# Total Knee Arthroplasty With Extra Articular Deformity

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# Disclosures

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Bone Joint Journal, CORR, BJO,
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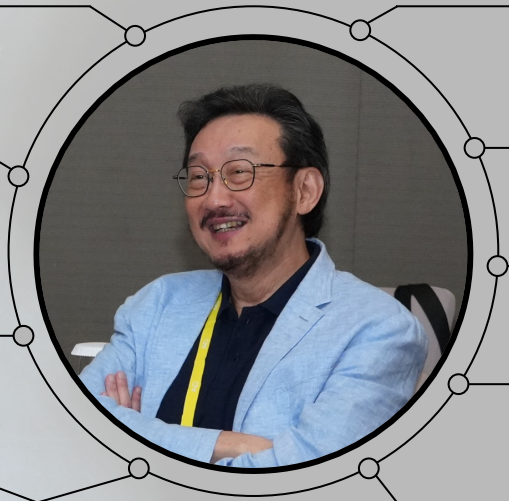
KSSTA, JISAKOS



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**President | 2019 - 2022**
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**President | 2020 - 2022**
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# Challenges of Extra Articular Deformity in TKA

- **A deformity is considered as extra-articular when it is located proximal to the femoral epicondyles or distal to the fibular neck**
- **Clinically significant deviation if :**
  - Coronal > 5° and sagittal > 10°
- Confront with challenges of bone resection and soft tissue balancing
  - **Improper bone cut for intra-articular correction ➡ imbalance soft tissue gap**

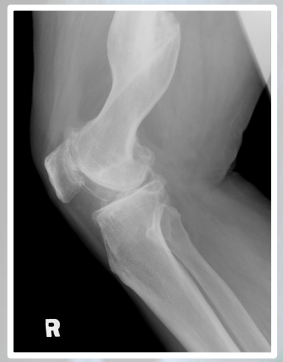
# Extra Articular Deformity :
## The Questions ?

**Can we correct the extra-articular deformity in the joint ?**

**Doing so may correct alignment, but there will be an effect on soft tissue balance**

**When is an osteotomy appropriate ?**

**When can we do it as part of the joint replacement and when should we do a 2-stage procedure ?**




# Pre-Operative Planning
# Radiographic Evaluation

**Long Leg Views**

>50% of EAD of the tibia are **not detected** on short films of the knee

Intra or extra articular deformity

CT scan if suspicion of bone loss

*Alghamdi et al, J Arthrop 2014*


# Which Technique to Choose?

***How would you manage the deformities ?***

- Is it only a ligament problem ?
- Is it only a bone defect problem ?
- Is it a combined problem ?

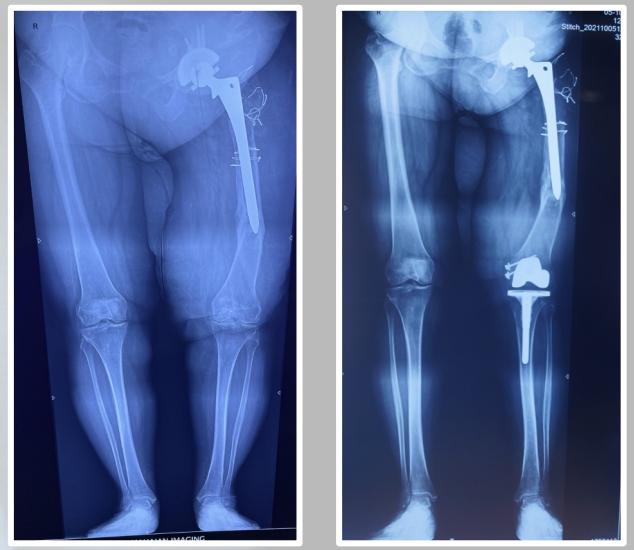
**TKA with extra-articular osteotomy**

- **One-stage**
- **Two-stage**

# Intra Articular Correction

**Indications** for **intra-articular correction** :

- Extra-articular deformity is far from the joint
- Bony cuts do not interfere with ligamentous attachments



*Courtesy of Rajeev Sharma*

# Tips & Trick
# in Intra Articular Correction

**If the proposed femoral bone resection passes distal to the insertions of the collateral ligaments** (on average 25 mm proximal to the joint line), an intra-articular correction **is feasible**

**If the perpendicular line passes through the top of the tibial plateau,** correction with primary arthroplasty **is feasible** *(Wang et al)*

# Pre-Operative Planning for TKA: **Sagittal Plane**

**Intra-articular correction with TKA is :**

- Procurvatum deformity is < 10°
- Recurvatum deformity is < 20°

**Guidelines :**

- **Sagittal deformity > 20° ➜** an **osteotomy** should be performed before TKA

*Ashok Rajgopal*

# One-Stage TKA + Osteotomy

## Advantages

- Single surgical session
- Easier ligament and soft-tissue balance management
- Reduce cost

## Drawbacks

- The coronal deformity is corrected in extension but not in flexion
- Technically demanding
- Higher surgical risk: blood loss, thromboembolism, infection

# **Tibial Rotational** Alignment

Knee Surgery, Sports Traumatology, Arthroscopy
https://doi.org/10.1007/s00167-020-05914-9

