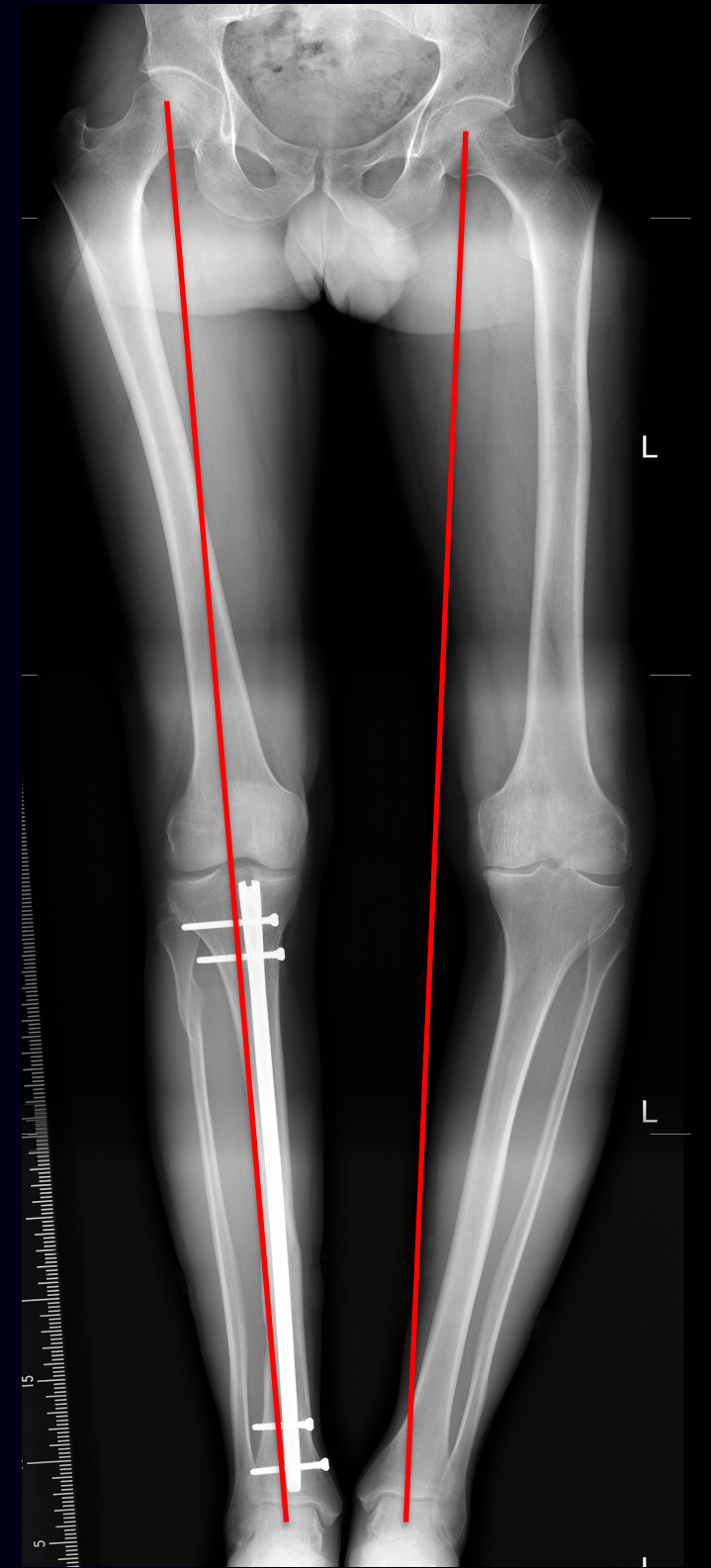


# 10<sup>th</sup> Advanced Course on Knee Surgery

## The varus knee

Sam Oussedik

Consultant Orthopaedic Surgeon,  
Head of Dept, UCLH, London, UK



# “Normal” alignment

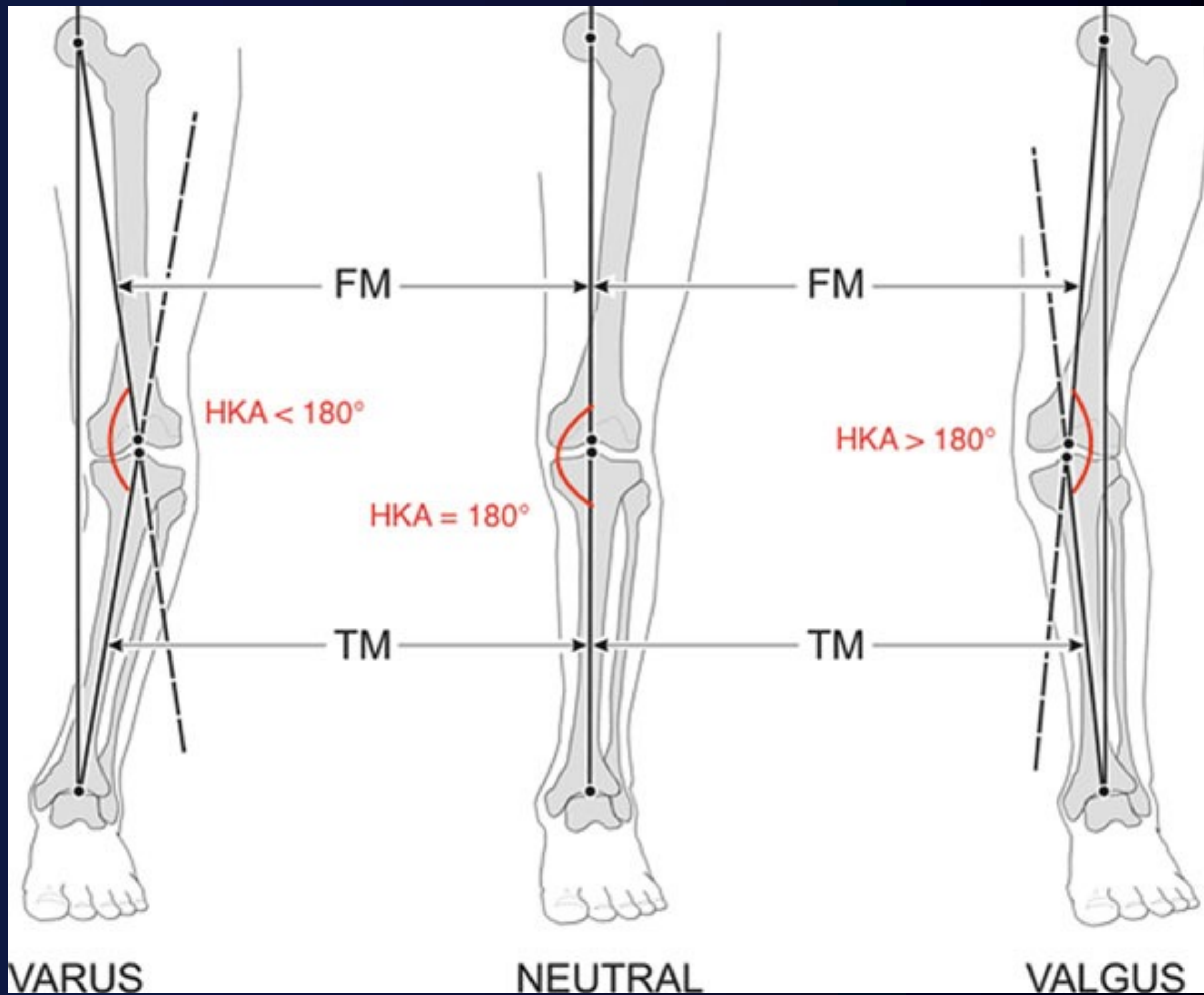
## **The Chitranjan Ranawat Award**

**Is Neutral Mechanical Alignment Normal for All Patients?**

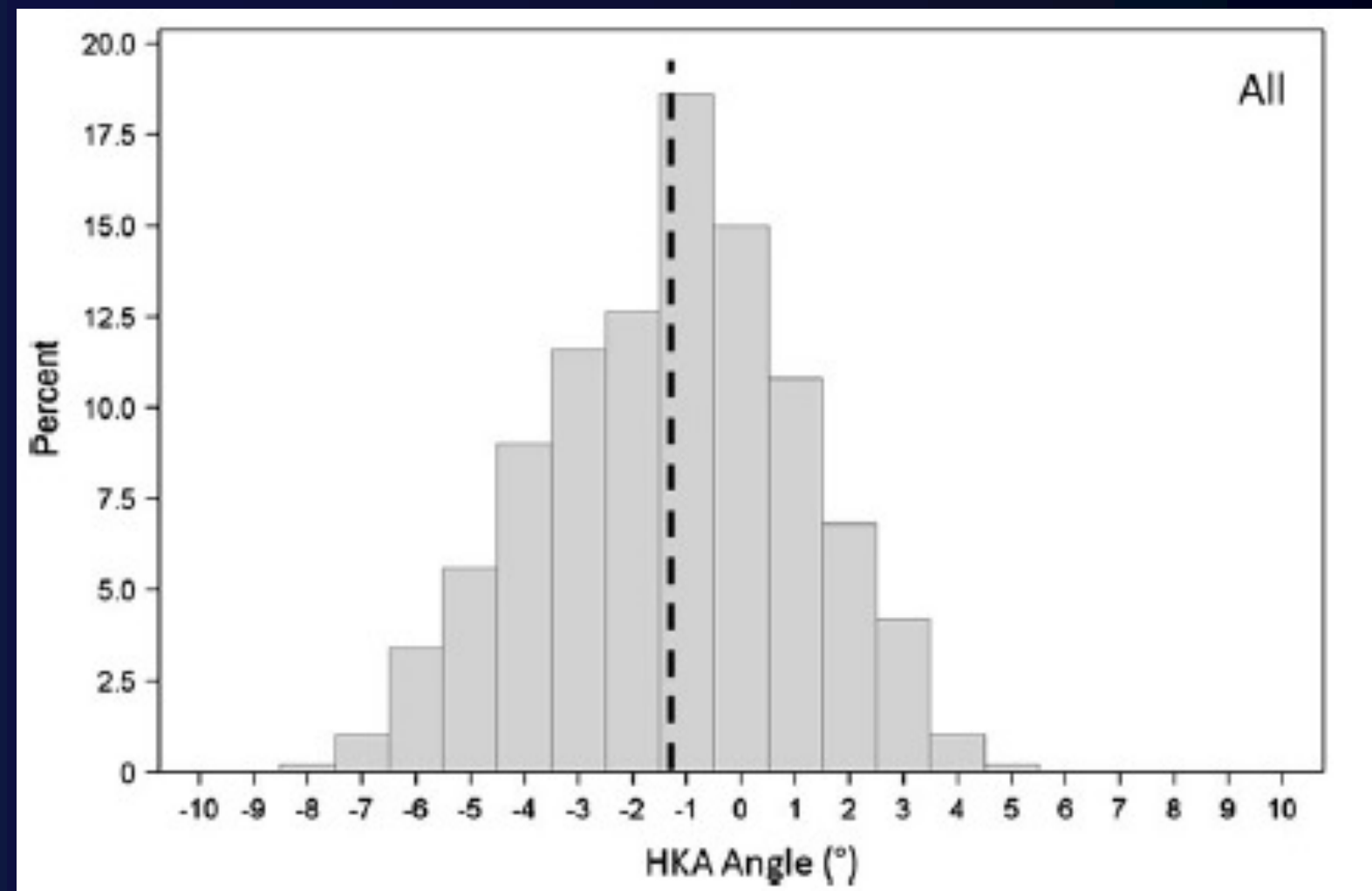
**The Concept of Constitutional Varus**

**Johan Bellemans MD, PhD, William Colyn MD,  
Hilde Vandenneucker MD, Jan Victor MD, PhD**

**Clin Orthop Relat Res (2012) 470:45–53**



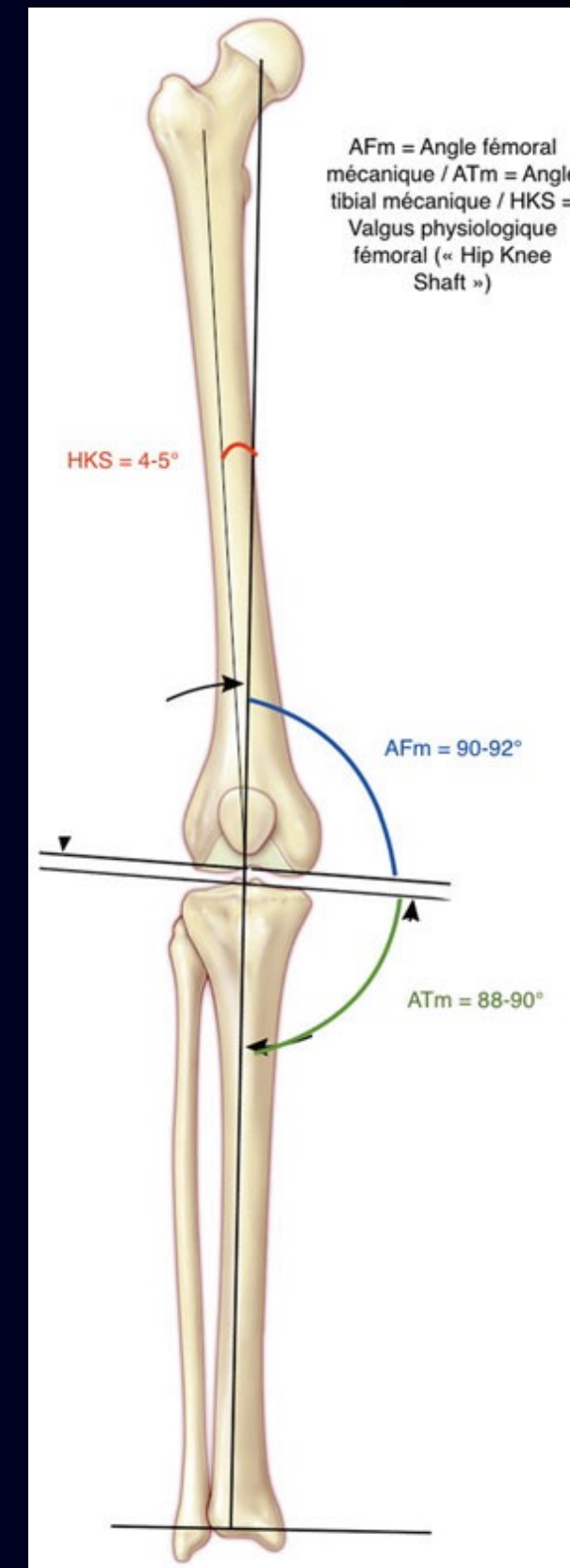
