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Relationship between proximal tibio-fibular overlap and lower limb torsion in an Asian Population

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Faculty Disclosure Information

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Background

- Knee osteoarthritis - most common joint disease[1]
- Pre-operative planning is key for good alignment/outcomes[2,3]
- AP films to measure coronal angles
- Lower limb torsion affects these angles[11]
- Is there a simple measurement to reflect torsion?

AP View:

Measurement Tools Information

Limb Alignment Analysis (Unilateral)

Angle(°)	Pre	Normal	Post
mLPFA	86	85-90	86
mLDFA	85	85-90	88
mMPTA	84	85-90	84
mLDTA	86	86-92	86
JLCA	1	0-2	1
Length (mm)	**Pre**	**Normal**	**Post**
MAD	2		86
Femur	382		381
Tibia	279		279
Total Length	663		662

Original image

Aim

- This study aims to investigate the relationship between **proximal tibio-fibular overlap** with **femoral and tibial torsion**

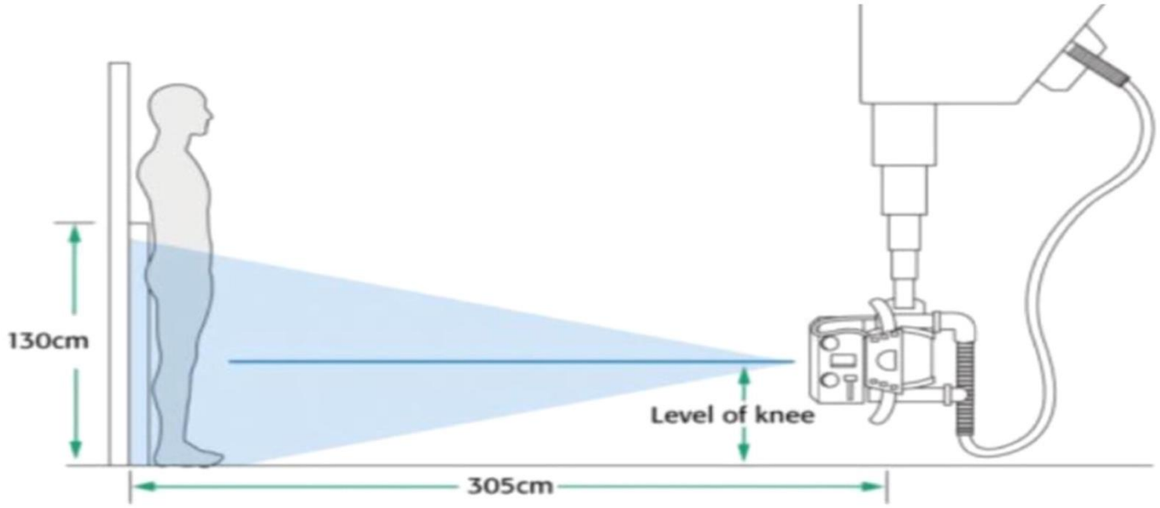
- Hypothesize a positive relationship

Methods

- Single-centre retrospective cohort study
- Patients recruited September 2018 to April 2024
  - Inclusion: planned for either unicompartmental knee arthroplasty (UKA) or total knee arthroplasty (TKR)
  - Exclusion: previous lower limb procedures or patellar malalignment
- Long leg X-ray and Computed Tomography (CT) images of the lower limb were obtained beforehand for pre-operative planning
- Stats:
  - Inter/intra class correlation coefficient (ICC)
  - The Pearson correlation coefficient

Methods - Measurements

Modality	Full limb length X-Ray films	Computed Tomography (CT) Scan
Measurement	Tibio-fibular overlap	Femoral torsion, tibial torsion



Methods - Measurements

1) Proximal tibio-fibular overlap[4,5] :

