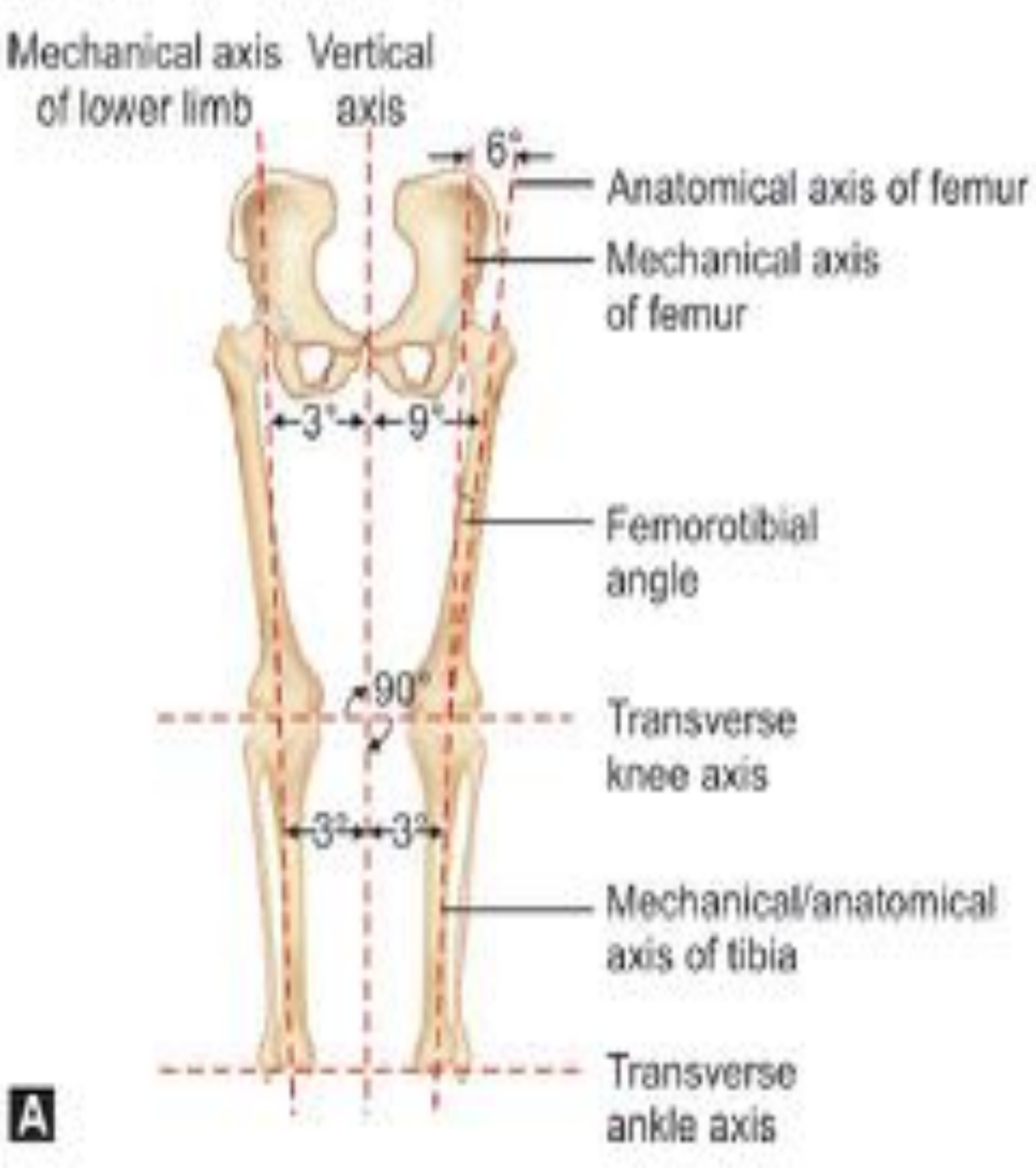
↓

Remove the cruciates and the menisci

TOTAL KNEE REPLACEMENT

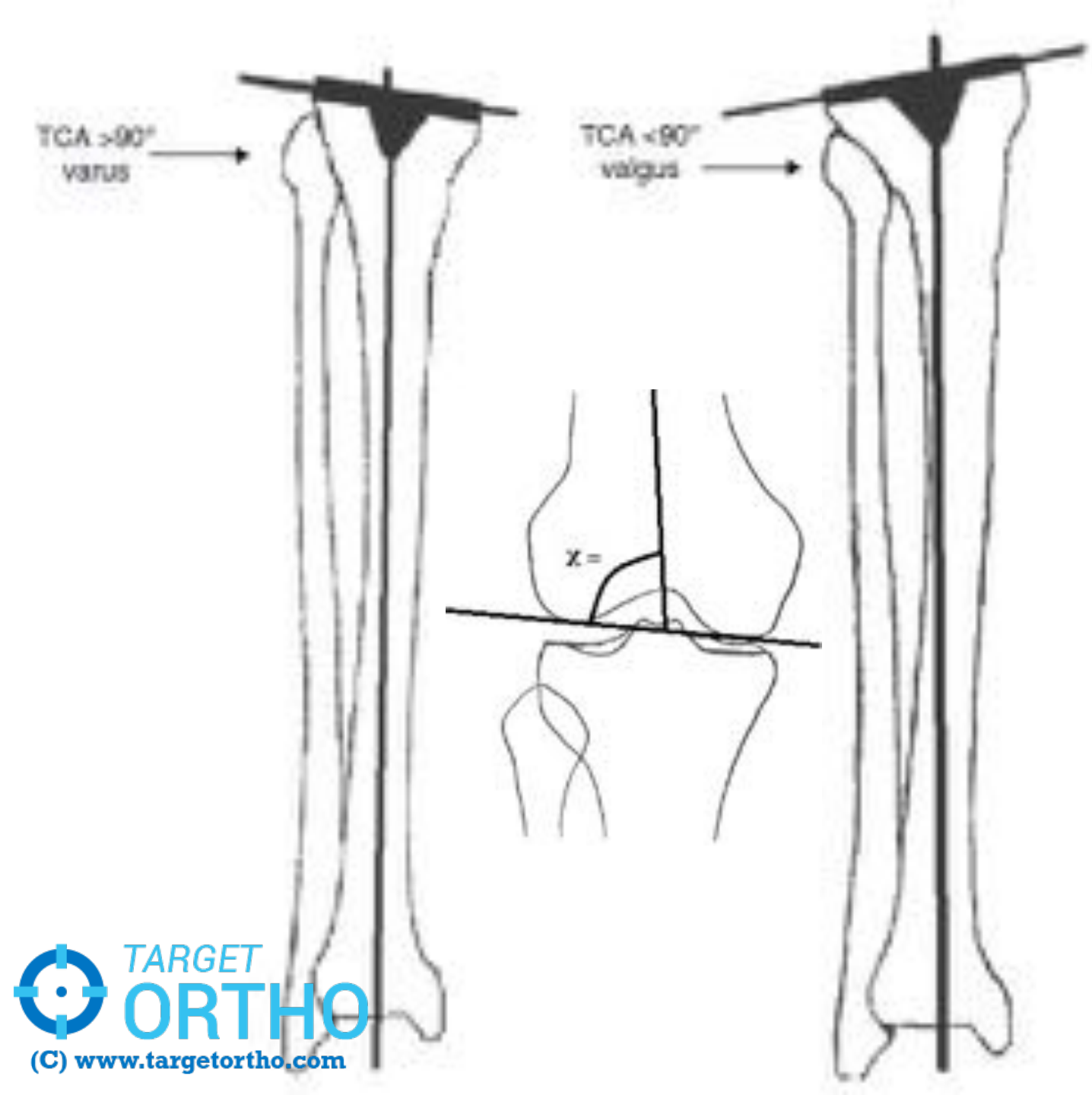
ALIGNMENT AND AXIS!!