# Native alignment



**Fig. 2** A histogram for HKA angle depicts the distribution and mean (1.3° varus; dotted line) of all 500 knees. HKA = hip-knee-ankle.

# Native alignment

- Mechanical neutrality achieved through:
  - Valgus distal femoral angle (0-3deg)
  - Varus proximal tibial angle (0-3deg)
  - Mechanically neutral, oblique joint line



# Native alignment



## ■ KNEE

### Coronal Plane Alignment of the Knee (CPAK) classification

A NEW SYSTEM FOR DESCRIBING KNEE PHENOTYPES

VOL. 103-B, No. 2, FEBRUARY 2021

**S. J. MacDessi,  
W. Griffiths-Jones,  
I. A. Harris,  
J. Bellemans,  
D. B. Chen**

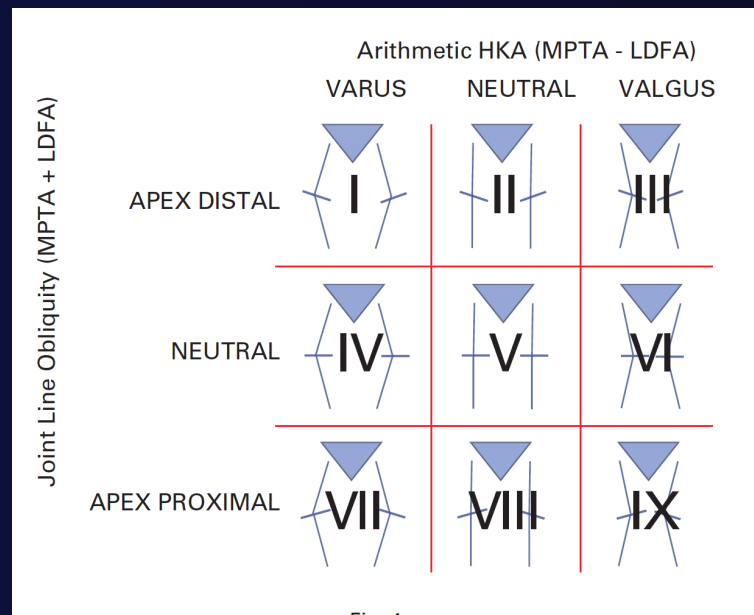
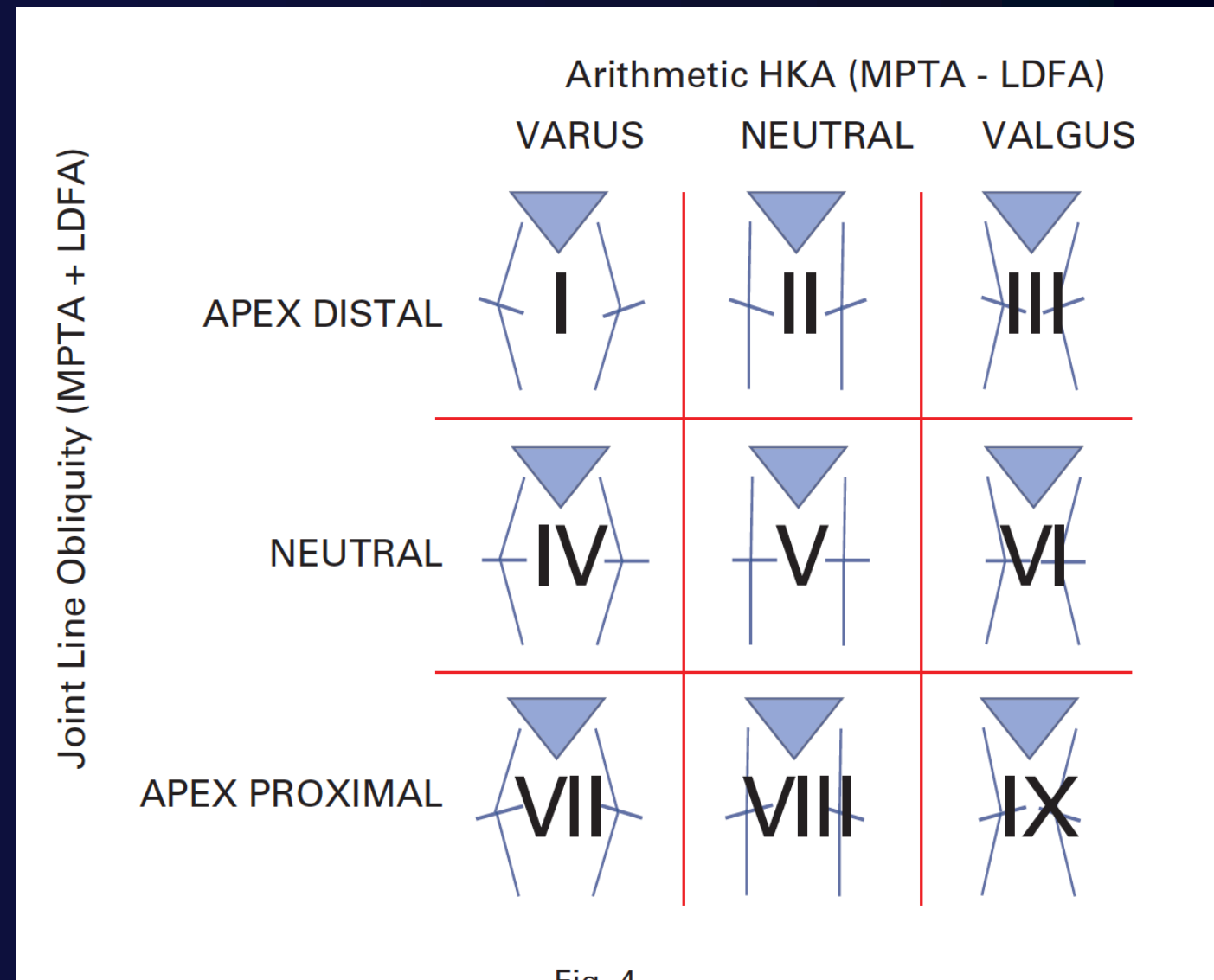


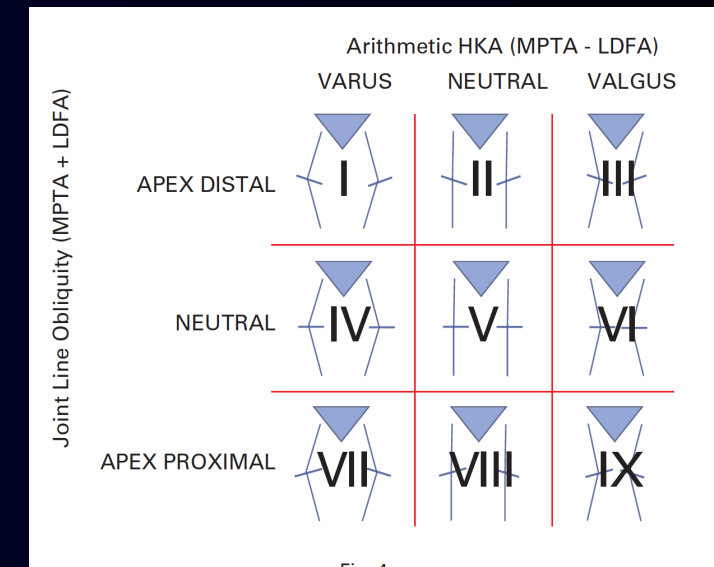
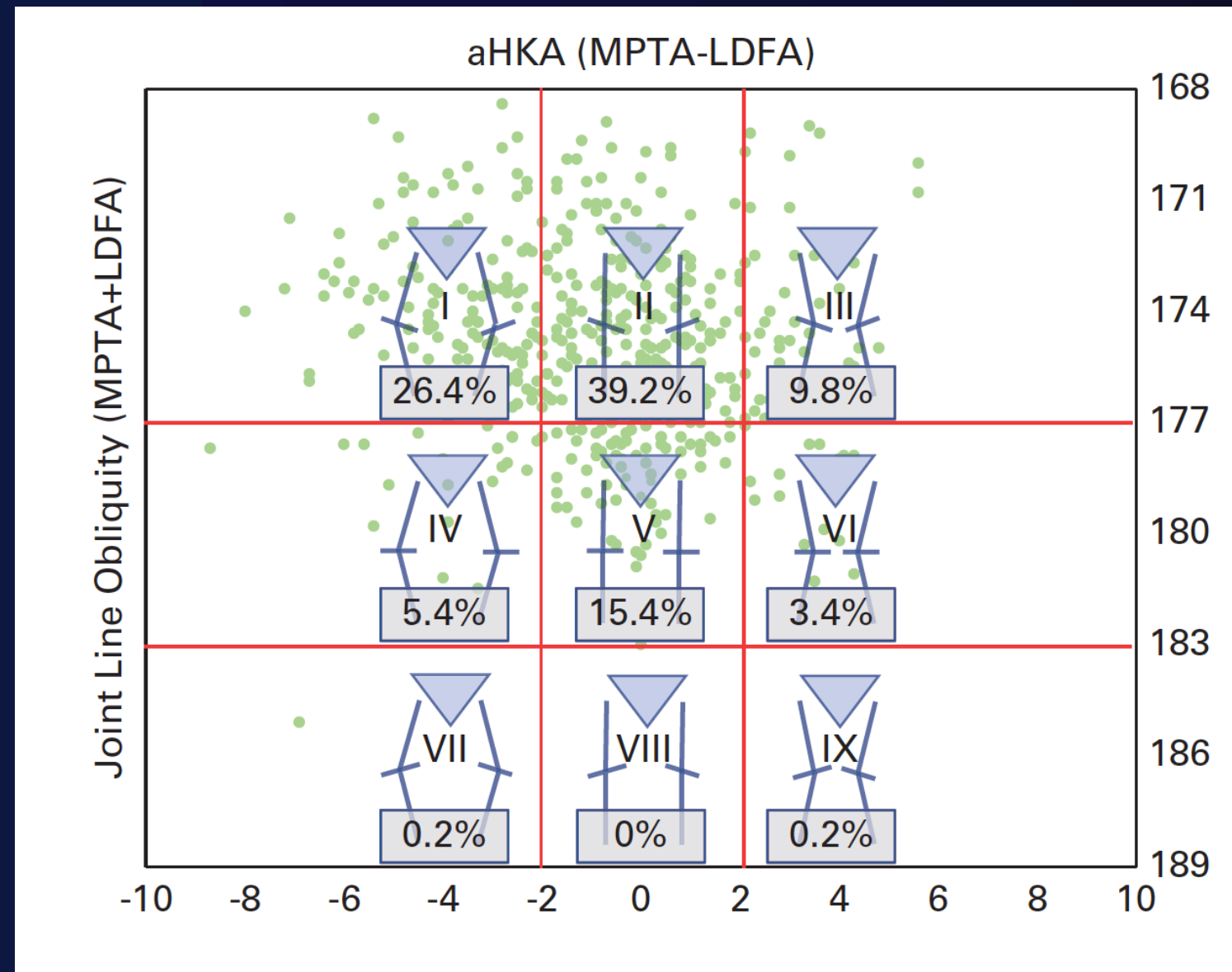
Fig. 4