KNEE

## Mismatched knee implants in Indonesian and Dutch patients: a need for increasing the size

Nicolaas C. Budhiparama[1,2,3] · Imelda Lumban-Gaol[1] · Nadia Nastassia Ifran[1] · Pieter C. J. de Groot[3] · Dwikora Novembri Utomo[2] · Rob G. H. H. Nelissen[3]

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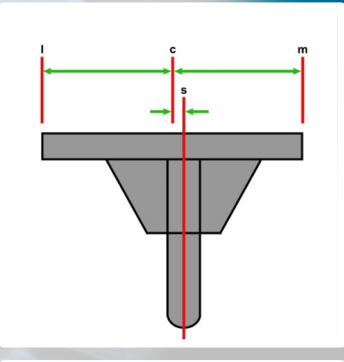
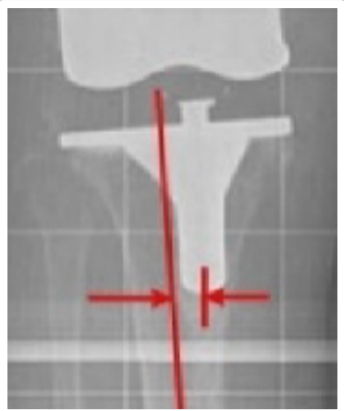
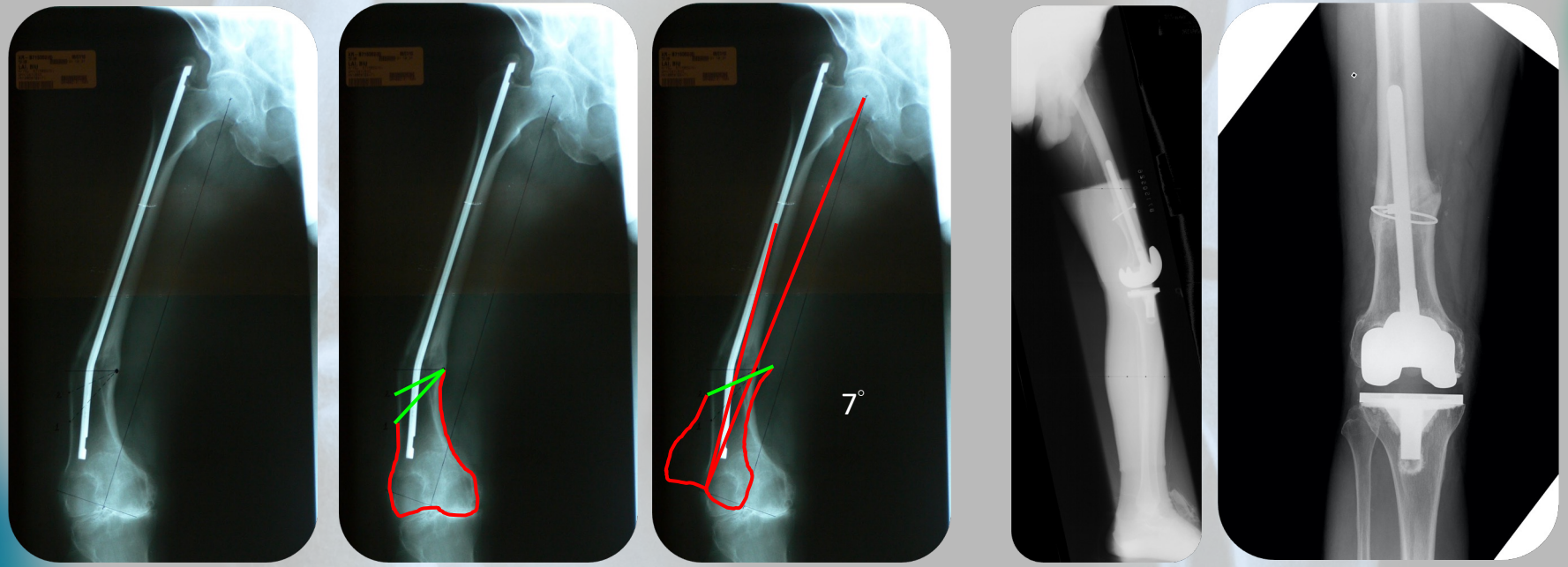
In Asian knees, the **tibial anatomic axis does not pass the same point of plateau** as the Western Caucasian knees

For Caucasian, **medially offset stem is more suitable** while in **Asian, more anterolateral**