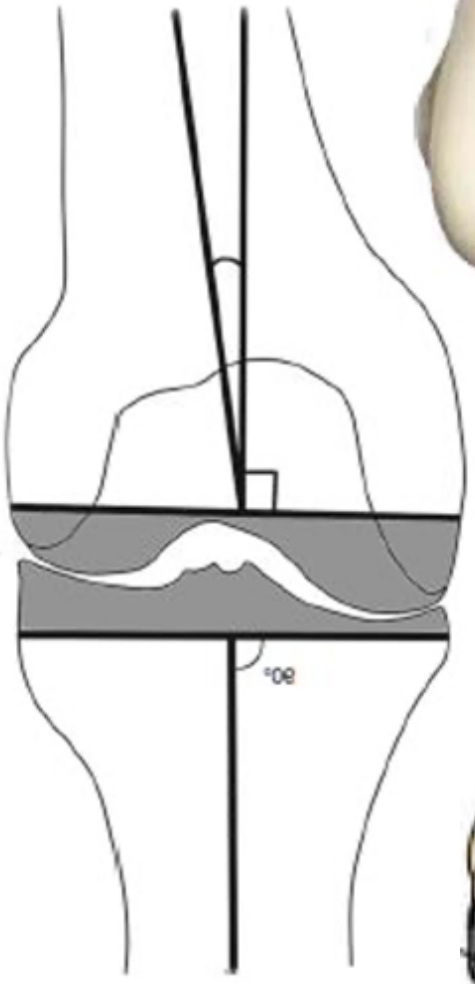
TOTAL KNEE REPLACEMENT

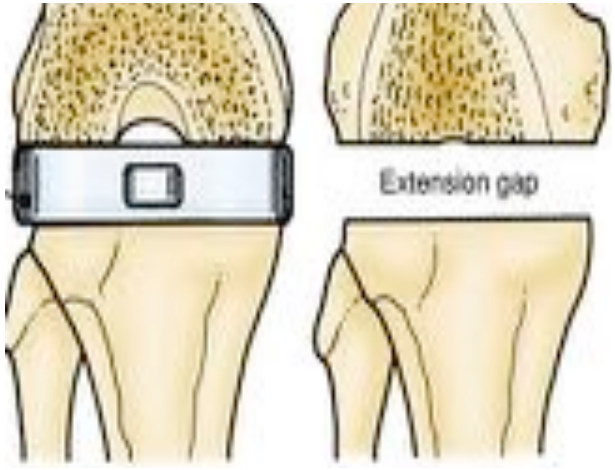
BONE OSTEOTOMY!!