# Native alignment



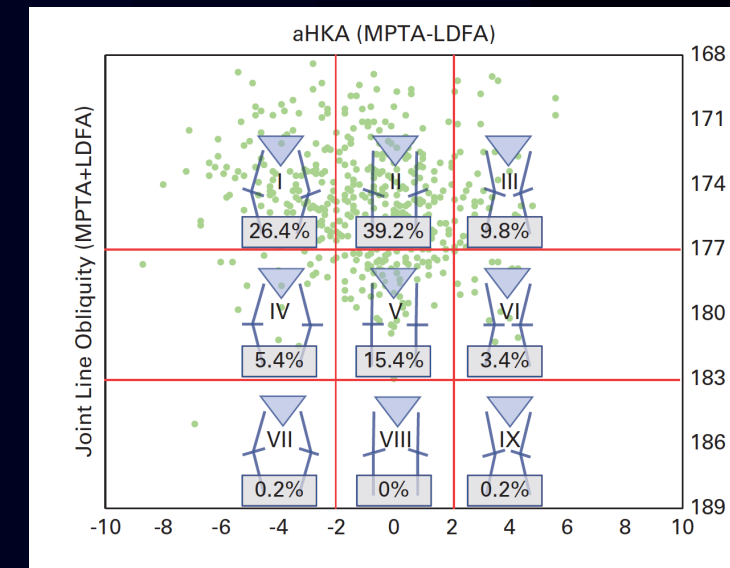
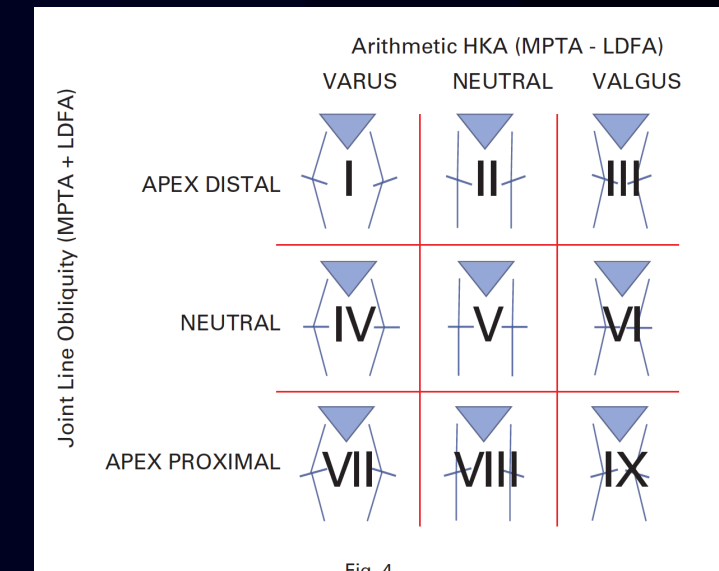
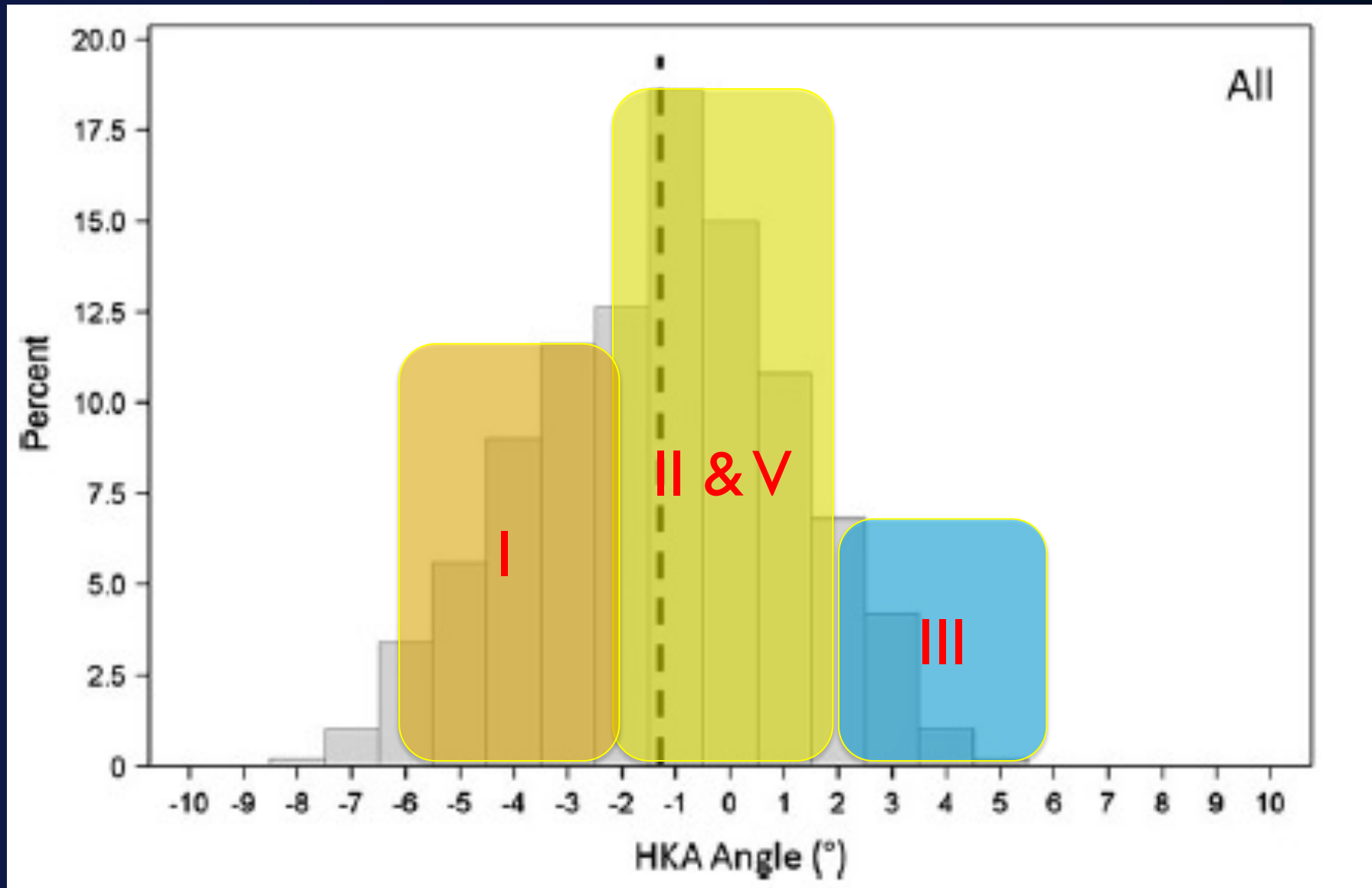


