DISIOR

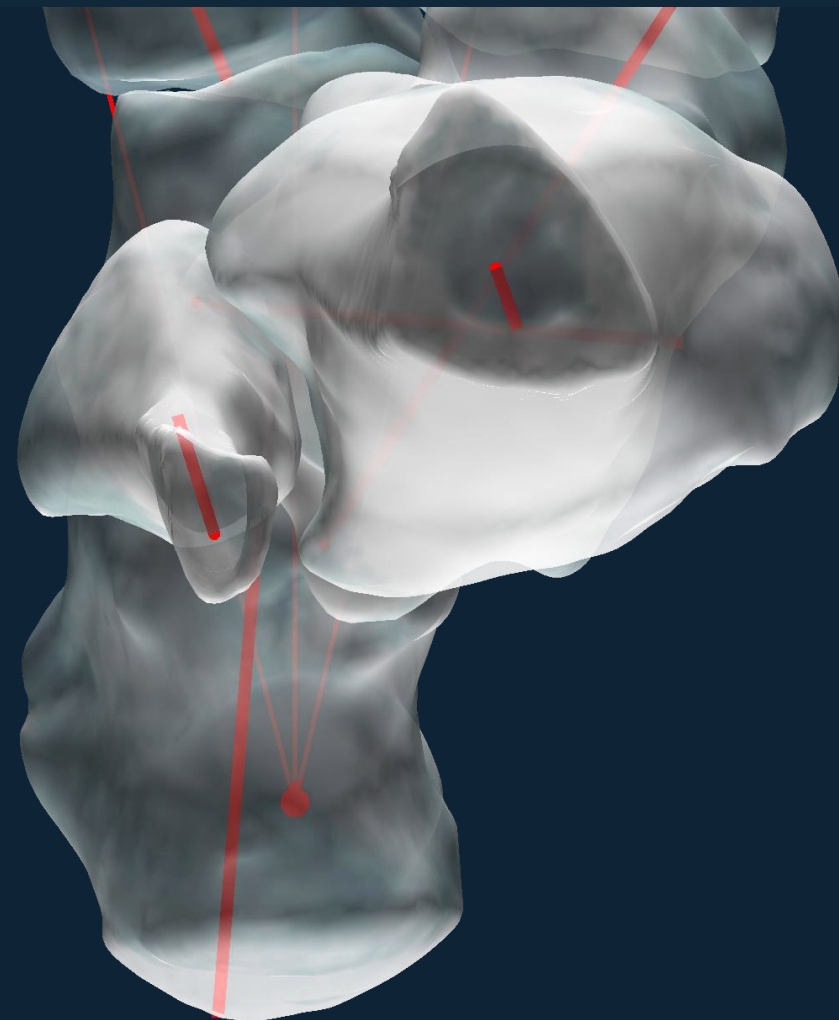# Making Medical Imaging Intelligent

AXIS DEFINITIONS

24.10.2019

Categories for different bone shapes

First column
- First proximal phalanx   **A**
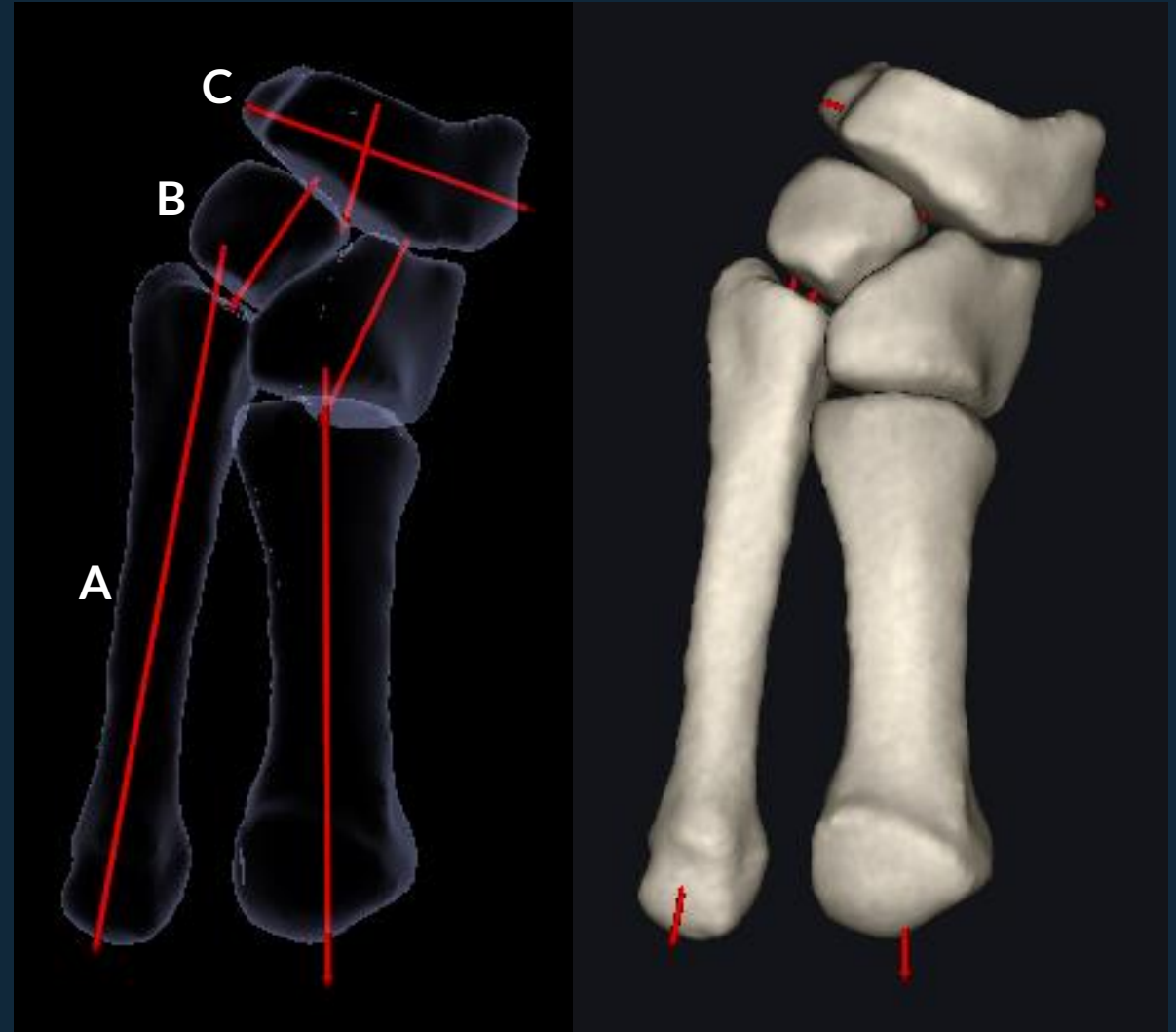- First metatarsal   **A**