FEMORAL BONE CUTS

TARGET ORTHO



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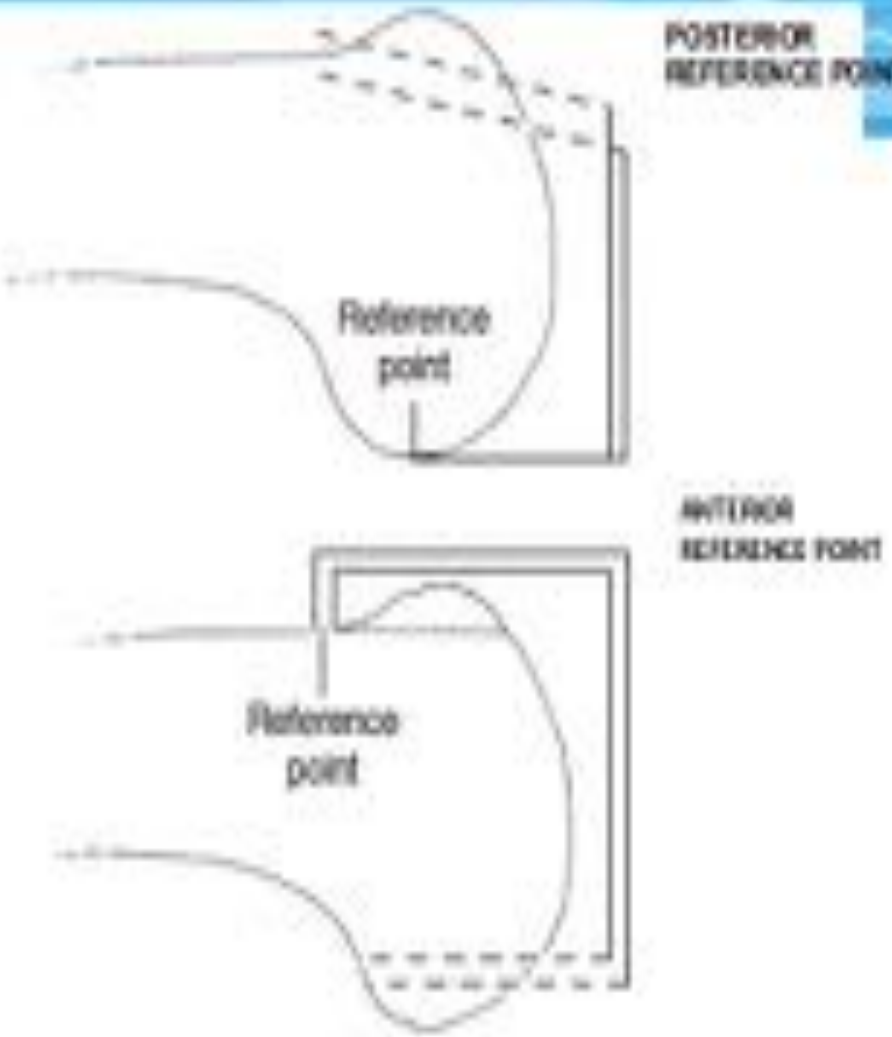
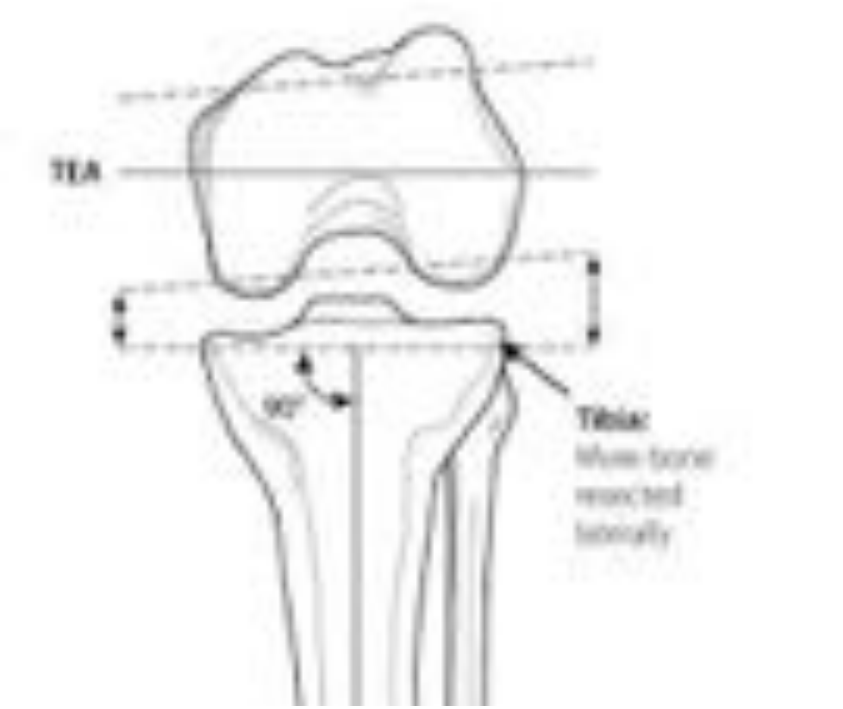
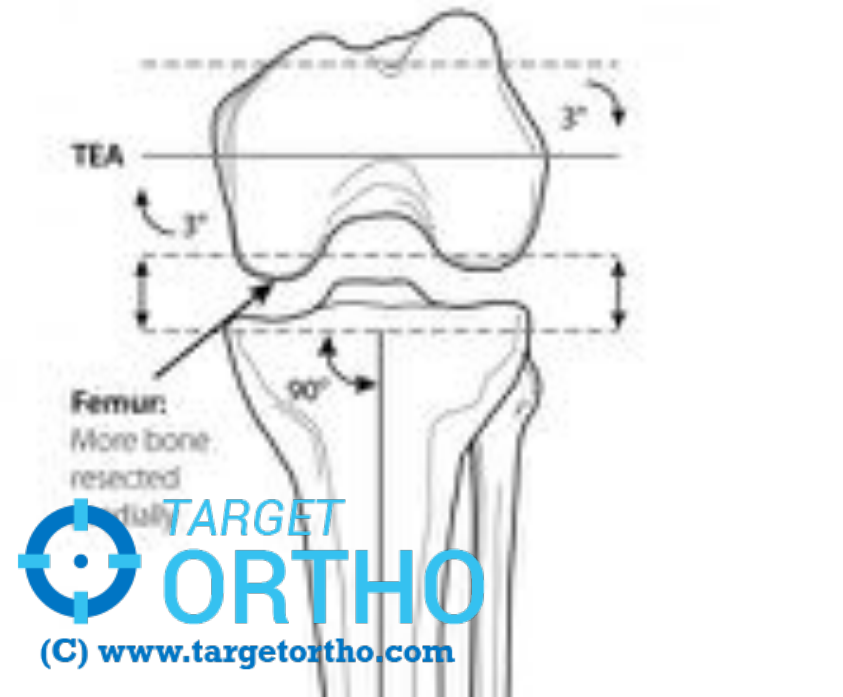
FEMORAL BONE CUTS

TARGET ORTHO

REFERENCE POINT





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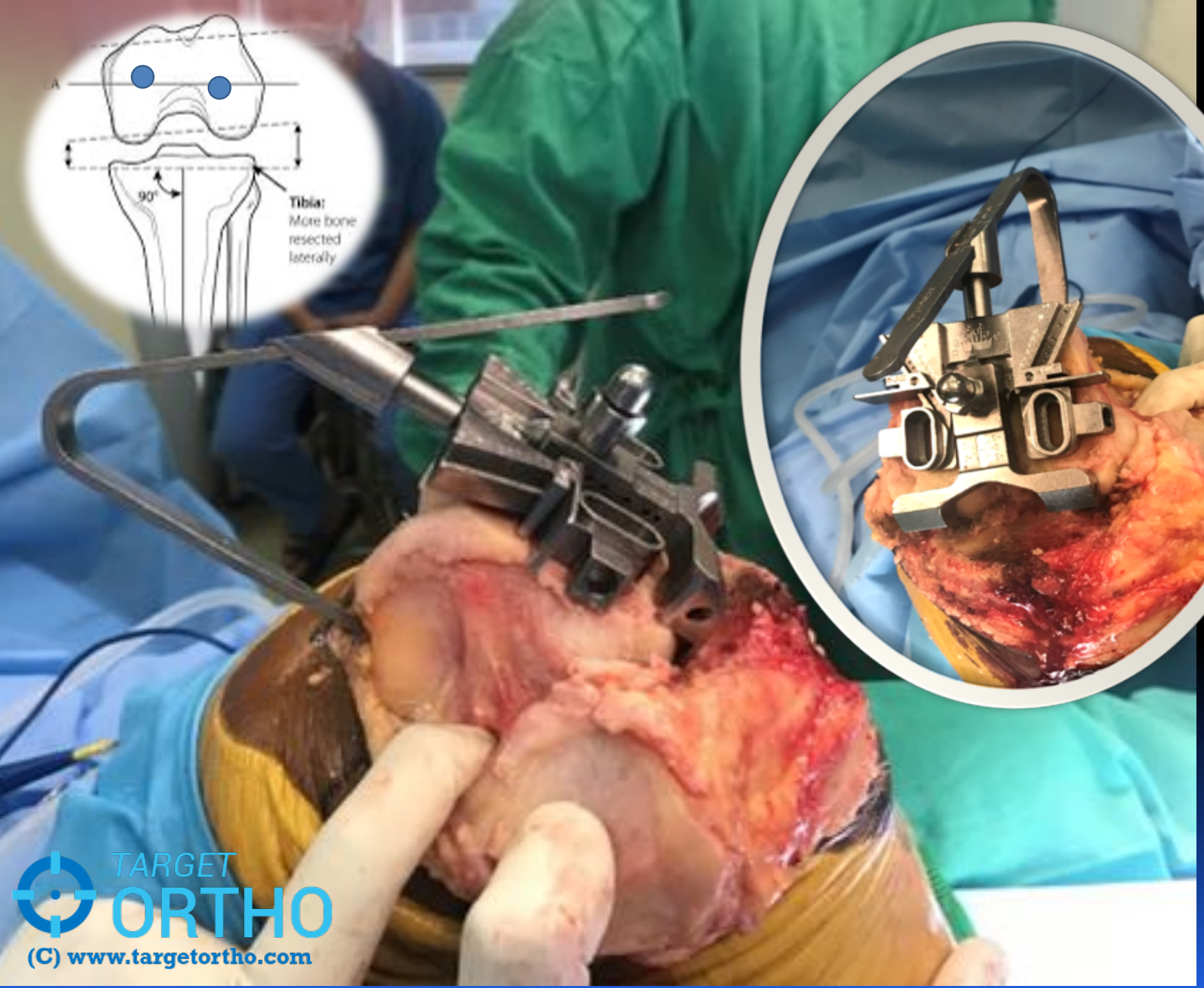