# Native alignment





# Native alignment



# Native alignment

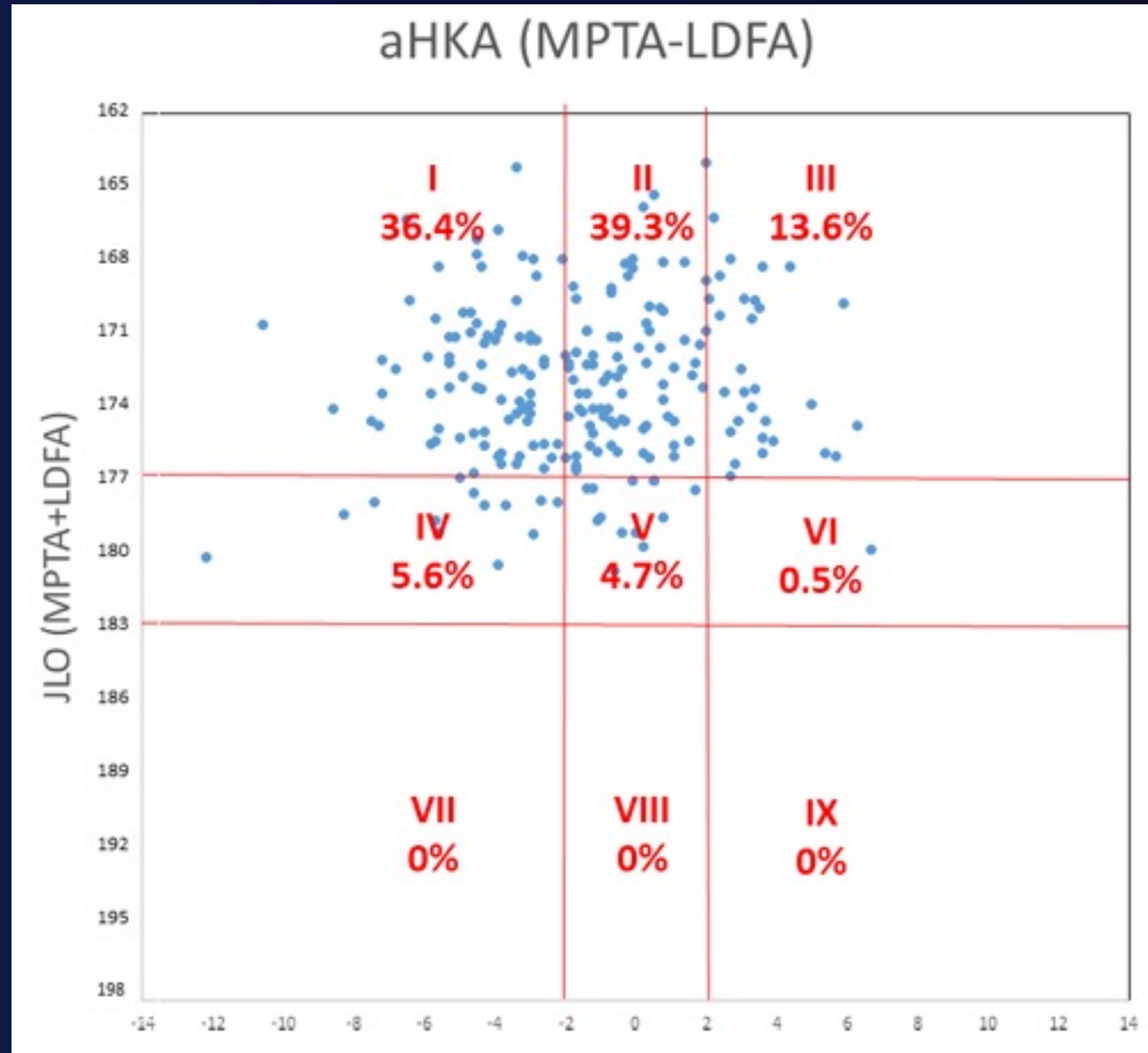
BJO



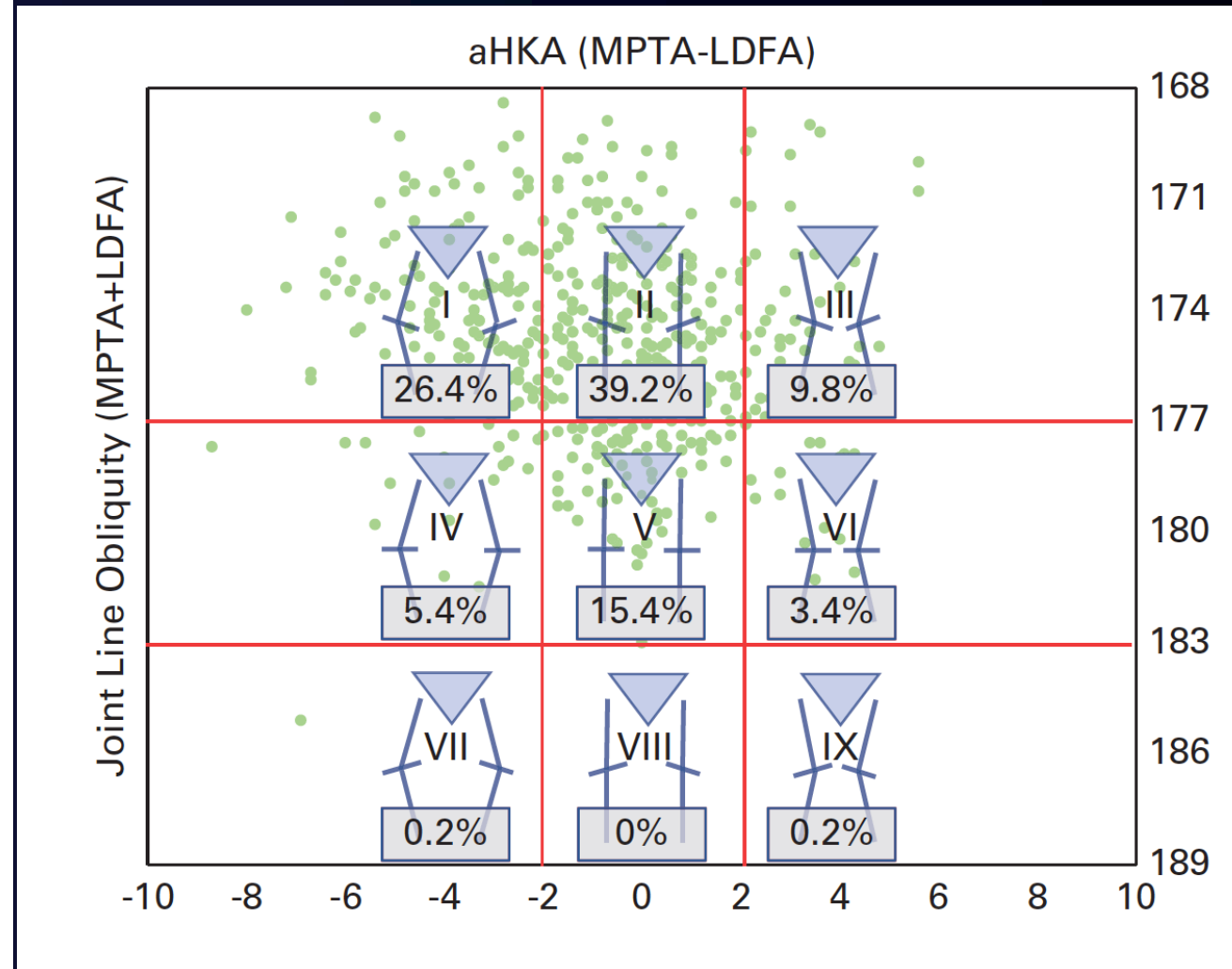
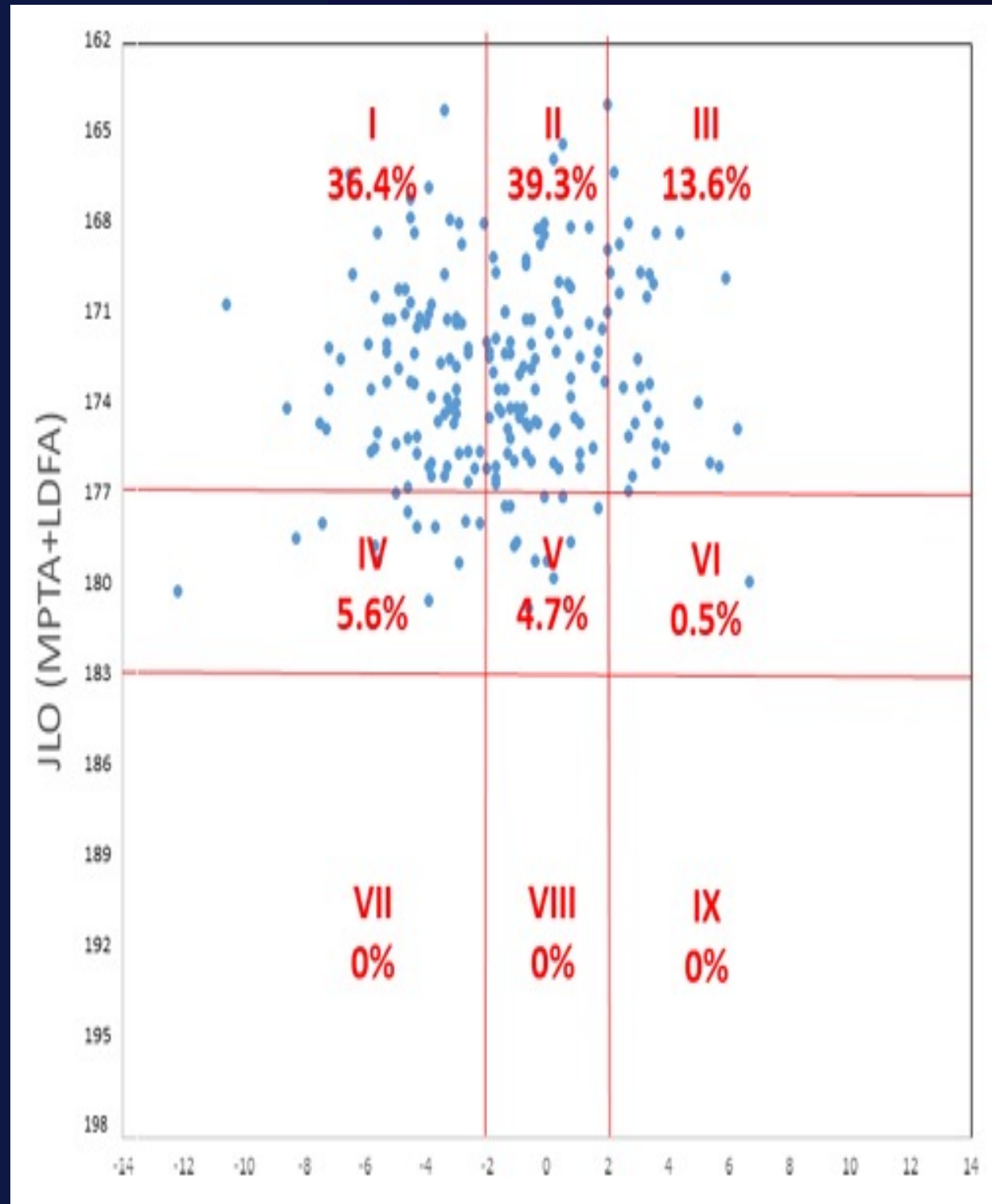
## ■ KNEE

**Validation and modification of the Coronal Plane Alignment of the Knee classification in the Asian population**

# Native alignment



# Native alignment

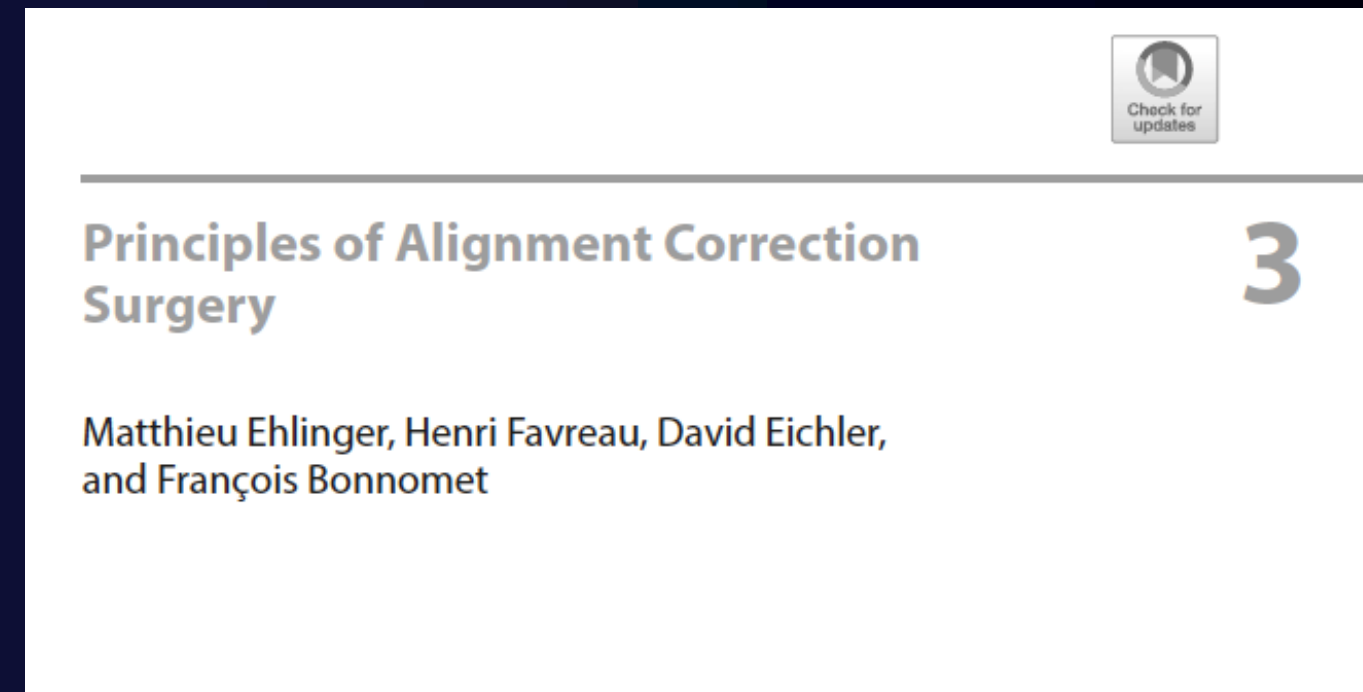
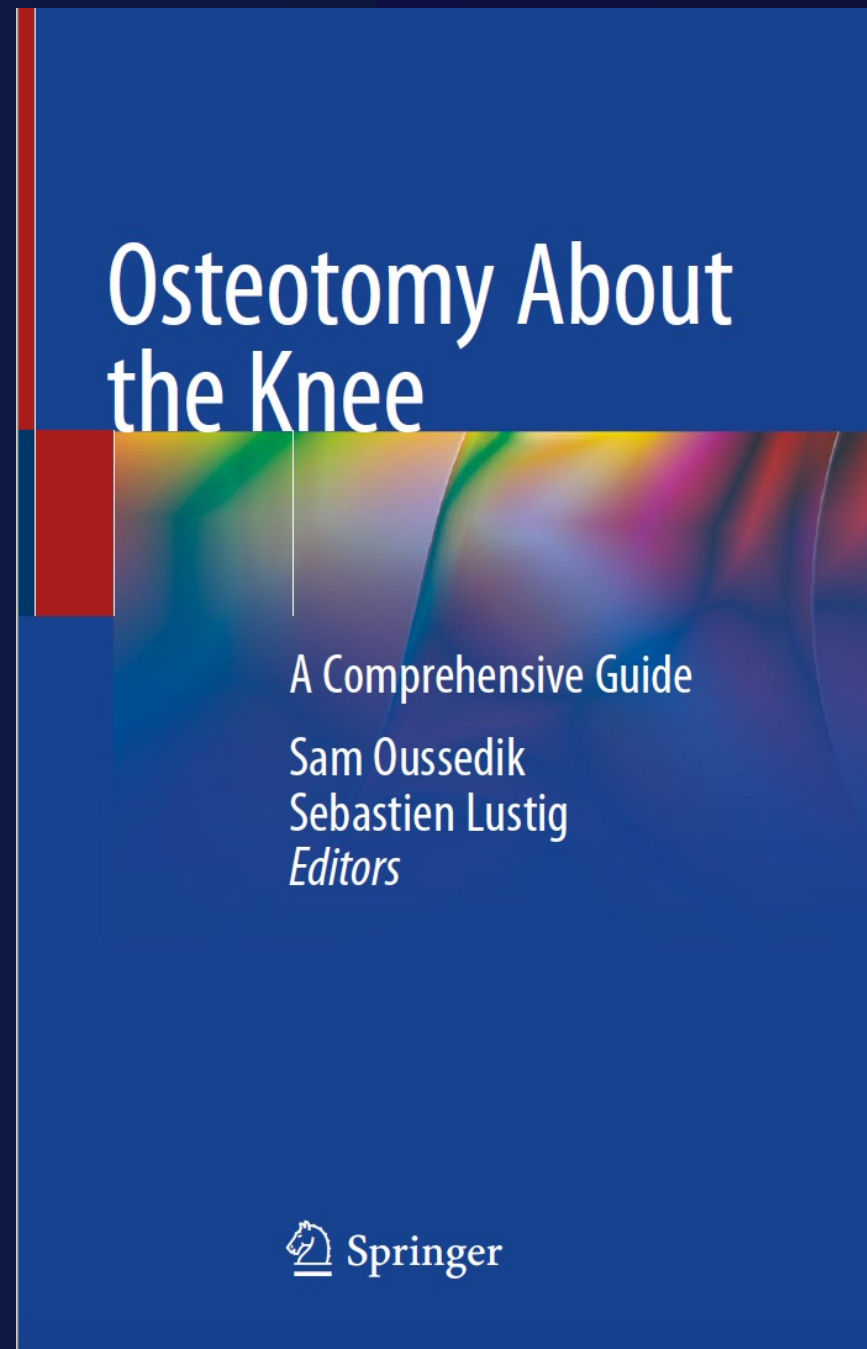