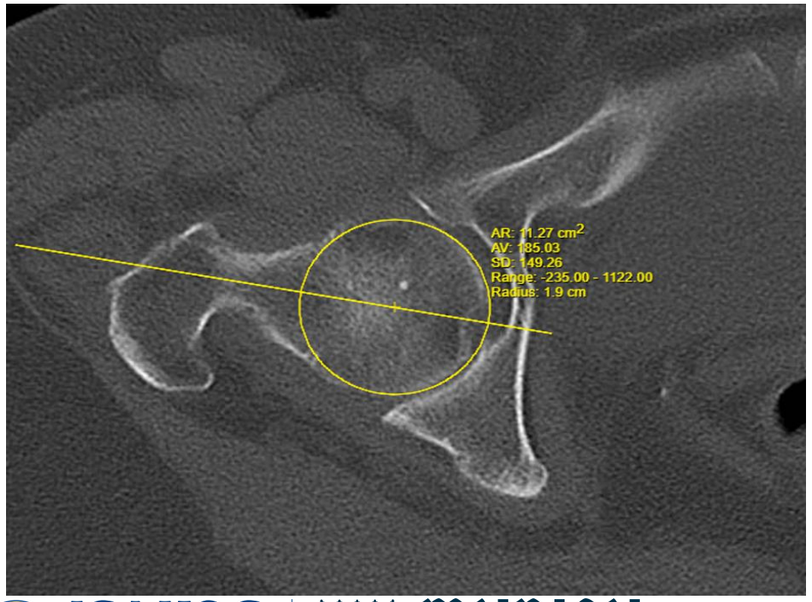
- longest overlapping length between the medial cortex of the fibula and the lateral cortex of the tibia, perpendicular to the anatomical axis of the fibula on the long bone frontal view

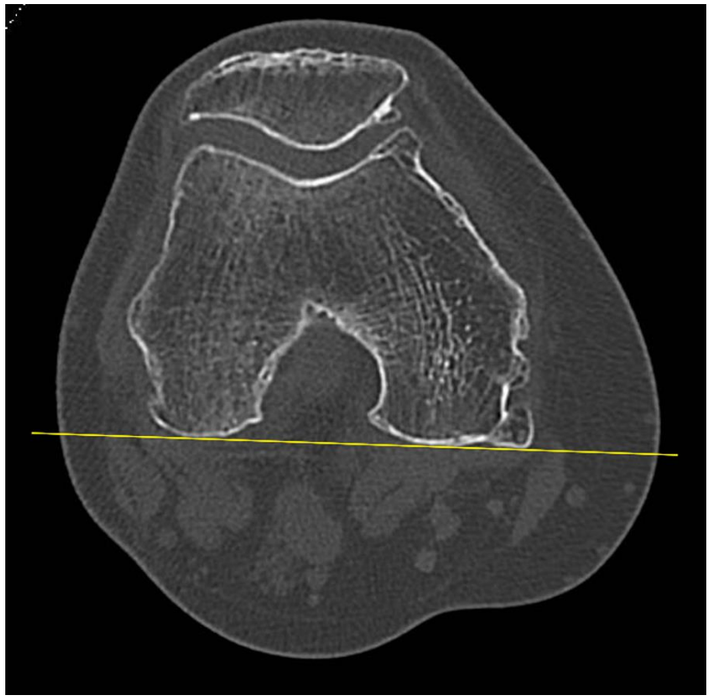
Methods - Measurements

2) Femoral torsion

- Angle between axis of femoral neck and tangent of femoral condyles

- Normal range = 5°to 20° [6-8]