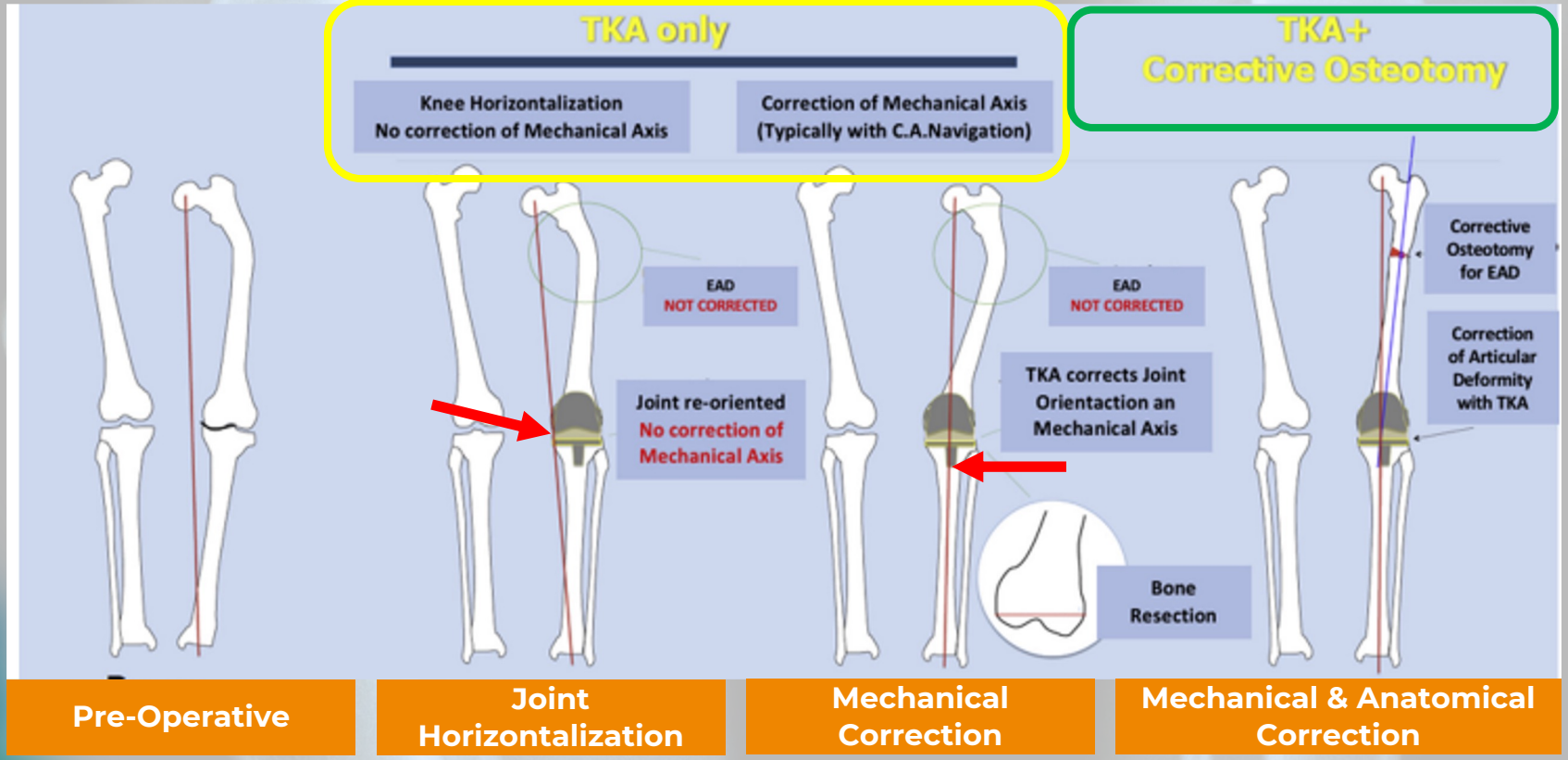


# One-Stage TKA + Osteotomy



# One-Stage TKA + Osteotomy




*de Pablos Fernández et al., Arthrosc Tech, 2019*

# Two-Stage TKA + Osteotomy

Osteotomy correction → Bone healing → **TKA**

## Greater surgical flexibility

Achieve not only overall alignment, but also anatomical axes

More favorable in younger patients

Sometime osteotomy alone reduce the pain and improve kinematic → delaying TKA

*Sculco et al, JAAOS, 2019*
*Seah et al, CORR, 2011*

# Two-Stage TKA + Osteotomy

**Staged osteotomy** **followed by arthroplasty**

is beneficial in :

- Severe cases in which bony cuts would interfere with soft-tissue structures
- In cases with leg-length discrepancy

**Severe Extra Articular Deformity**

# Tips & Trick

## Femoral-sided deformities !! :

**Less well tolerated than tibial deformities in the coronal plane**

A corrective cut of distal femur changes the balance of the knee only in extension

A corrective cut on the tibial side changes the balance of the knee **equally in flexion and extension**