# Native alignment

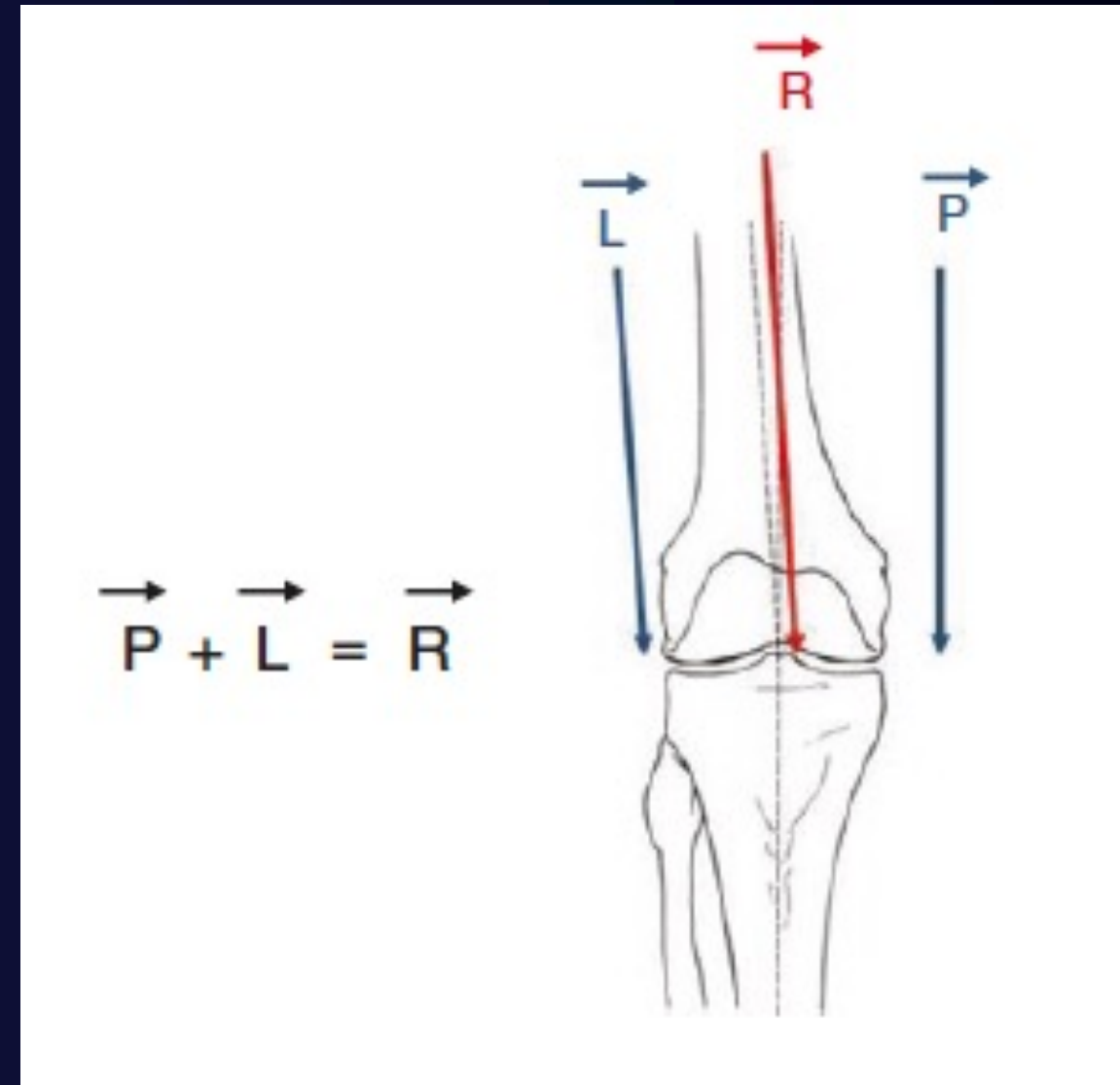
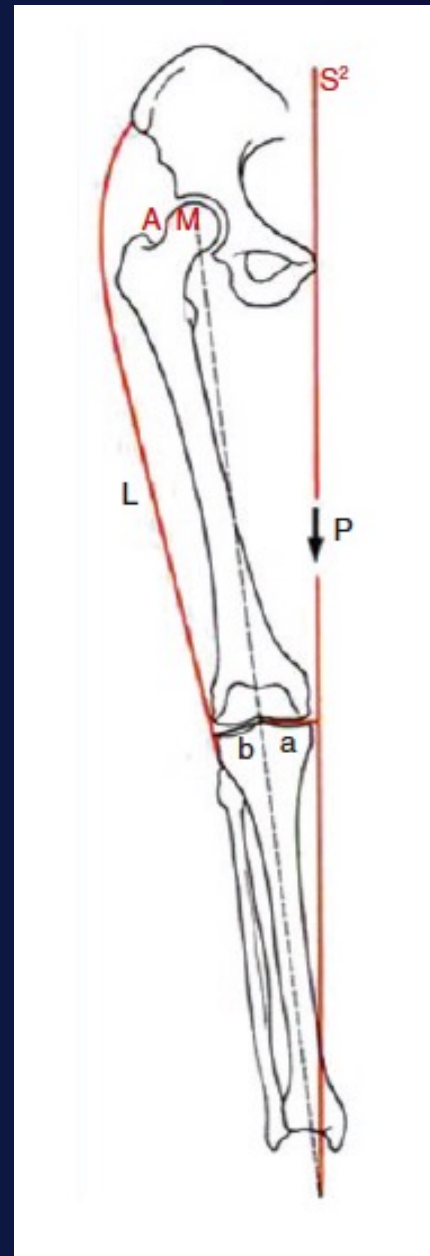
- Constitutional varus
- Joint line obliquity in extension
- Coronal alignment through ROM is a function of femoral alignment and rotation as well as tibial alignment



# Biomechanics

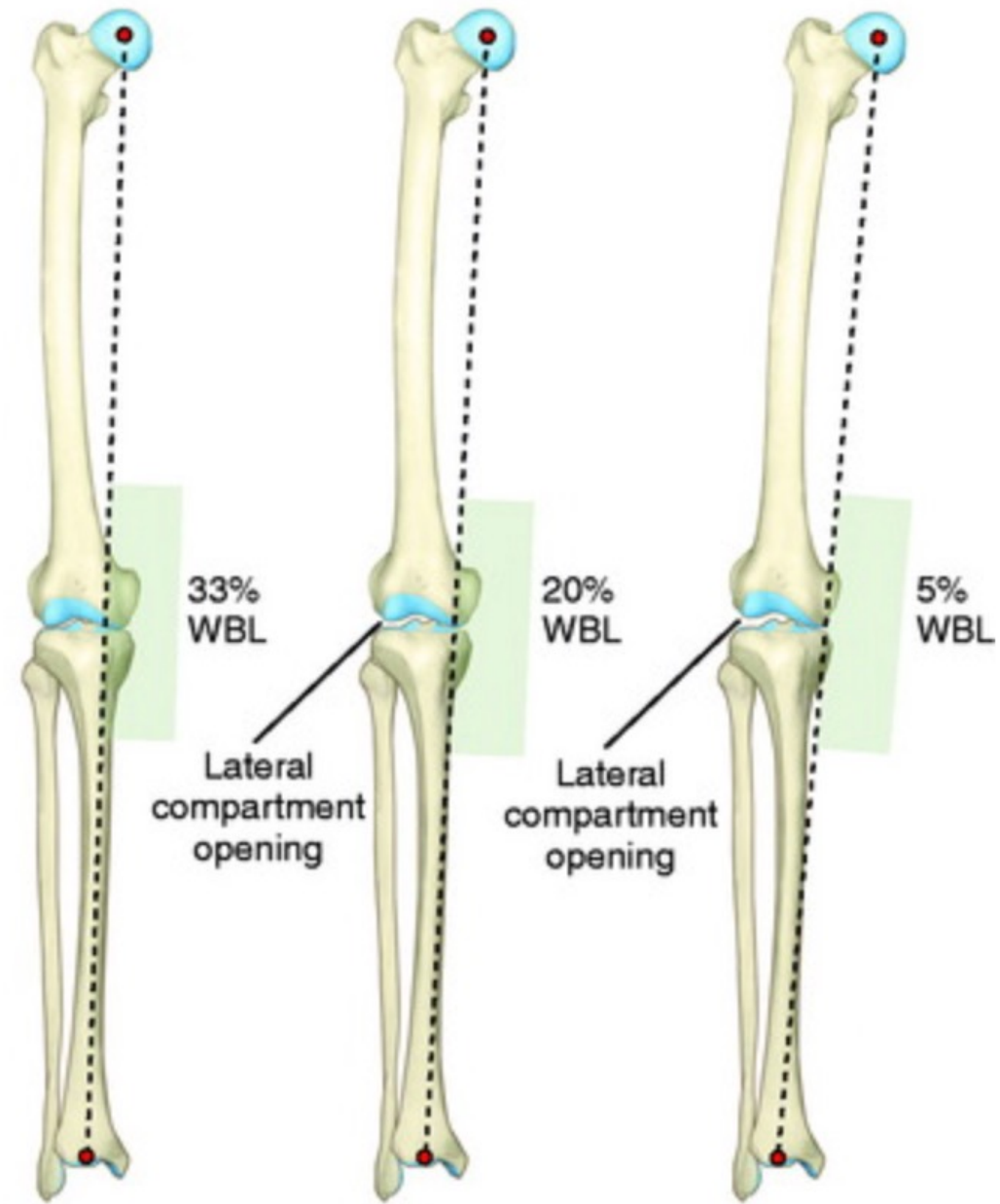


# Biomechanics





# Pathological changes



## Primary varus

- Tibiofemoral geometry

## Double varus

- Tibiofemoral geometry
- Separation of lateral compartment

## Triple varus

- Tibiofemoral geometry
- Separation of lateral compartment
- Varus recurvatum

# Pathological changes

The Journal of Arthroplasty 31 (2016) 2156–2160



Contents lists available at [ScienceDirect](#)

The Journal of Arthroplasty

journal homepage: [www.arthroplastyjournal.org](http://www.arthroplastyjournal.org)



Primary Arthroplasty

## A New Classification for the Varus Knee

Emmanuel Thienpont, MD, MBA <sup>a,\*</sup>, Javad Parvizi, MD <sup>b</sup>

<sup>a</sup> Department of Orthopaedic Surgery, University Hospital Saint Luc-UCL, Brussels, Belgium

<sup>b</sup> Department of Orthopaedic Surgery, Rothman Institute, Philadelphia, Pennsylvania



# Pathological changes

## *Intra-articular Deformity (Type IA)*

1. Reducible anteromedial osteoarthritis (AMOA) with an intact anterior cruciate ligament (ACL): typically Kellgren-Lawrence grade IV femorotibial disease with bone-on-bone contact. Anteromedial location can be observed on advanced imaging such as MRI or CT arthrography (Fig. 1).
2. Reducible posteromedial osteoarthritis with a deficient ACL: Kellgren-Lawrence grade IV femorotibial disease with bone-on-bone contact. Posteromedial wear can be observed on radiographs and confirmed by MRI or CT arthrography (Fig. 2).
3. Fixed varus deformity without lateral laxity.
4. Fixed varus with lateral laxity.