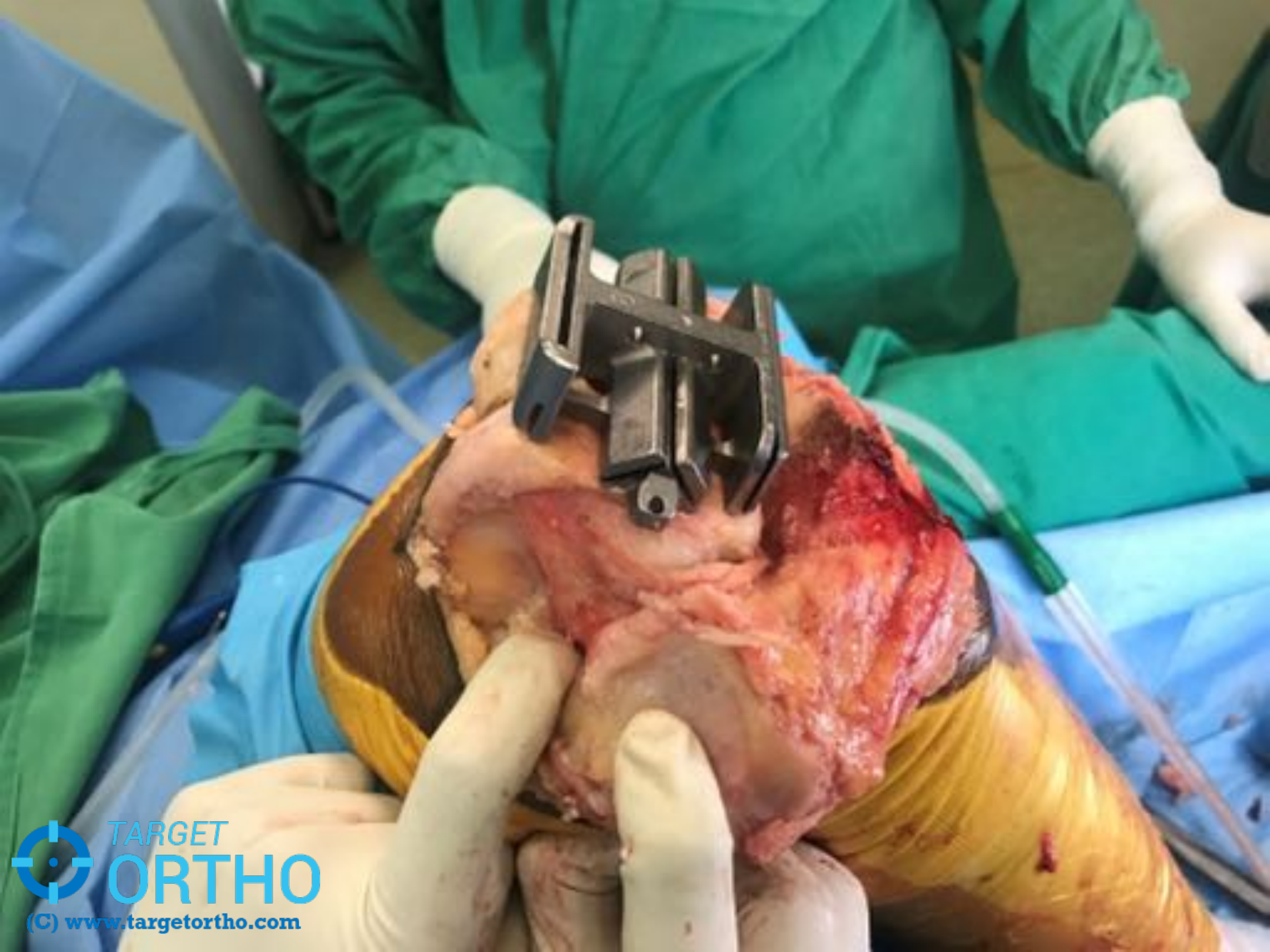
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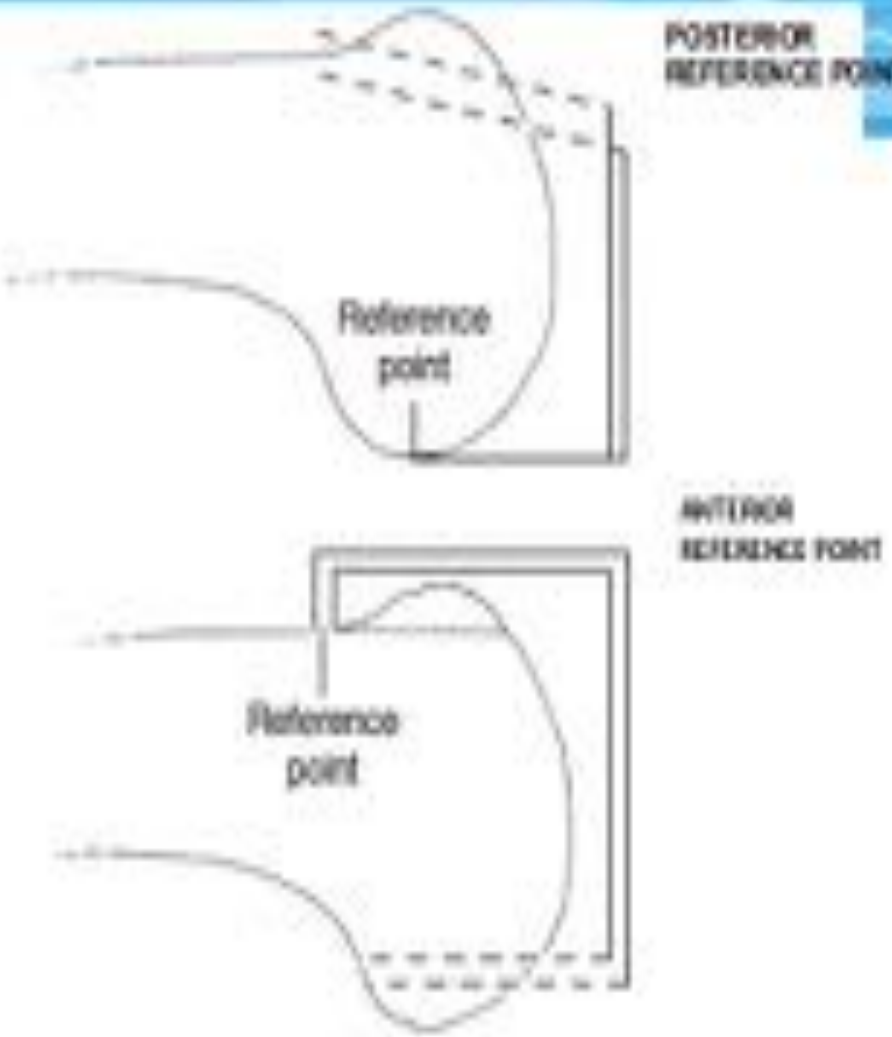