- Medial cuneiform   **B**
- Navicular   **C**

Second column
- Second proximal phalanx   **A**
- Second metatarsal   **A**
- Intermediate cuneiform   **B**
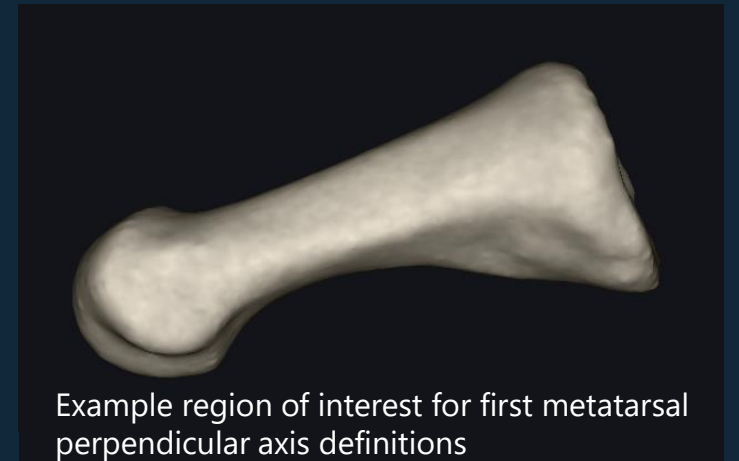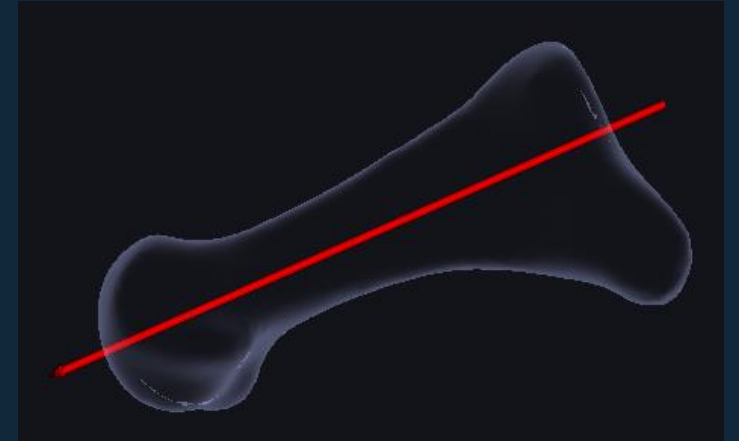- Navicular   **C**