# Pathological changes

*Metaphyseal Deformity (Type M; Within 5 cm of Joint Line) either at the Femoral (F) or Tibial (T) Level*

1. Metaphyseal involvement because of wear (bone defects).
2. Metaphyseal involvement because of changed joint line obliquity.

*Diaphyseal Deformity (Type D; At Least 5 cm Away From Joint Line)*

1. Deformity at the tibial level.
2. Deformity at the femoral level.
3. Deformity at the tibial and femoral level combined.



# Varus deformity



# Varus deformity



# Correctable Varus deformity, lateral laxity

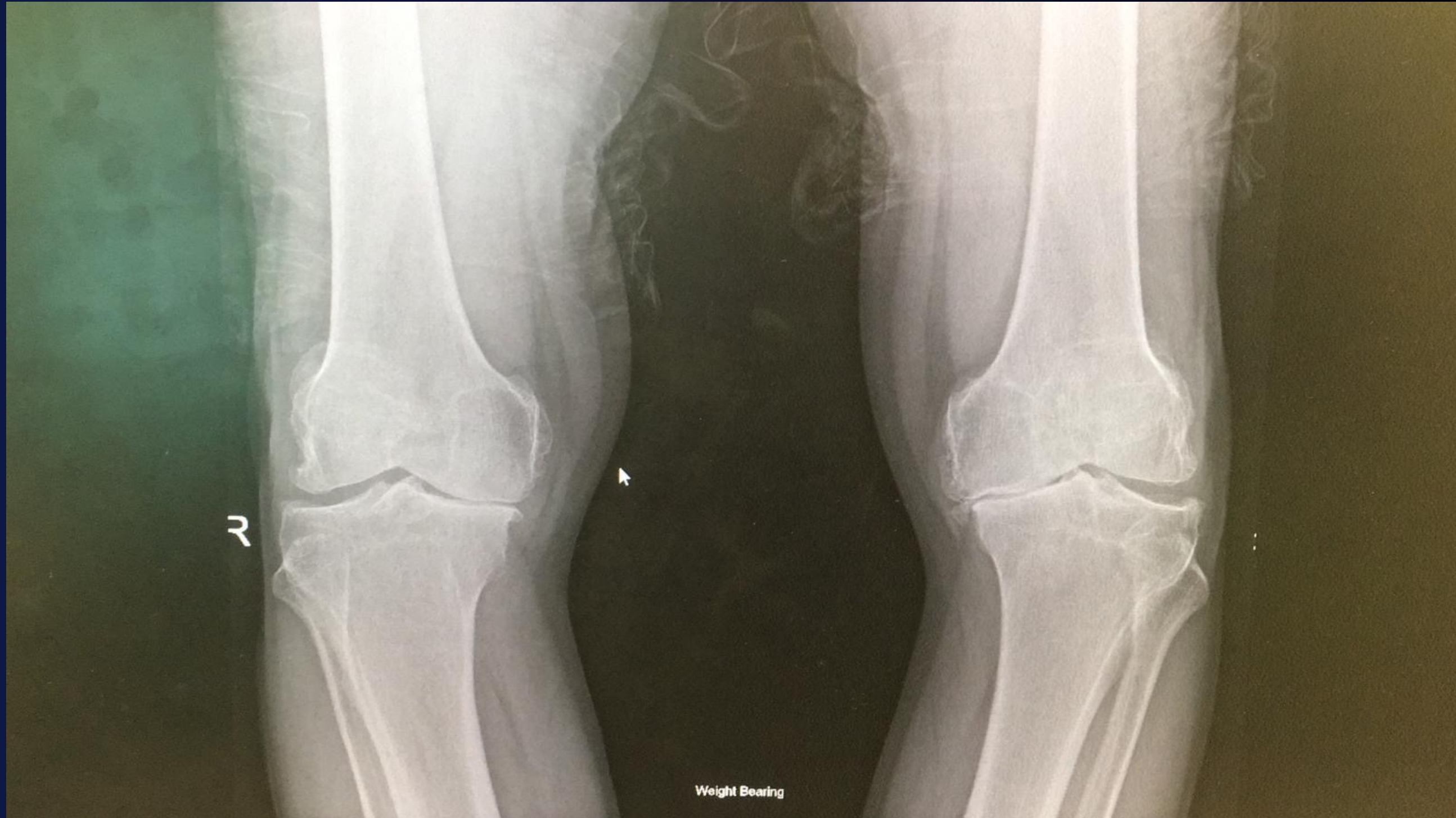




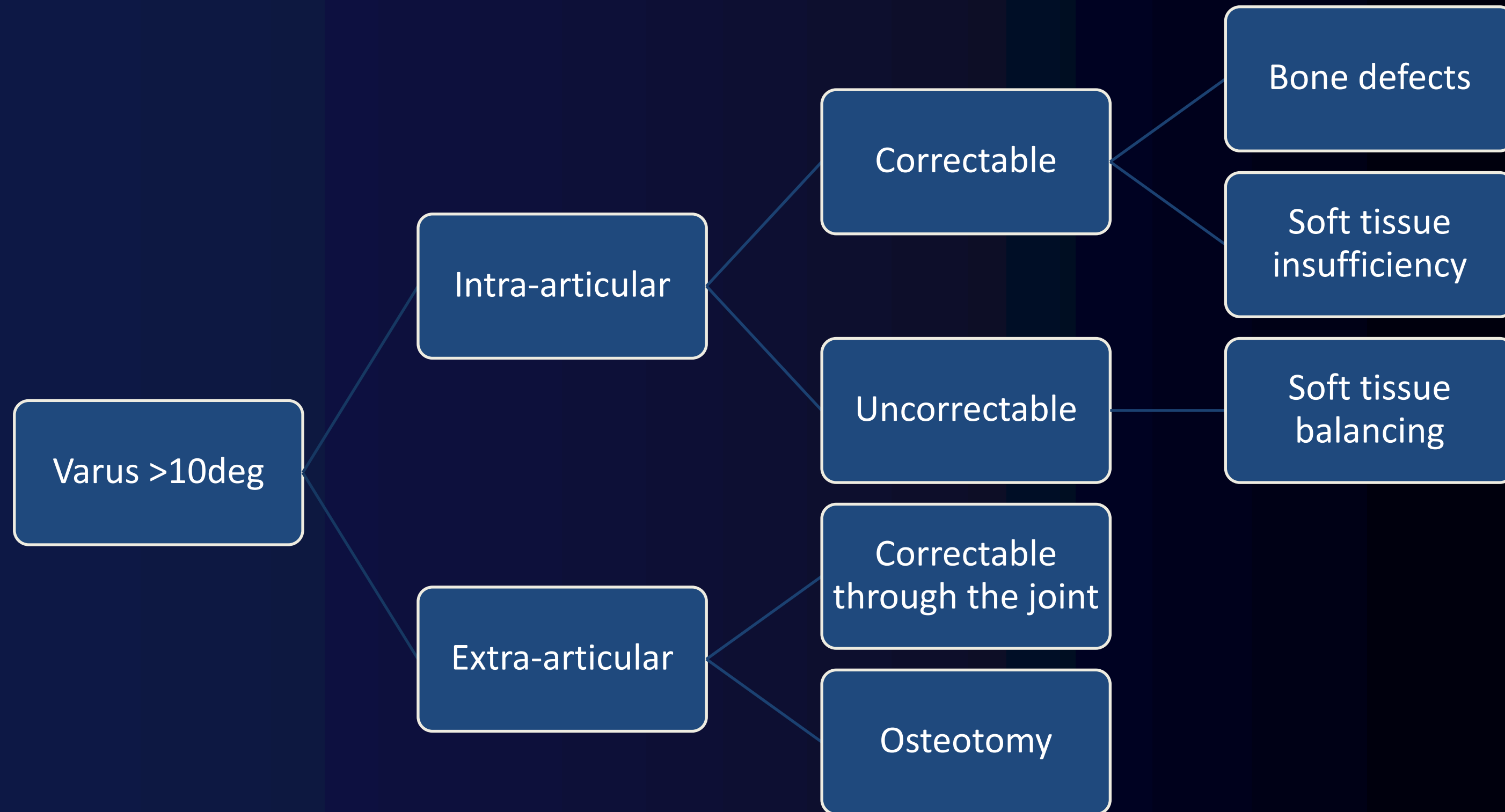
# Correctable Varus deformity, lateral laxity