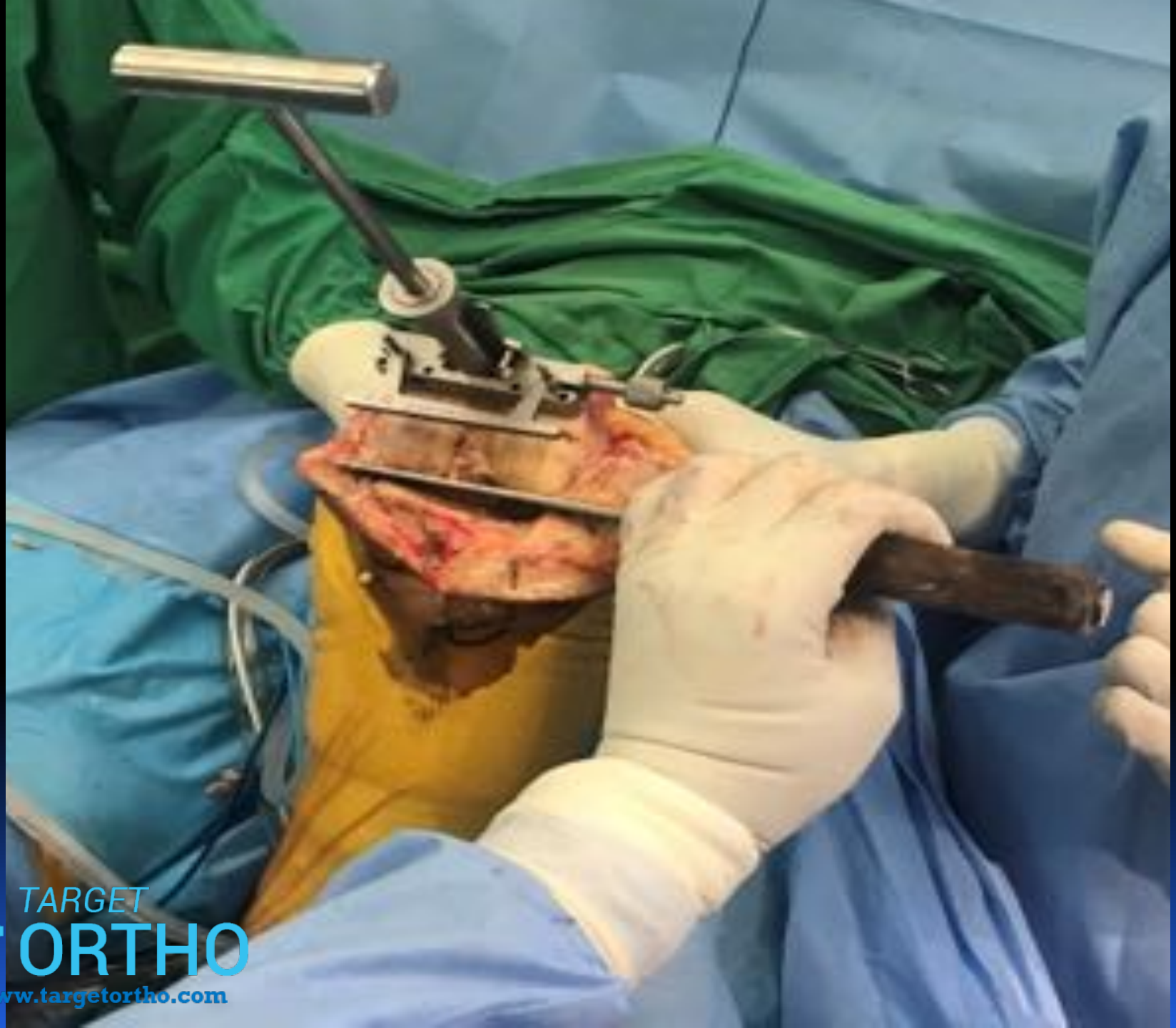

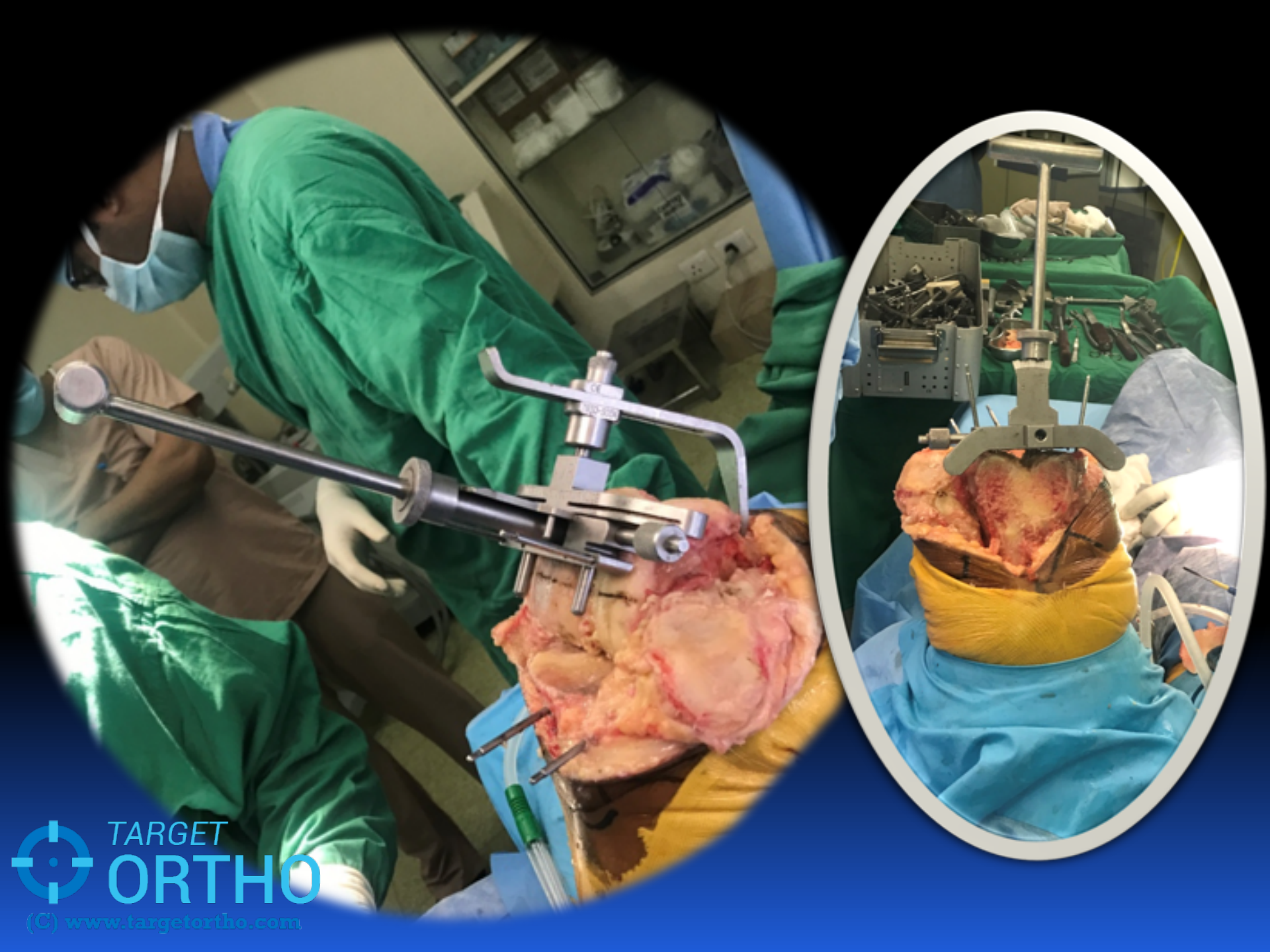

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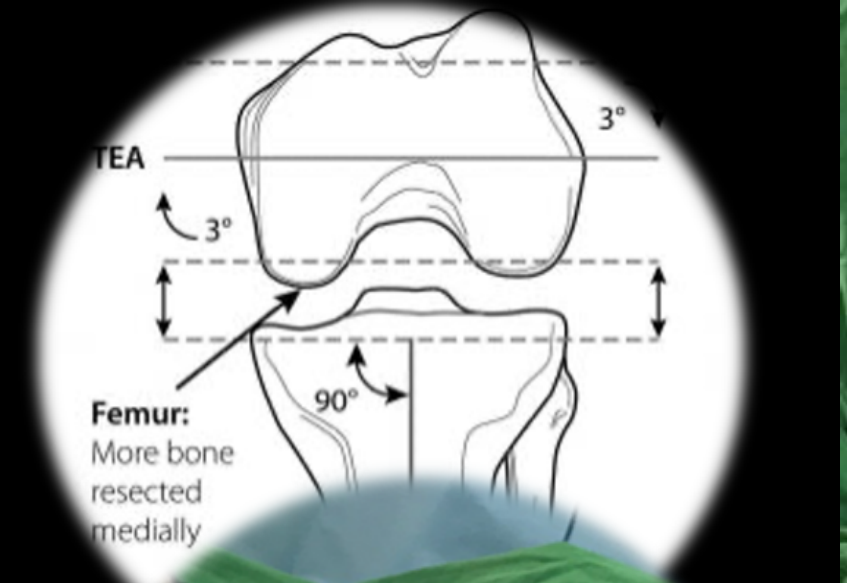
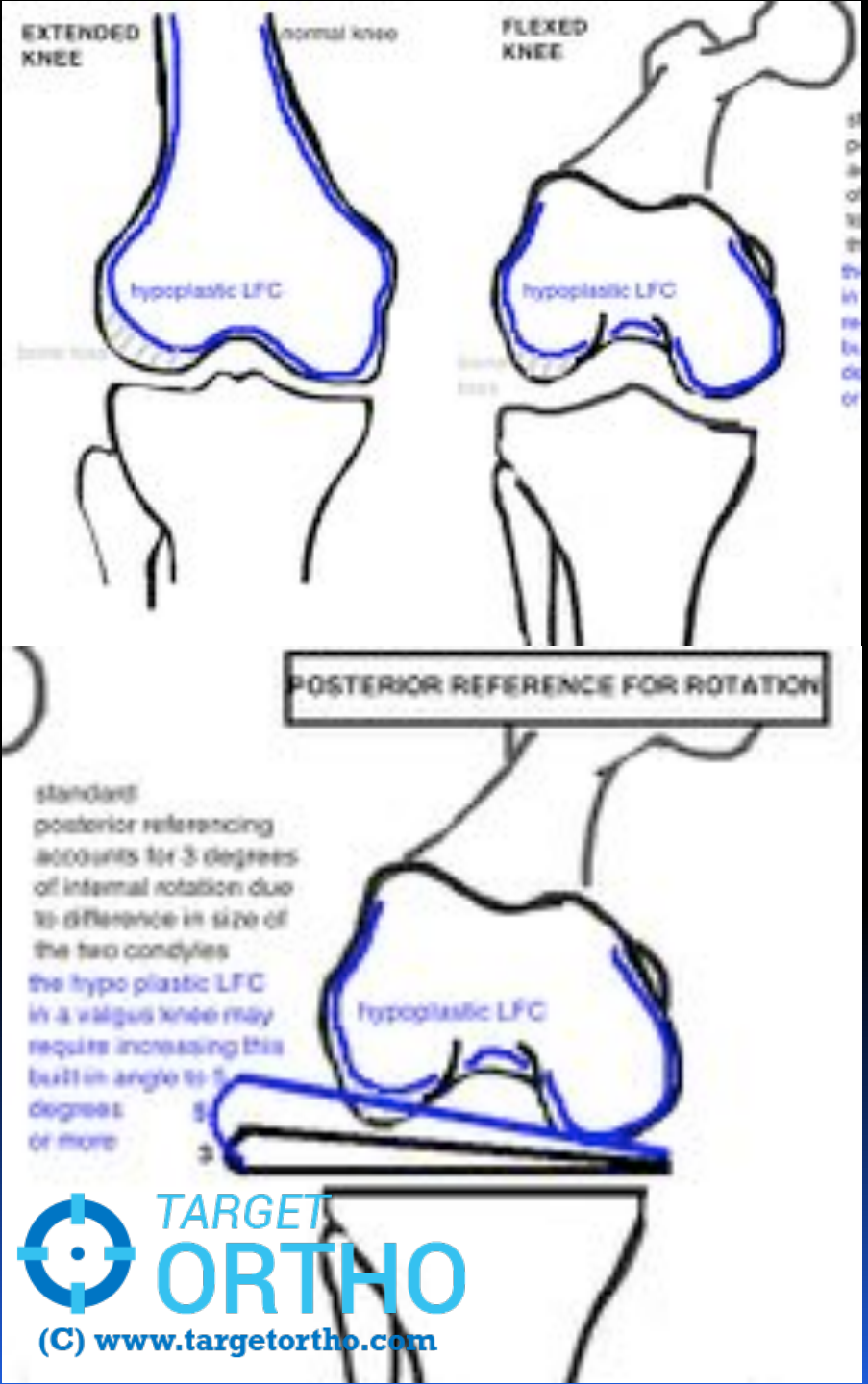