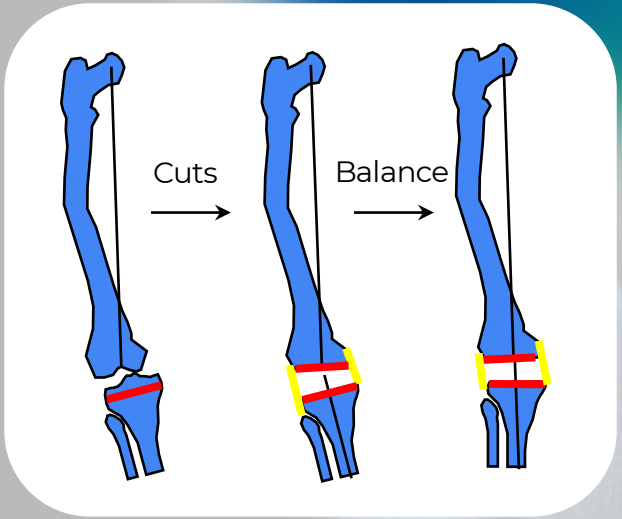
# Femoral Side

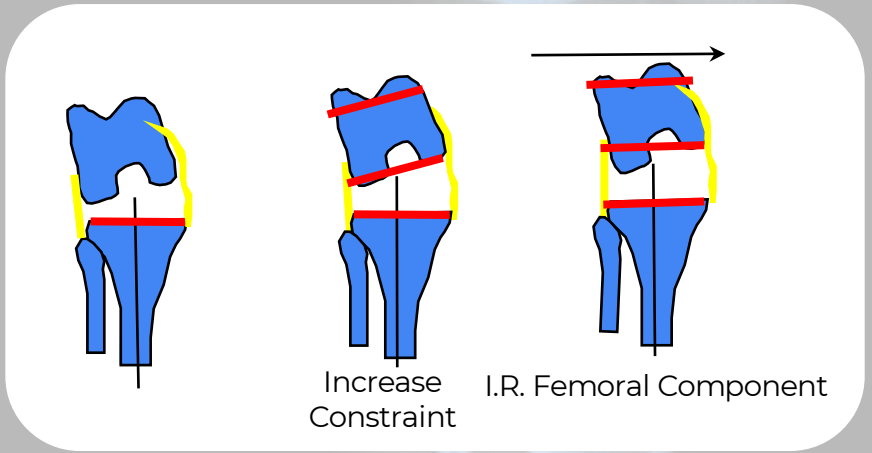
**Balanced in extension**

**Unbalanced in flexion**

**Options**

- More constraint
- Cheat by rotation of femoral component
- Beware there is a limit