For fitting details, see…

Elongated bone fitting (A)

Metatarsal, proximal phalanx and other "long bone shapes"

1. Longitudinal axis: The software scans bone and determines its cross section at various locations. Weighted center point is computed for each cross section. Robust line fitting routines are used to find a straight line representative for the cross section points.

2. Perpendicular axes: a subset of a bone surface can be projected into a plane perpendicular for the bones first axis. Robust line fitting routines are used to find a straight line representative for the projected data.

Example region of interest for first metatarsal perpendicular axis definitions

Cuneiform fitting (B)
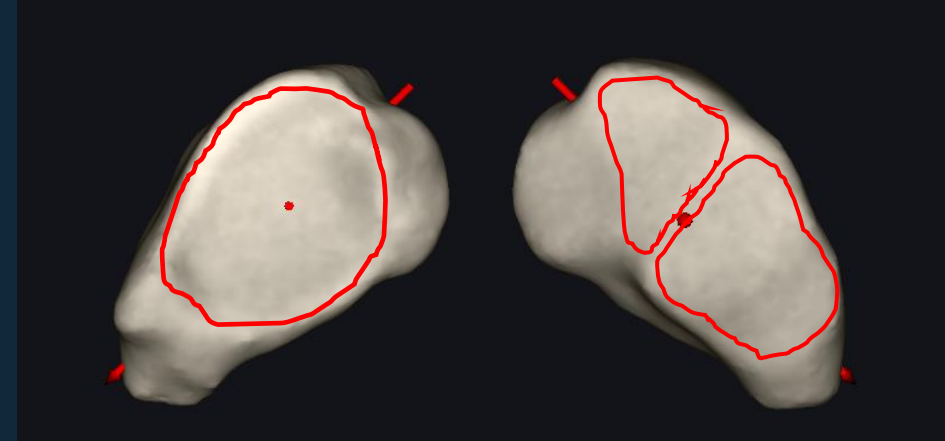
Medial and intermediate cuneiform axes

1. First axis goes through navicular – medial cuneiform articular surface weighted center point and through medial cuneiform – 1st metatarsal articular surface weighted center point

2. For perpendicular axes, a subset of a bone model surface is projected into a plane perpendicular to the models first axis. Robust line fitting routines are used to find a straight line representative for the projected data.

Navicular fitting (C)

Navicular axes

1. First axis goes through talonavicular articular surface weighted centerpoint and navicular – medial cuneiform – intermediate cuneiform articular surface weighted centerpoint

2. For perpendicular axes, a subset of a bone model surface is projected into a plane perpendicular to the models first axis. Robust line fitting routines are used to find a straight line representative for the projected data.

Talonavicular articular surface

Navicular – medial and intermediate cuneiform articular surfaces

Navicular and its perpendicular axes

Talus, Calcaneus fitting (other bones)