# Fixed Varus deformity

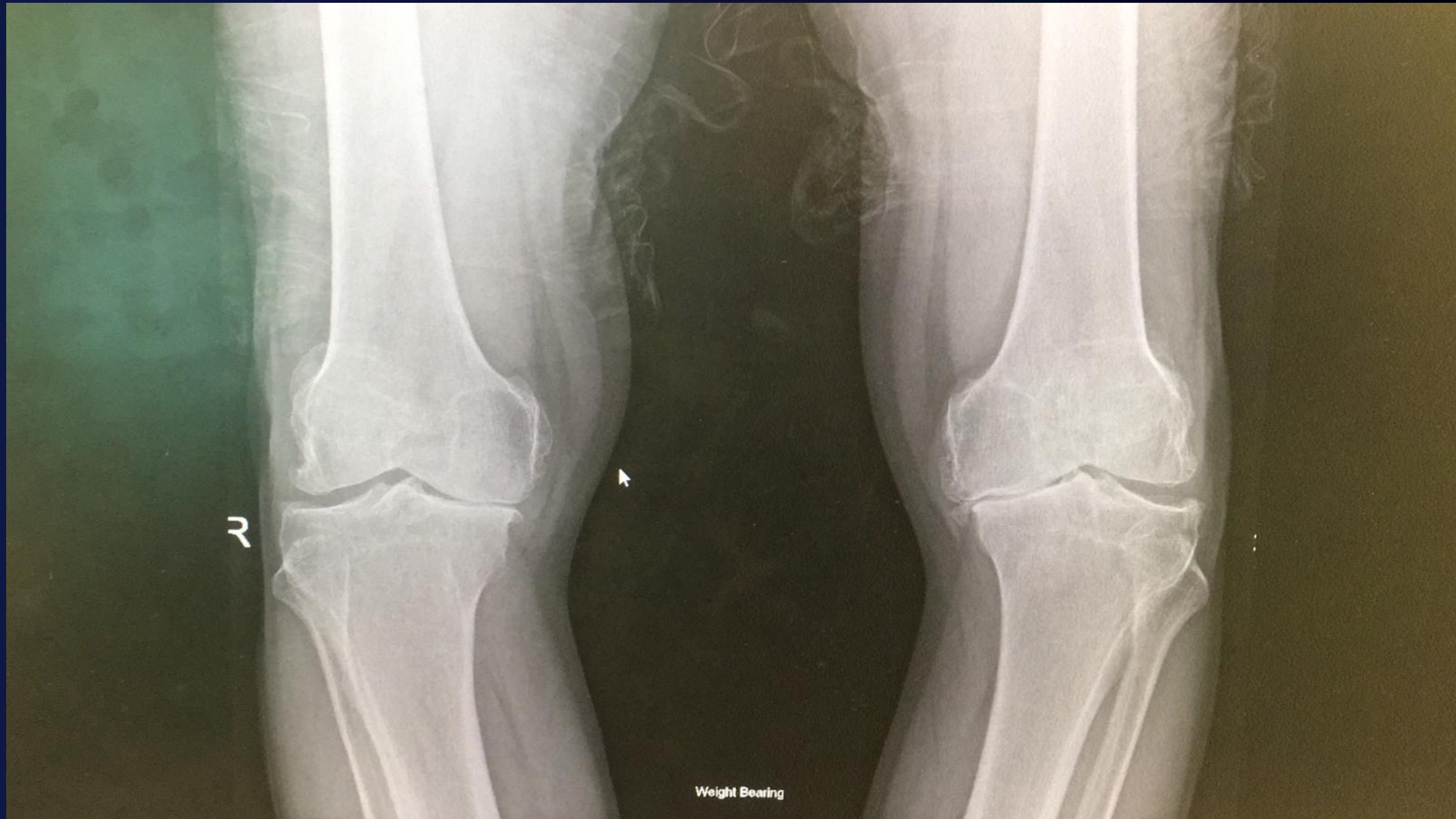


# Dealing with varus deformity

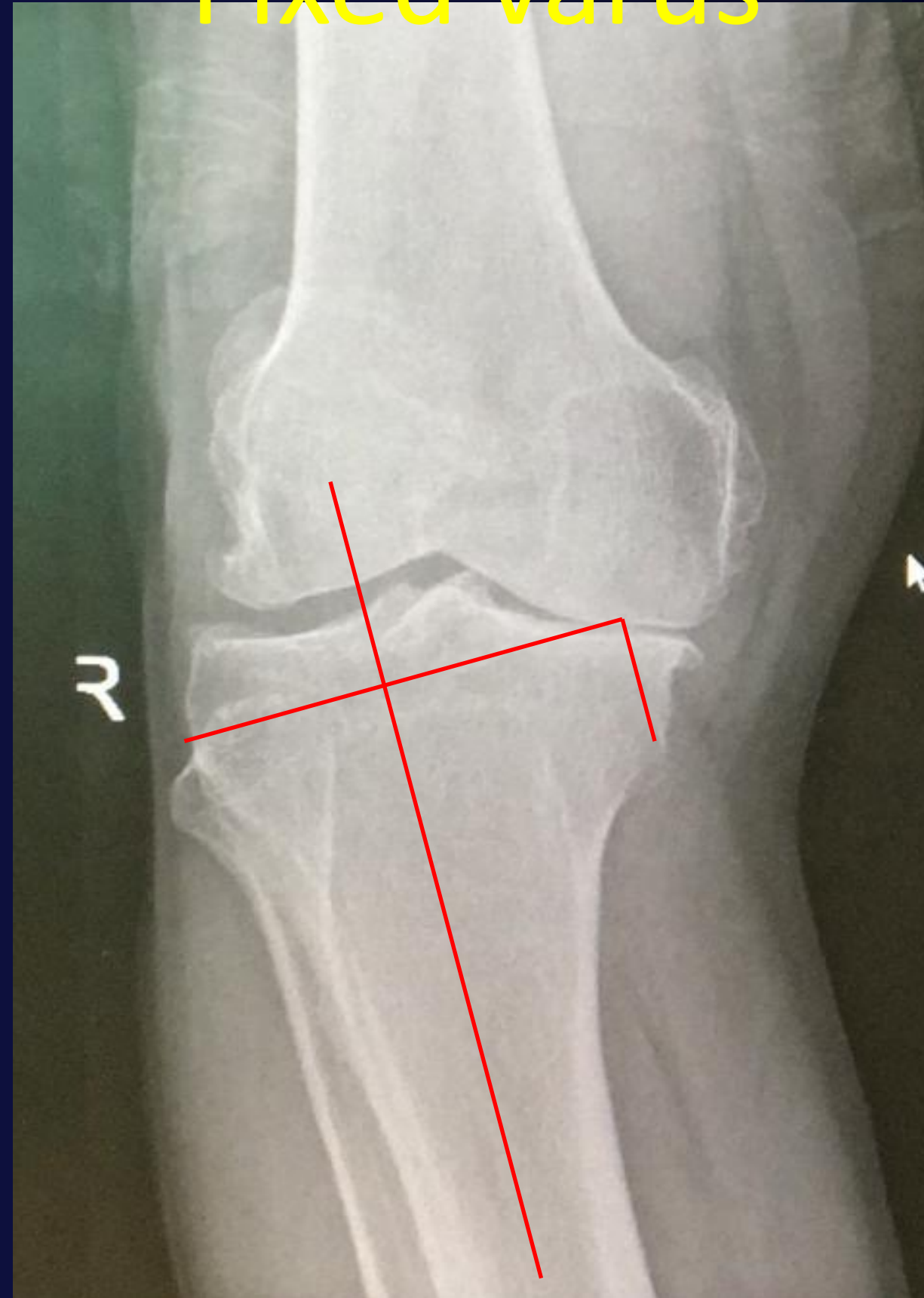




# Fixed varus



# Fixed varus



# Fixed varus



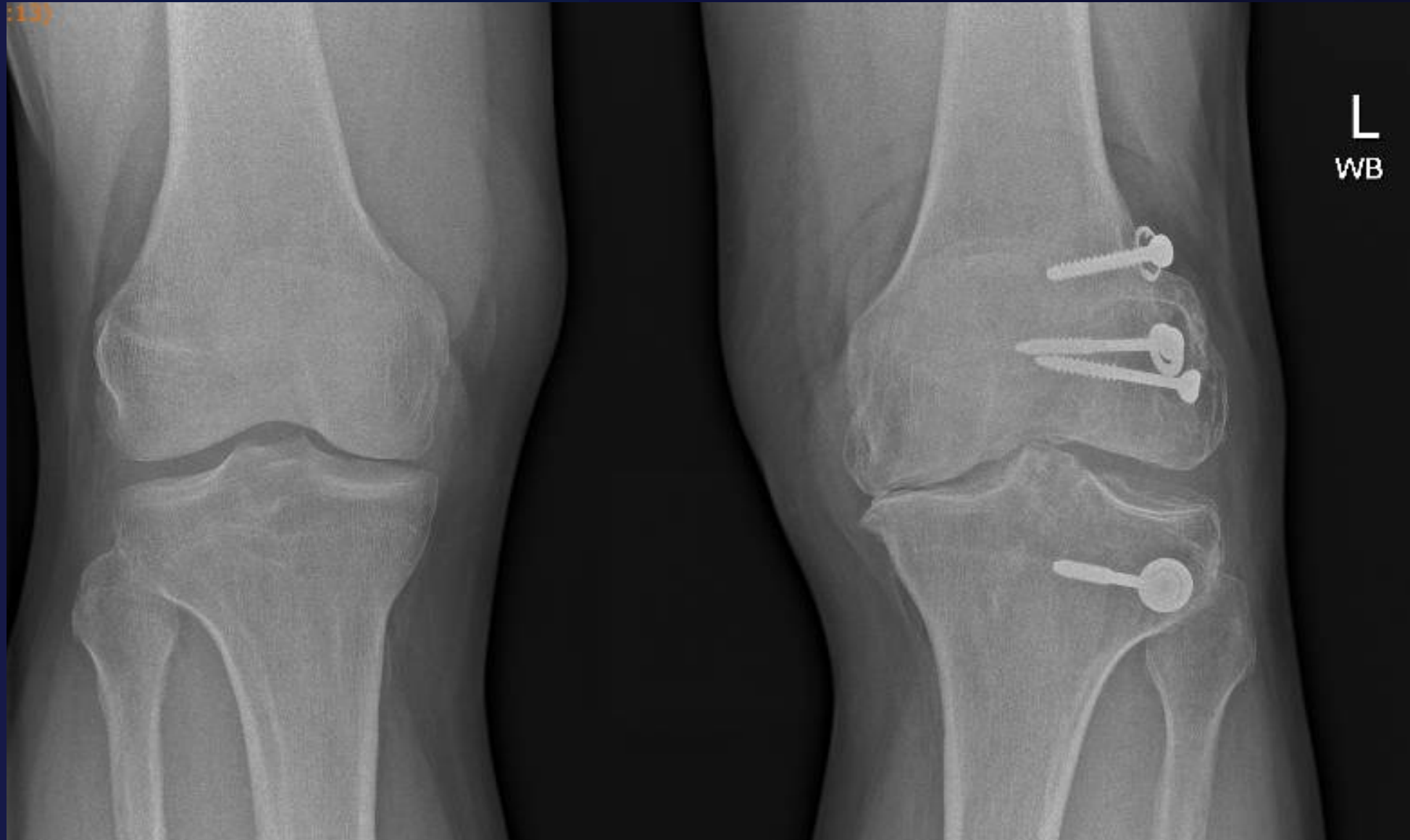


# Fixed varus





# Fixed varus + Posterolateral incompetence



# Fixed varus + Posterolateral incompetence



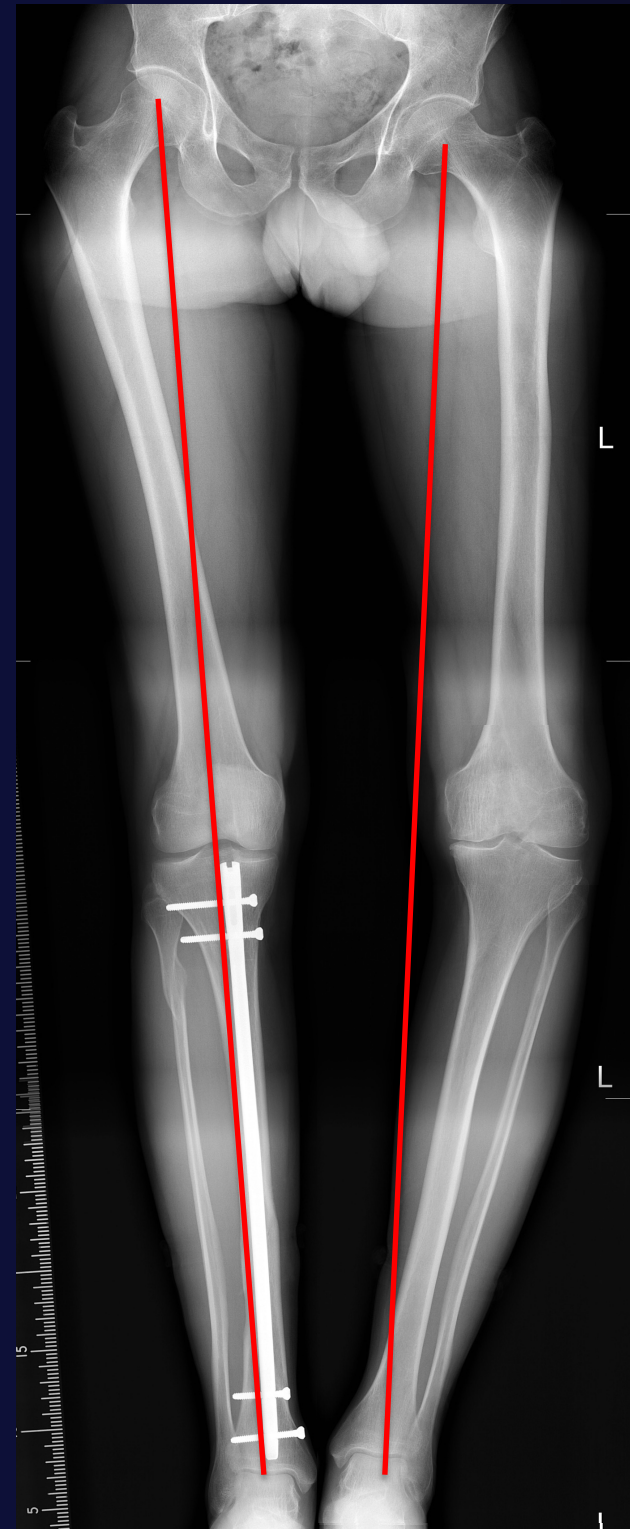
# Extra-articular deformity

HKA: 3VAR

LDFA: 2VAL

MPTA: 3VAR

JLCA: 2VAR



HKA: 20VAR

LDFA: 7VAR

MPTA: 7VAR

JLCA: 6VAR

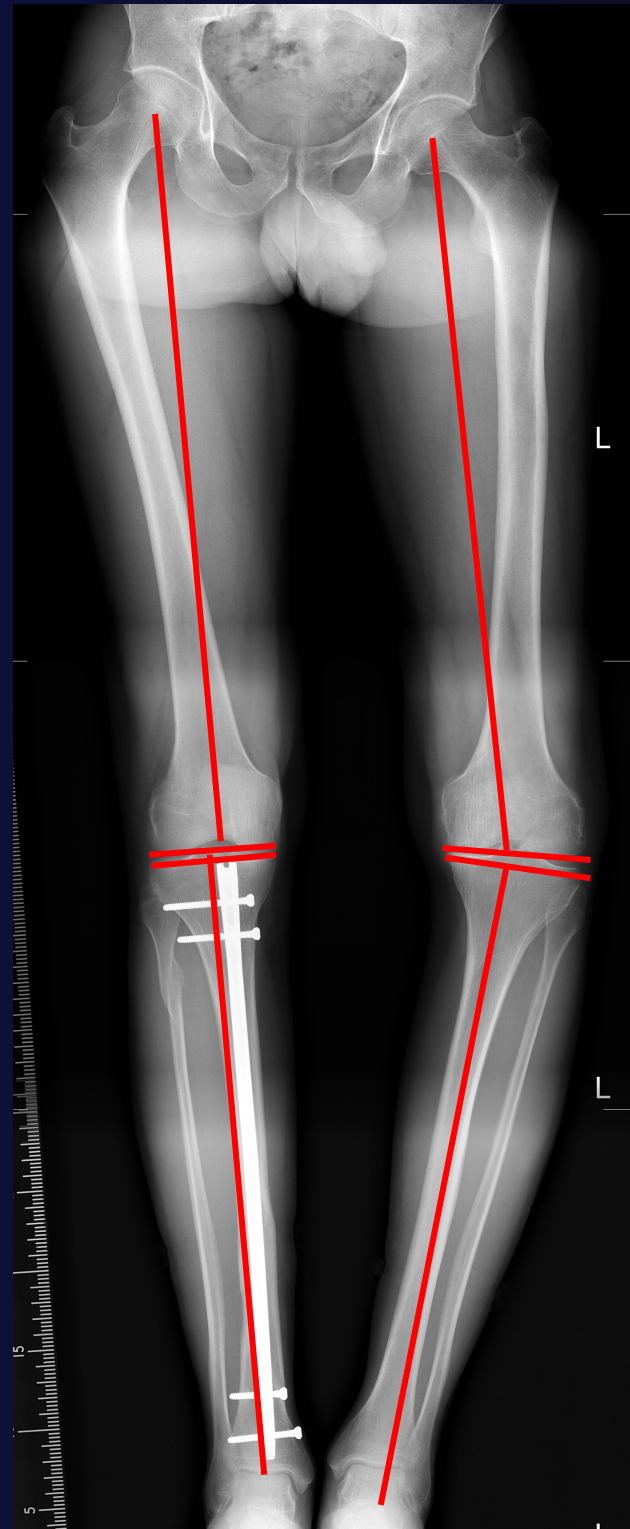
# Extra-articular deformity

HKA: 3VAR

LDFA: 2VAL

MPTA: 3VAR

JLCA: 2VAR



HKA: 20VAR

LDFA: 7VAR

MPTA: 7VAR

JLCA: 6VAR