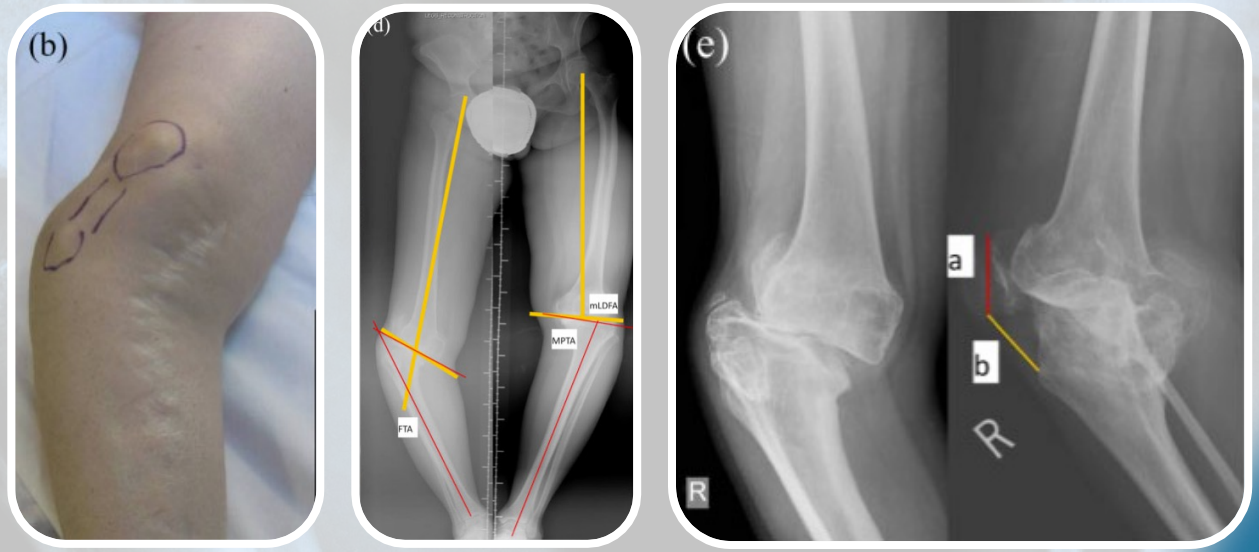
# Pre-Operative Planning

*Journal of Orthopaedic Surgery*
26(1) 1–8

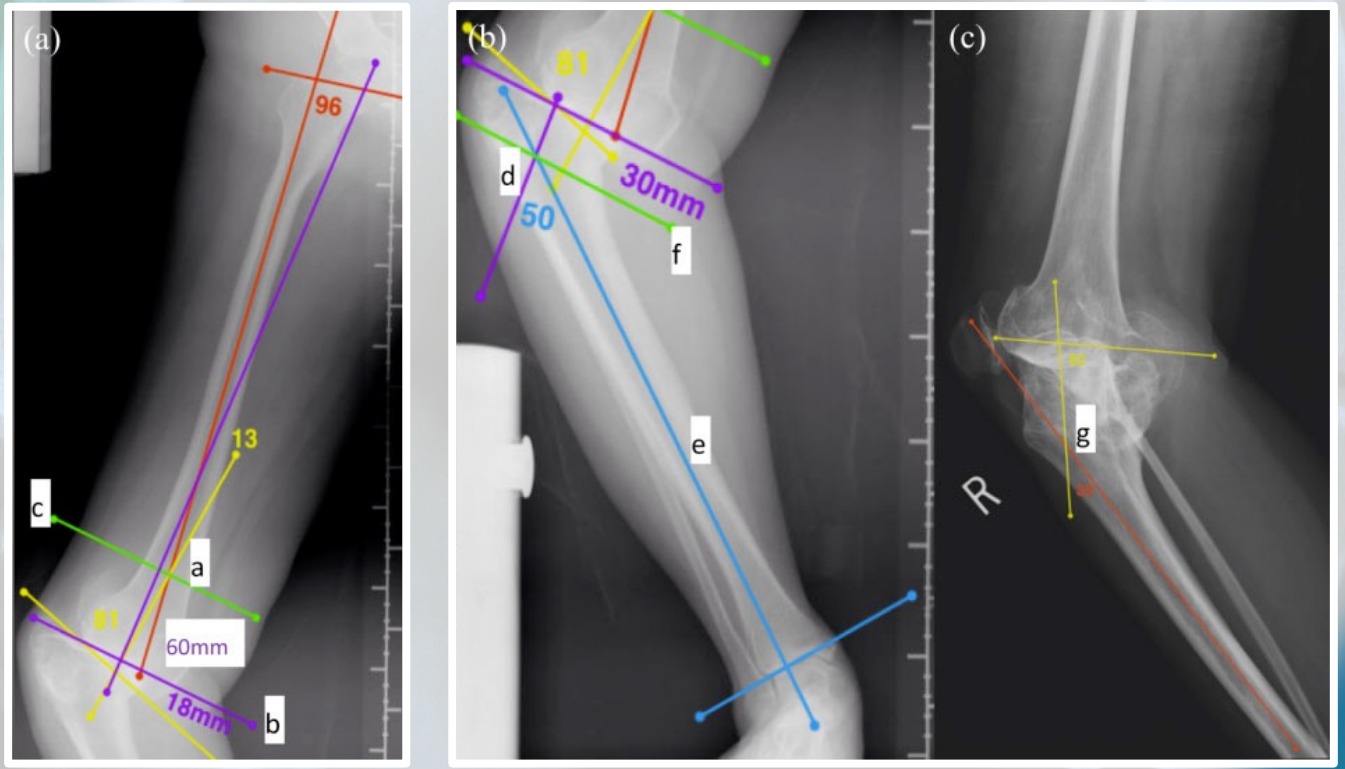
DOI: 10.1177/2309499017718911
journals.sagepub.com/home/osj
SAGE

## Total knee arthroplasty in a knee with triple deformity of femur–tibia–extensor mechanism

Jason CH Fan[1], KB Kwok[1] and YW Hung[1]