Alignment of talus and calcaneus

1. Longitudinal axis: The software scans bone and determines its cross section at various locations. Weighted center point is computed for each cross section. Robust line fitting routines are used to find a straight line representative for the cross section points. Additional projections of joint facets and tendon insertion are used to determine bone alignment.
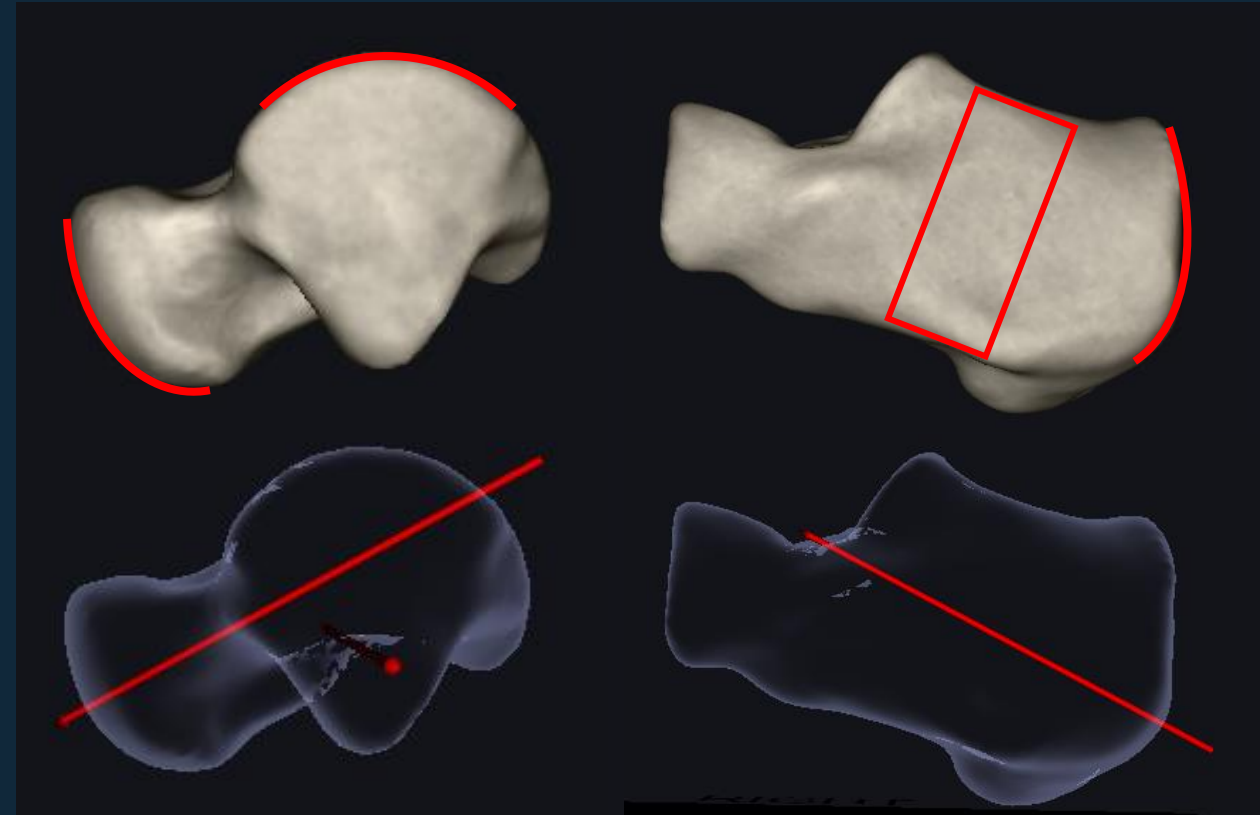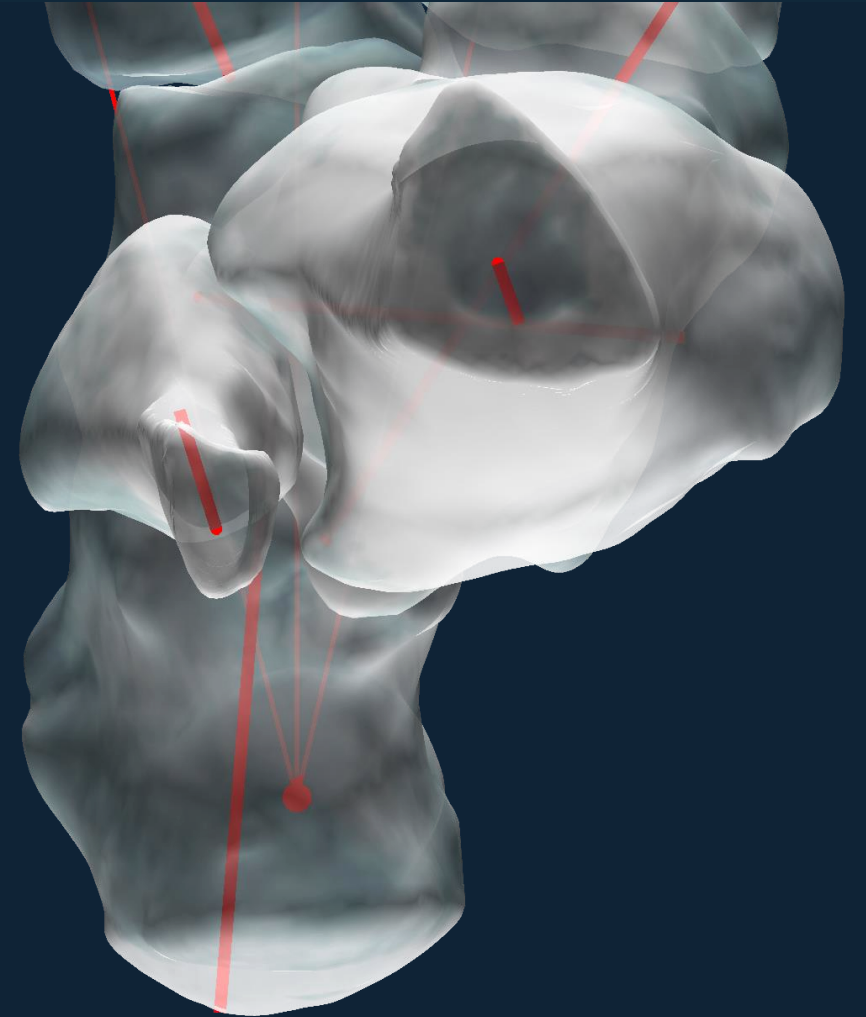
Making Medical Imaging Intelligent