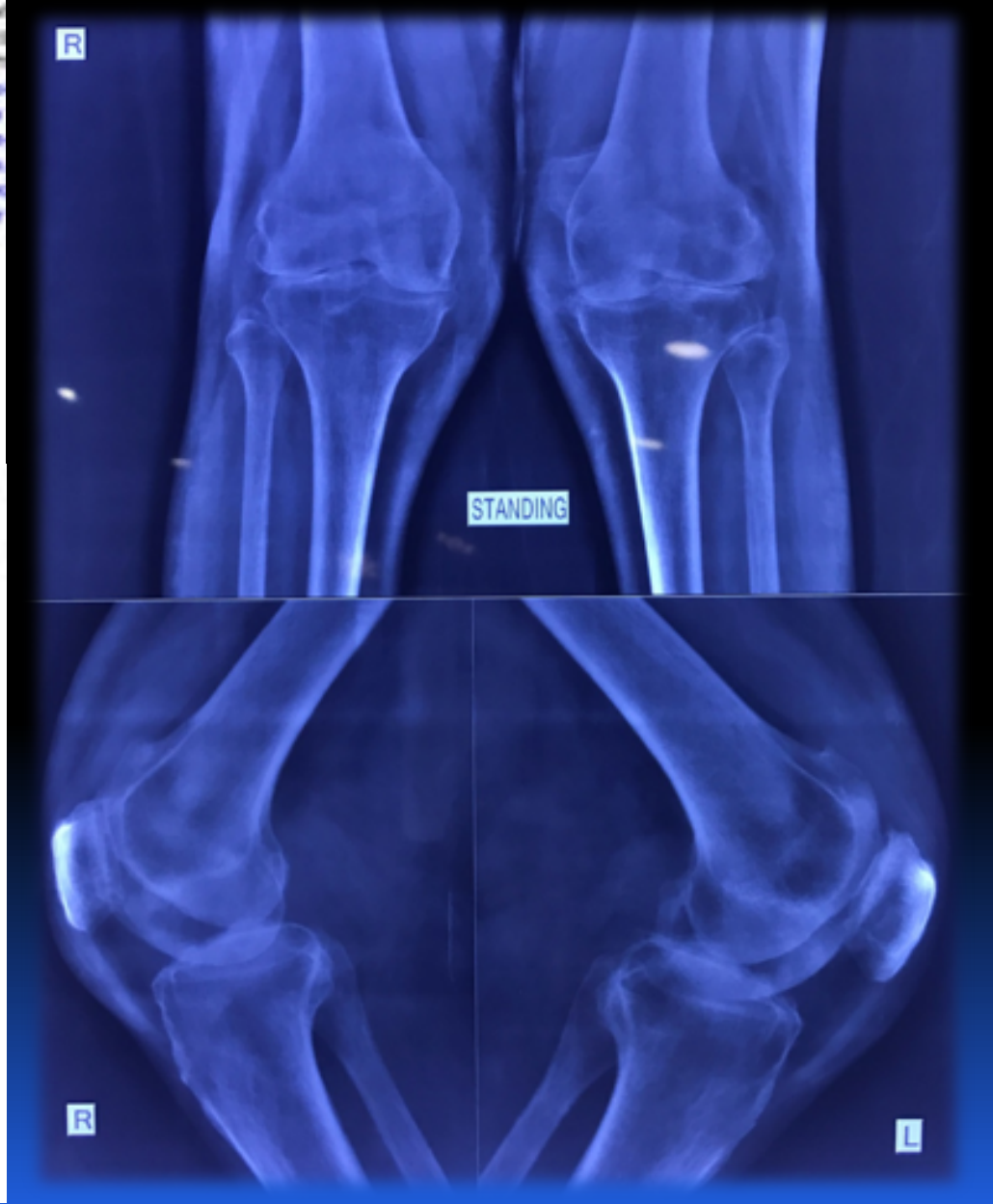




Hypoplastic Lateral Femoral Condyle



BALANCE THE CUTS

LIGAMENT BALANCING

DON'T RESURFACE THE PATELLA

UNTILL ....

Patellar cartilage present is extremely unsatisfactory.

Patient being operated is a case of Inflammatory (e.g. RA) or Crystalline arthropathy (e.g. Gout) *and not O.A.*

TOTAL KNEE REPLACEMENT

SPECIAL SITUATIONS !!

BONE DEFECTS !!