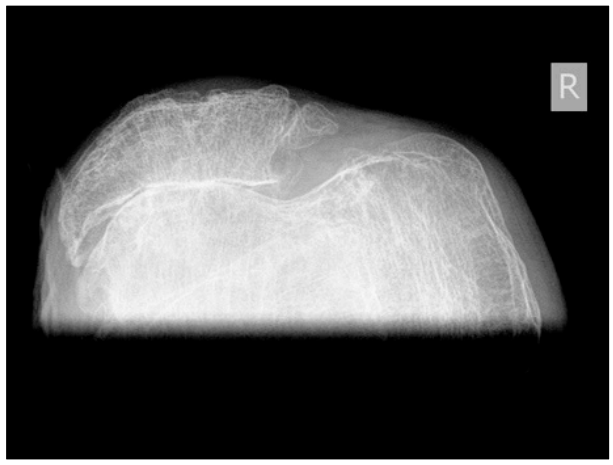


# Pre-Operative Planning




*Fan et al., J Orhtop Surg, 2017*

# Extra Articular Deformity
# **Femoral Osteotomy**


# Extra Articular Deformity
# Femoral Osteotomy

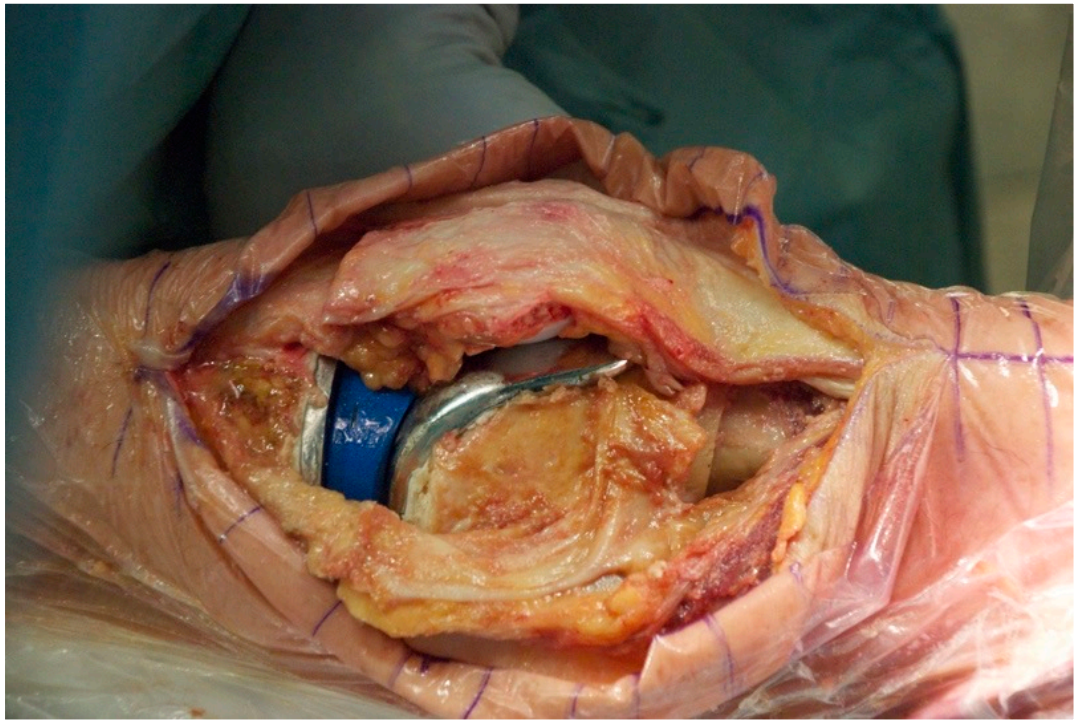
**PLAN**

**This operation is done before you get to the operating theatre!**

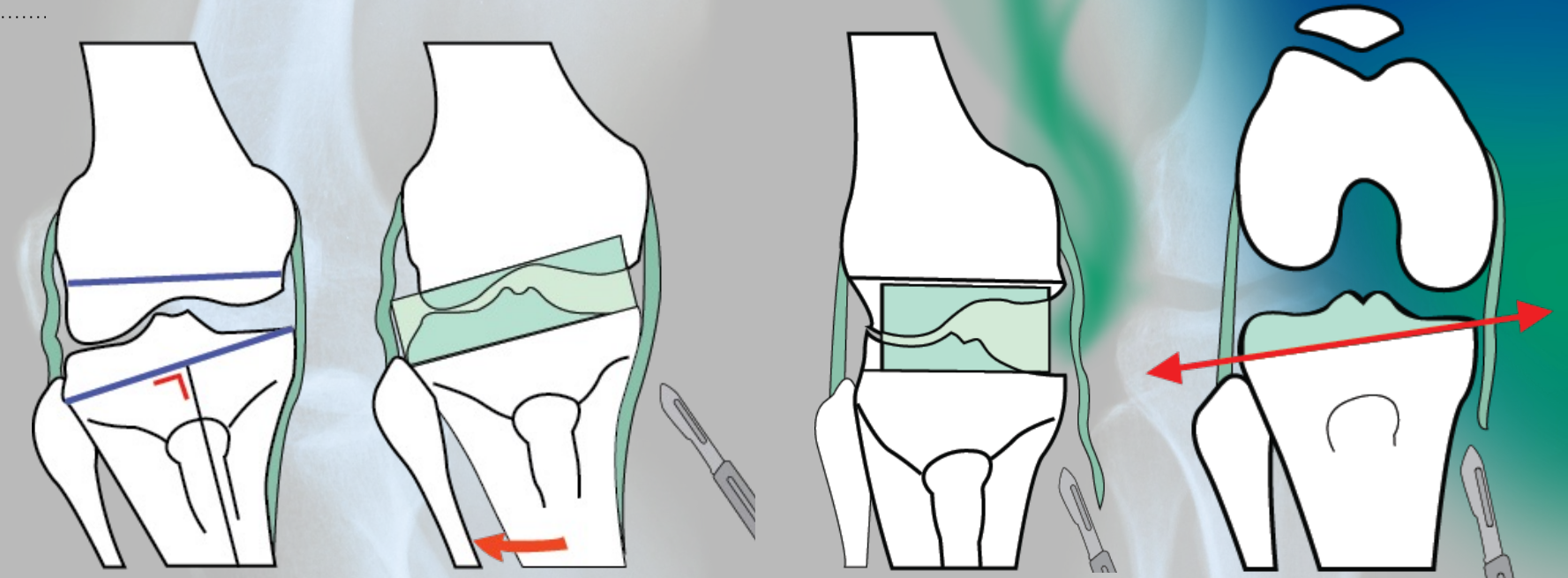
**Where ?**

At the site of deformity, if feasible

# Extra Articular Deformity
# **Femoral Osteotomy**



# Femoral Malunion
# **Varus Deformity**



Extension GAP

Asymmetrical

Release

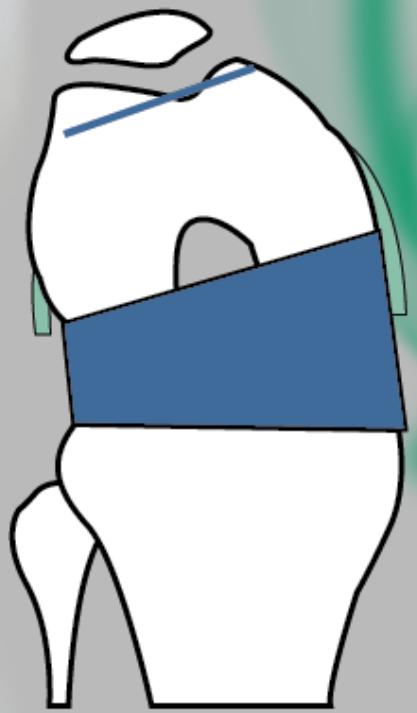
Mismatch
flexion / extension

# Femoral Malunion
# **Varus Deformity**

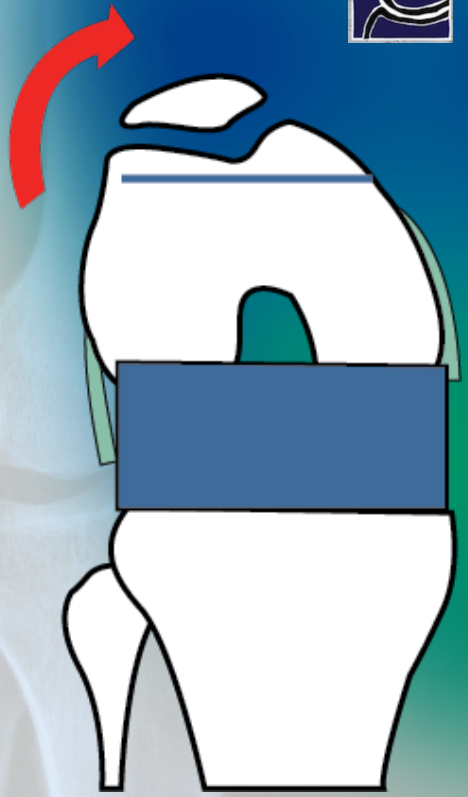
In–order-to compensate the asymmetrical distal femoral cut:

- Either accept a medial laxity in flexion
- Or internally rotate the femoral component

*Courtesy of Sebastien Lustig*



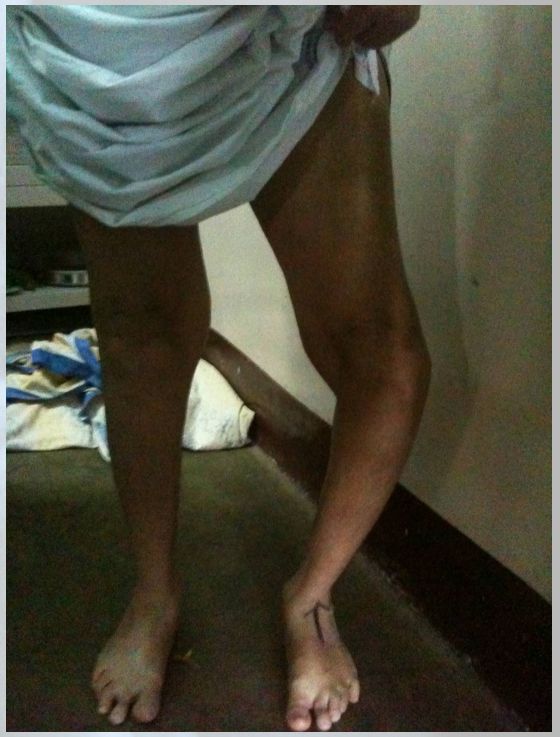
More constrained prosthesis



Internal femoral torsion

# CASE

## Extra Articular Deformity Proximal Tibia



# CASE

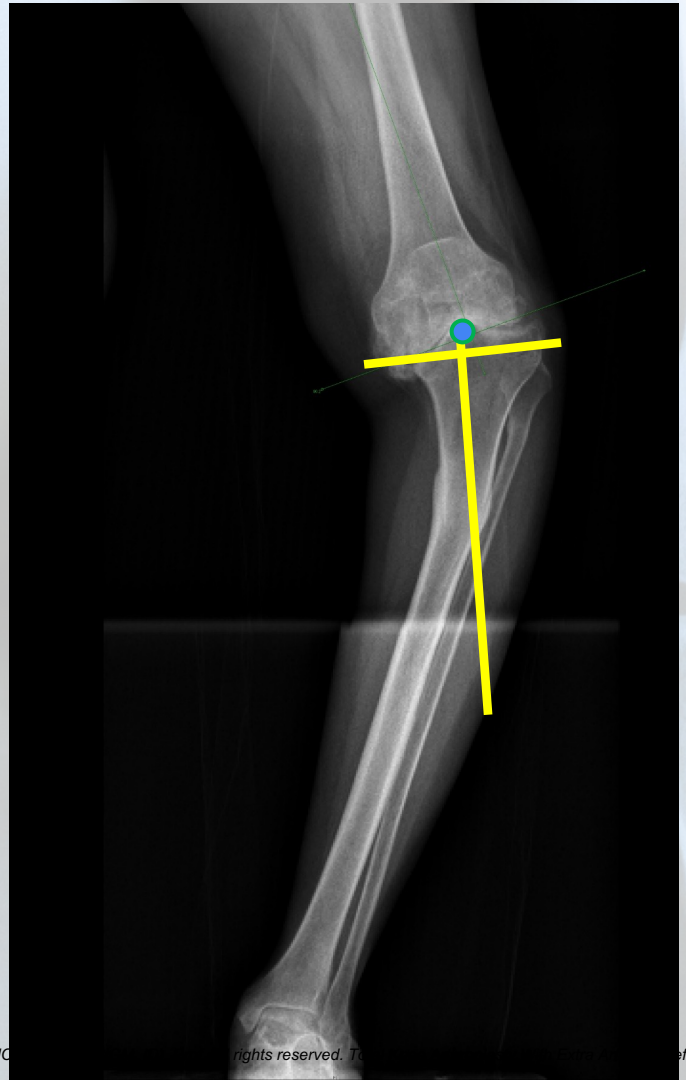
# Extra Articular Deformity Proximal Tibia

Extramedullary alignment

With extra-articular correction

# CASE

## Extra Articular Deformity Proximal Tibia



Intramedullary alignment

With extra-articular correction

# Extra Articular Deformity
## Proximal Tibia


4 years post op

# Which Techniques to Choose ?

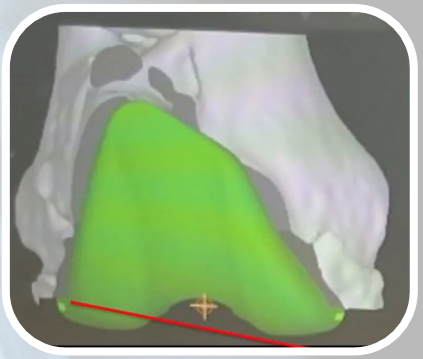
## How do you manage the bone cuts ?