MEASUREMENT DEFINITIONS

24.3.2020

Bonelogic Foot and Ankle measurements

1. All measures are calculated based on 2D projections of 3D axes
    - 2D projection viewing angle is determined based on imaging device projection coordinates

2. Measures are shown with + or − signs
    - Generally all measures are generated as positive angles
    - Certain measures of interest are distributed around zero with following sign convention:
        - Meary's angle (sagittal): negative towards pes planus, positive towards pes cavus.
        - Hindfoot moment arm and Saltzman view: negative towards varus, positive towards valgus
        - Lateral talar station: positive if talus is anterior to tibial longitudinal axis

DISIOR

Bonelogic Foot and Ankle measurements
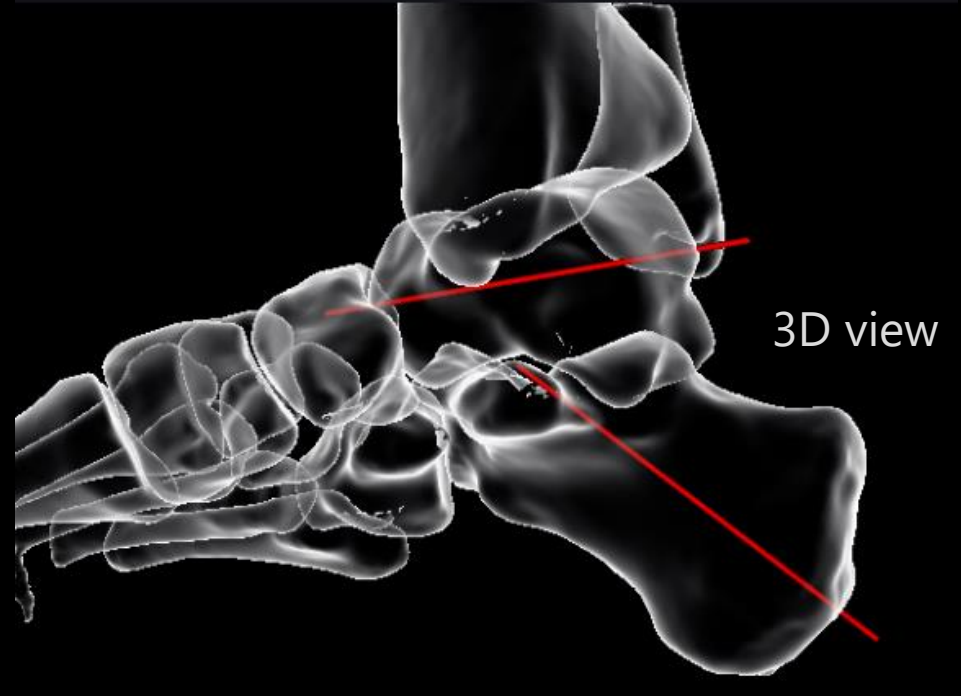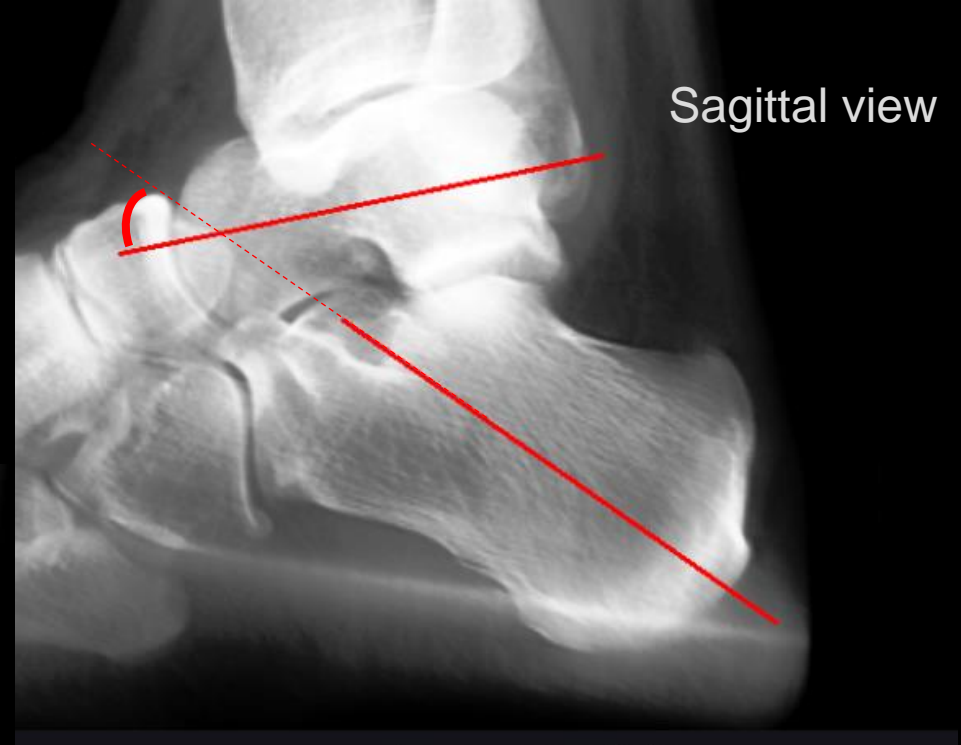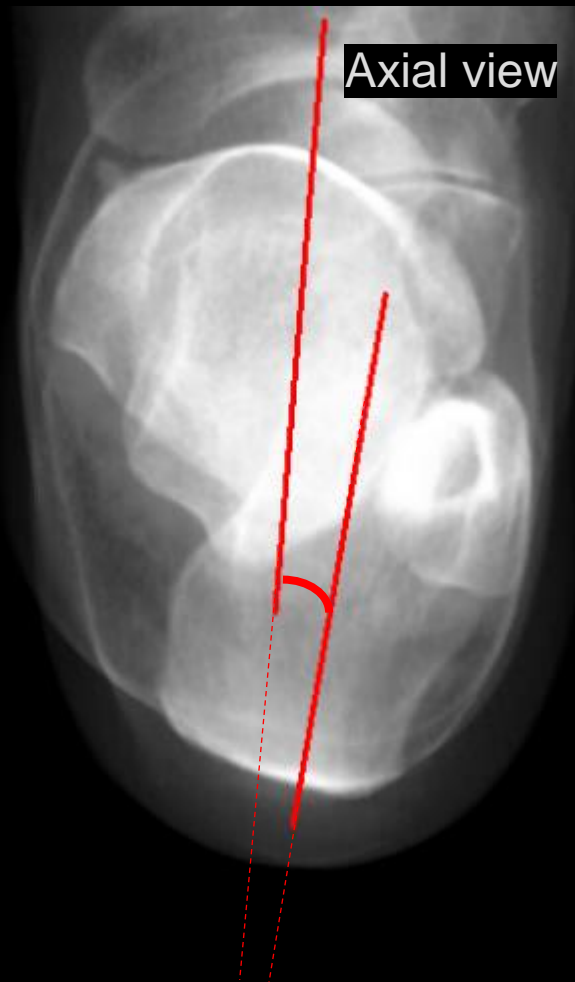
1-2. Meary's angle (sagittal-axial)
- Talus longitudinal axis
- 1st metatarsal longitudinal axis