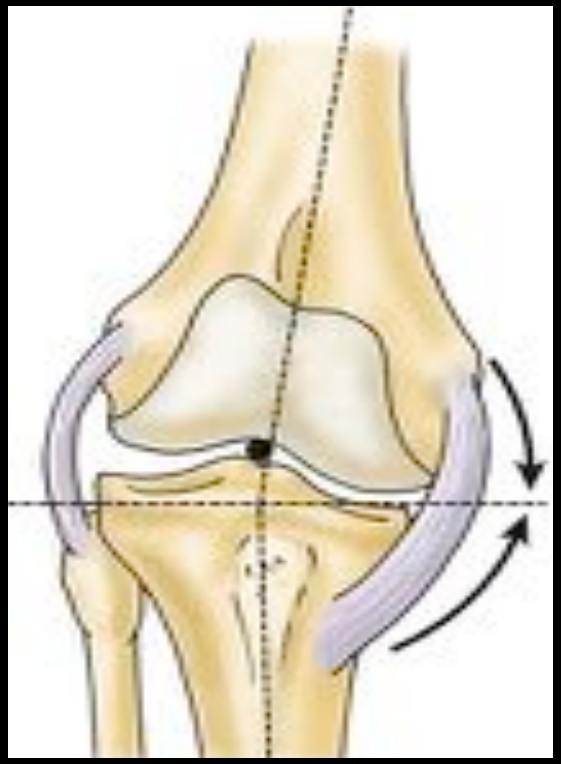
TYPE	DEFINITION	TREATMENT OPTION
TYPE I 	Minor osseous deficiency (< 5mm) , intact cortex, no metaphyseal bone loss and normal joint line	Fill with graft (morselized) or cement; shift component, take up in bone cut
TYPE II 	More extensive deficiency (5-15 mm), Can be uncontained, Some metaphyseal bone loss, Joint line slightly altered	Structural autogenous bone grafts >> Augments
TYPE III 	Uncontained defect, extensive metaphyseal bone loss, altered joint line	Structural allografts, Metaphyseal sleeves and condyle replacing components, Hinged implants

BONE DEFORMITY !!

INTRA ARTICULAR

VS

EXTRA ARTICULAR



VARUS DEFORMITY

MEDIAL RELEASE

Postero medial capsule from tibia

Superficial MCL

Pes anserinus insertions

Strip off periosteum from tibia distally for additional 4-5 cms

Balance in extension is critical!

In patients who have had a severe varus deformity since childhood (e.g. Blount's), only little correction is advisable.

TIPS

TARGET ORTHO

A Femoro-Tibial angle less than 3° (coincident with mechanical axis of less than 0°) is considered varus!

VALGUS DEFORMITY

LATERAL RELEASE

PCL to be always released

IT band at joint line

Strip off LCL and Popliteus from LFC

Strip off Lateral head of Gastrocnemius and postero lateral capsule off the femur

TIPS

- There is often accompanying lateral bone atrophy of defect usually in femur (role of Anterior referencing)
- Often there are accompanying patello femoral problems (dysplasia, patella alta etc) that need to be attended
- High chance of CPN palsy. Exploration controversial !!!
- Some surgeons suggest constrained prosthesis if valgus > 20°

FLEXION DEFORMITY

Up to 10° of flexion contracture is compatible with almost normal life!

FLEXION DEFORMITY

Contracture of posterior capsule or it is stretched and tightened due to posterior osteophytes

Narrow extension gap

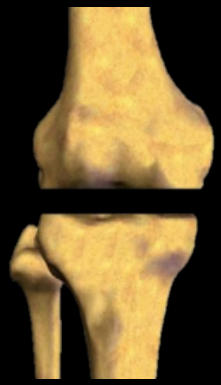
High posterior tibial slope

POSTERIOR RELEASE

Posterior osteophytes

Posterior capsule stripped off a short distance from femoral condyles posteriorly

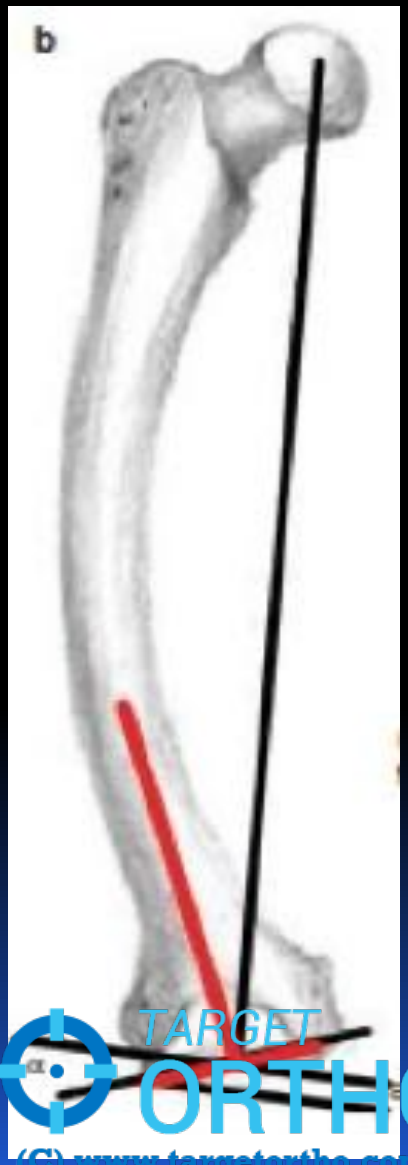
Release tendinous origins of Gastrocnemius muscles



FLEXION DEFORMITY

DEGREE OF DEFORMITY	MANAGEMENT
< 15°	Posterior soft tissue release
15-30°	Take Distal femoral cut + 2 mm *(2 mm cut balances 15° of flexion contracture)*
> 30°	Preferably 2 stage surgery OR Perform single stage surgery with very extensive posterior release and maximize extension gap (> 6mm resection is not allowed as this elevates the joint line inadvertently) *AND* *preferably go with constrained prosthesis*

EXTRA ARTICULAR DEFORMITY



It is impossible to perform intra articular correction if angulation is more than 20° or difference between anatomical and mechanical axis of femur is more than 13°.

ANKYLOSIS !!!

ROM less than 10-95° is labelled Ankylosis

Walking 65°, climbing 95°,
Flexion contracture > 10° causes gait pattern change

T

Very high complication rate

I

Achieving more than 90° flexion difficult

P

Pre requisite is to have good extensor function

Evaluate Extensor mechanism with MRI or USG

S

Plan to Reconstruct if absent

Conversion to arthrodesis EASY even if TKR fails

TARGET
ORTHO