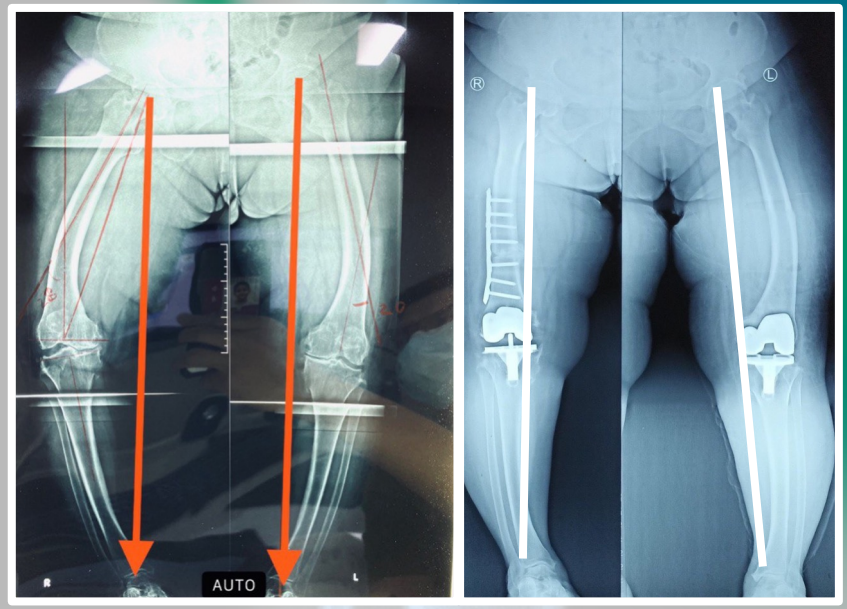
- Should the surgeon use patient-specific instruments ?
- Should the surgeon use navigation / robotics ?
- When & Where is an osteotomy appropriate ?

- **Conventional**
- **Navigation / Robotics**
- **Custom prosthesis**

# Why Use
# A Robotics / Computer ?

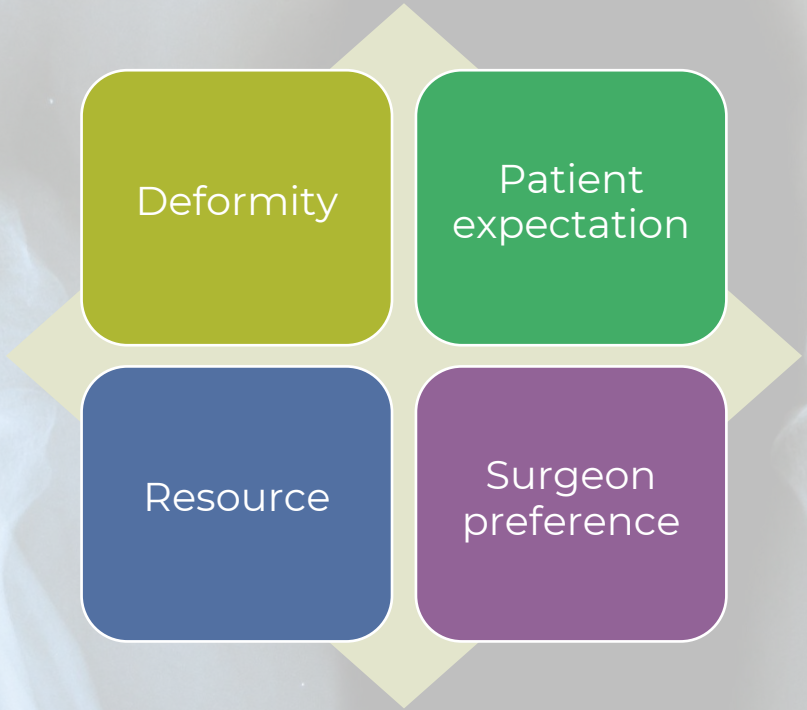
- Accurate evaluation of sagittal and coronal plane deformities
- Real time evaluation of soft tissue tension
- Avoids IM rod in severe deformities





# So, Which Techniques is The Best?

## The decision to perform TKA in EAD should be based on:



# Take Home Messages

- Pre-operative planning is critical in treatment of these difficult knees and should be performed by experienced arthroplasty surgeon
- A wide range of implants should be available
- Robotic / CAS is a useful adjunct but not needed in every case
- Intra-operative correction suffices in the majority of cases
- Outcomes are sustained over time if the planning and execution are done well


# Thank you for your attention

AAHKS AMERICAN ASSOCIATION OF HIP AND KNEE SURGEONS
APA ASIA PACIFIC ARTHROPLASTY SOCIETY
ASEAN Arthroplasty Association 2007
AAOS AMERICAN ACADEMY OF ORTHOPAEDIC SURGEONS
Asia Pacific Orthopaedic Association 1962
EFORT
Arthroplasty Society in Asia
ICJR
European Knee Society
Indonesian Hip and Knee Society 2001