Subject-specific orientations of the talocrural joint axes estimated from the morphology of the talar trochlea

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Disclosure

NO CONFLICT TO DISCLOSE

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Our disclosure are in the Final AOFAS Mobile App. We have no potential conflicts with this presentation.
Articular surface morphology of talar trochlea determine kinematic patterns of talocrural joint.

Asymmetry between medial and lateral radii of talar trochlea orient axis of rotation for talocrural joint.
Background

- **Dorsiflexion**
  - Anterior region is contact with tibial plafond

- **Plantarflexion**
  - Posterior region is contact with tibial plafond

Different medial and lateral radii between anterior and posterior talar trochlea

(Corazza et al. J Biomech. 2005)

Aims of this study

- Evaluate medial to lateral radius ratios of anterior and posterior trochlea
- Estimate subject-specific orientations of axis of rotation for talocrural joint

(Barnett et al. J Anat. 1952)
Forty-nine unilateral adult male tali
  - mean age: 32.9 [SD 9.1] years
  - age range: 20–49 years

Computed tomography (CT) images
  - slice thickness: 0.12–0.16 mm
  - in-plane resolution: 0.12 mm × 0.12 mm

Reconstruction of bone models
  - software: Mimics Version 9.0, Materialise Inc., Leuven, Belgium
Methods

Medial to lateral radius ratios of anterior and posterior trochlea were calculated.
Methods

- **Dorsiflexion axis**
  - passing through centres of anteromedial and anterolateral circles

- **Plantarflexion axis**
  - passing through centres of posteromedial and posterolateral circles

Inclination and deviation angles were calculated for dorsiflexion and plantarflexion axes.
Results

Medial to lateral radius ratios

- Anterior: less than 1.0 in all samples
- Posterior: widely distributed from 0.58 to 1.63
Results

* Inclination and deviation angles

- **Dorsiflexion:** > 0 degrees except one sample
- **Plantarflexion:** from -31.8 to 31.0 degrees

- **Dorsiflexion:** > 0 degrees except one sample
- **Plantarflexion:** from -3.4 to 17.4 degrees
Discussion

**Dorsiflexion axis**

- **Inclination angle**
- **Deviation angle**

Dorsiflexion axis was **unidirectional**

- downward and laterally on coronal plane
- backward and laterally on transverse plane

**Eversion and external rotation** of talus during talocrural dorsiflexion

**Plantarflexion axis**

- **Inclination angle**
- **Axis of rotation**

Plantarflexion axis was **bidirectional**

- downward and **laterally** on coronal plane
- downward and **medially** on coronal plane

**Opposite axial rotation** of talus during talocrural plantarflexion
Conclusion

- Anterior talar trochlea exhibited **unilateral asymmetric shape**
- Posterior talar trochlea exhibited **bilateral asymmetric shape**
- Morphological feature of talar trochlea may induce **subject-specific axial rotation of talocrural joint**

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References