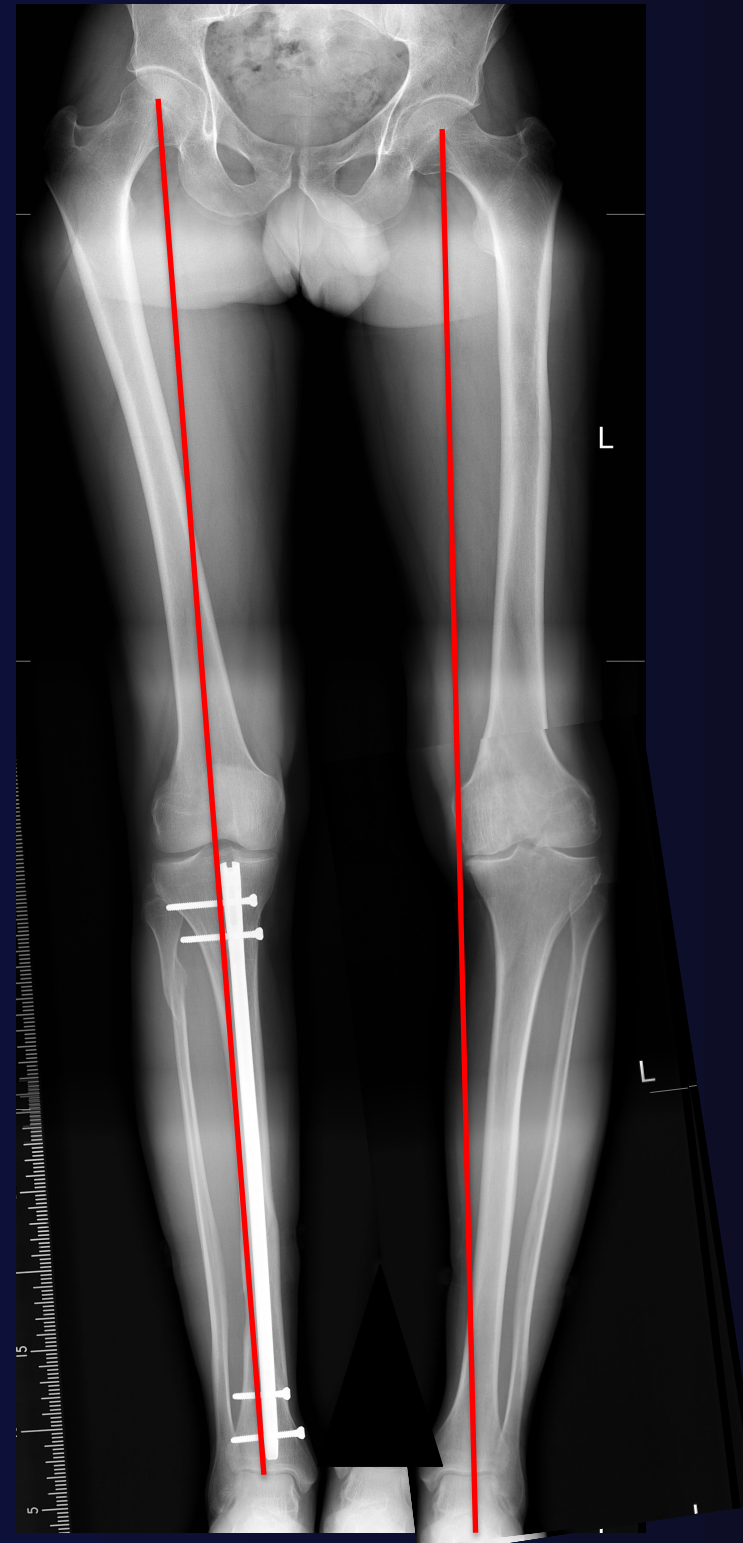
# Extra-articular deformity

HKA: 3VAR

LDFA: 2VAL

MPTA: 3VAR

JLCA: 2VAR



HKA: 10VAR

LDFA: 3VAL

MPTA: 7VAR

JLCA: 6VAR

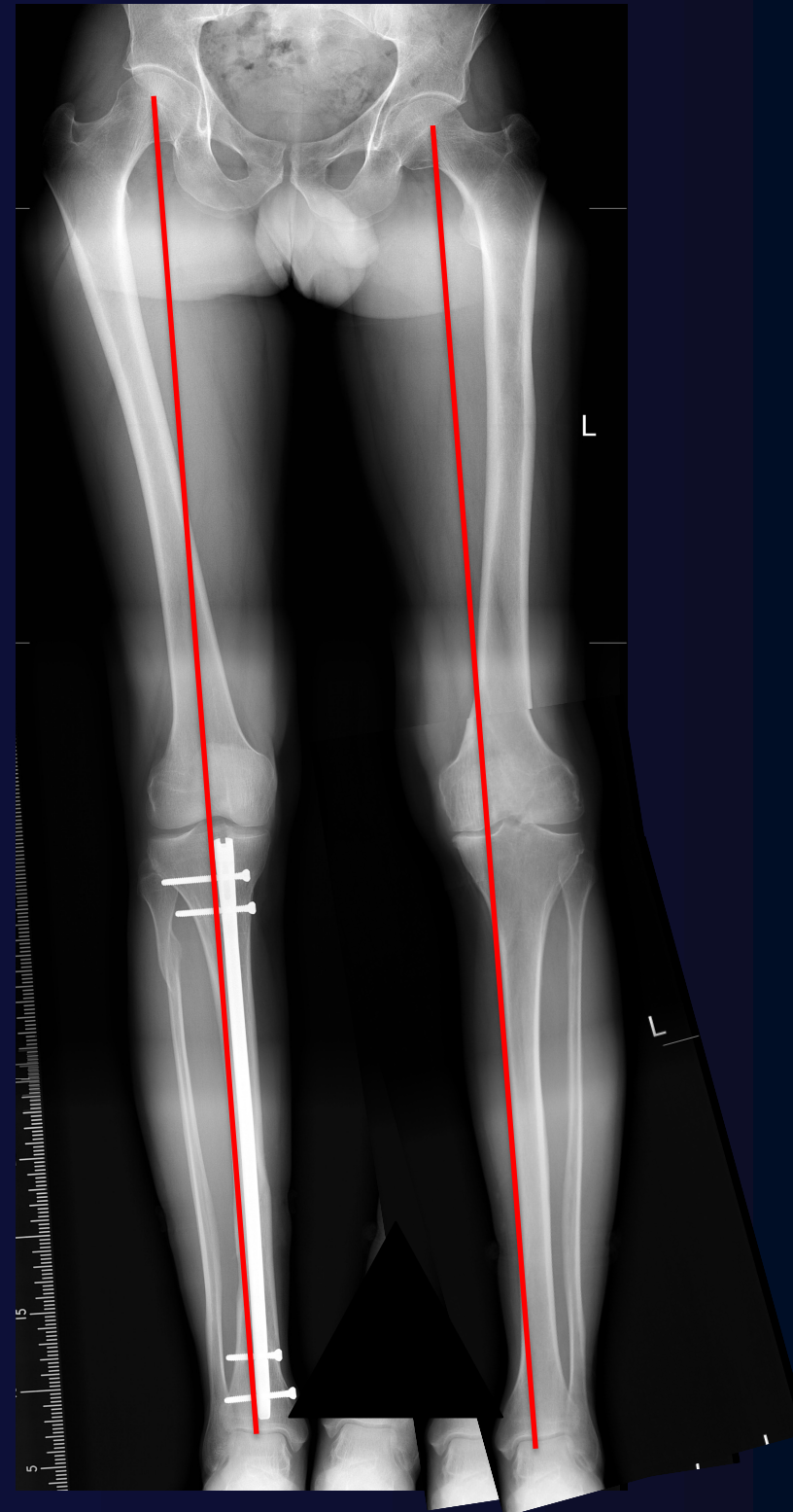
# Extra-articular deformity

HKA: 3 VAR

LDFA: 2 VAL

MPTA: 3 VAR

JLCA: 2 VAR



HKA: 3 VAR

LDFA: 3 VAL

MPTA: 3 VAR

JLCA: 3 VAR

# Extra-articular deformity





# Summary

- The majority of knees show varus physiological alignment
- Over time this can be exacerbated by intra-articular injury
- Analyse the deformity by site and correctability
- Treat the deformity where you find it
- Beware convex side laxity – be prepared to balance and increase constraint when necessary





# THANK YOU