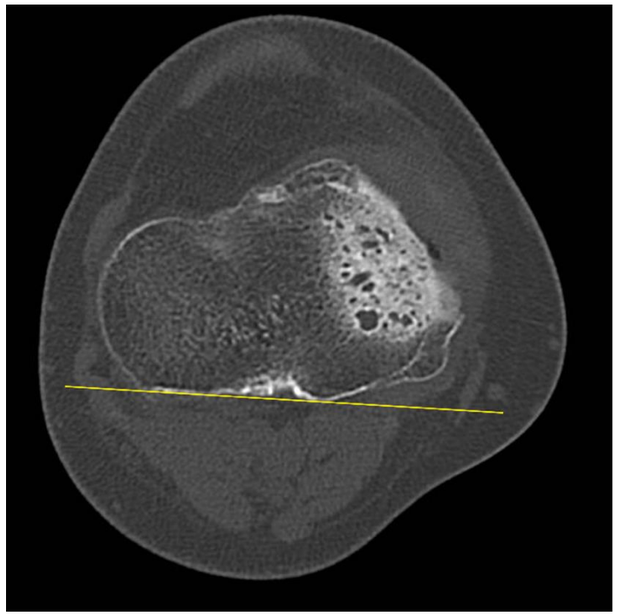


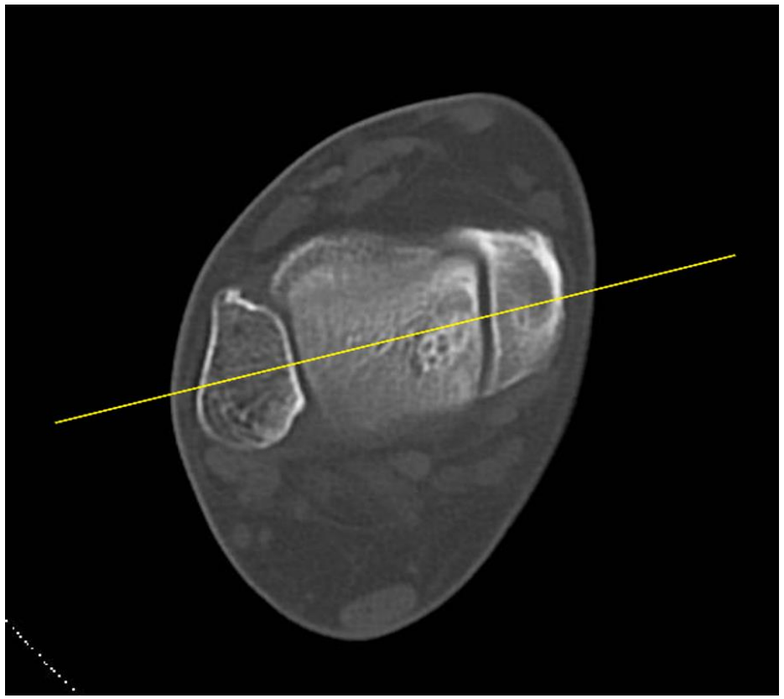
Methods - Measurements

3) Tibial torsion

- Angle between the tangent to the posterior contour of the proximal tibia and the transmalleolar axis

- Normal range 20°-30° external rotation[9]





Results

Demographics	
Number of patients	135
Gender (M:F)	46:89
Age (years)	63-78
BMI (mean)	27.2

	Mean (Intra observer ICC/inter observer ICC)
Tibio-fibular overlap	14.5mm (0.88/0.87)
Femoral anteversion	20.0° (0.85/0.82)
Tibial torsion	20.5° (0.83/0.78)

ICC > 0.75 (good reliability)

Correlation analysis

Moderate correlation between **tibio-fibular overlap and tibial torsion** (ρ=0.454, **p<0.01**)

Weak correlation between **tibio-fibular overlap and femoral anteversion** (ρ=0.349, **p<0.01**)

Discussion

- Lower limb torsion affects preoperative planning and can result in under correction of coronal alignment in HTO

- With increased external tibia torsion → fibular more posterior with respect to tibia

- Limitations
  - Asian population
  - High incidence of tibial torsion (18.6%), hence individuals with lower tibial torsion may be underrepresented
  - Selection bias (retrospective study)
  - Tibio-fibular overlap may be affected by bone size of patients

Conclusion

- Positive relationship between tibio-fibular overlap and tibial torsion

- Further regression analysis to define a cut-off value

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