Sagittal view

Axial view

3D view

DISIOR
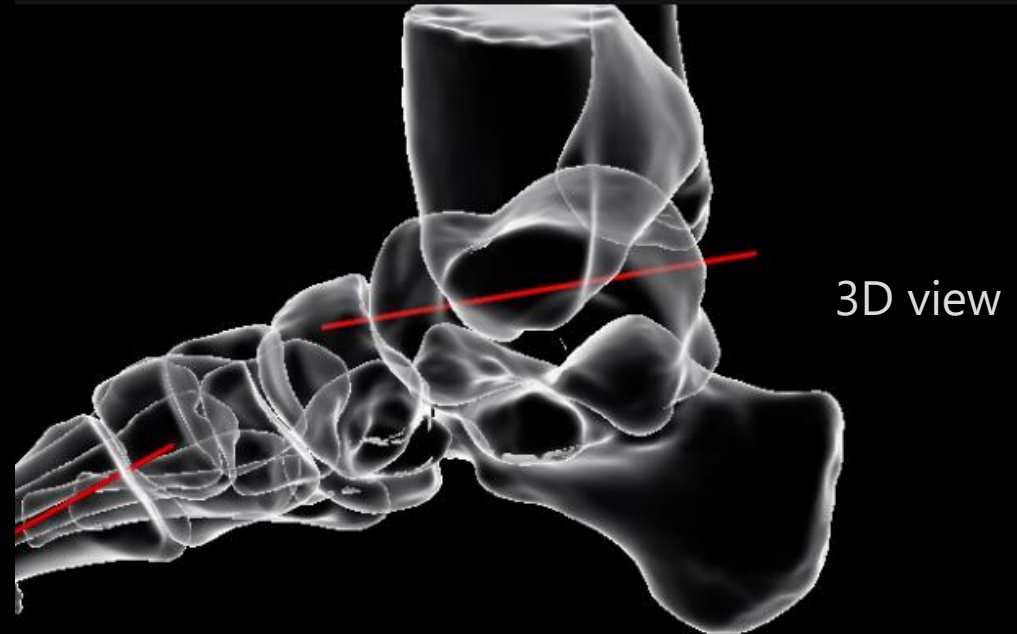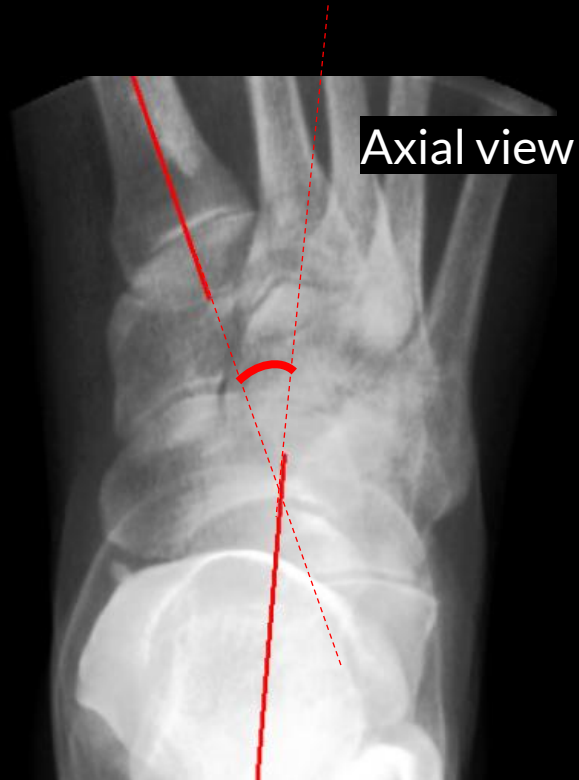
Bonelogic Foot and Ankle measurements

3-4. Talocalcaneal angle (axial view-sagittal view)
- Talus axis
- Calcaneus axis

Sagittal view

Axial view

3D view

DISIOR

Bonelogic Foot and Ankle measurements

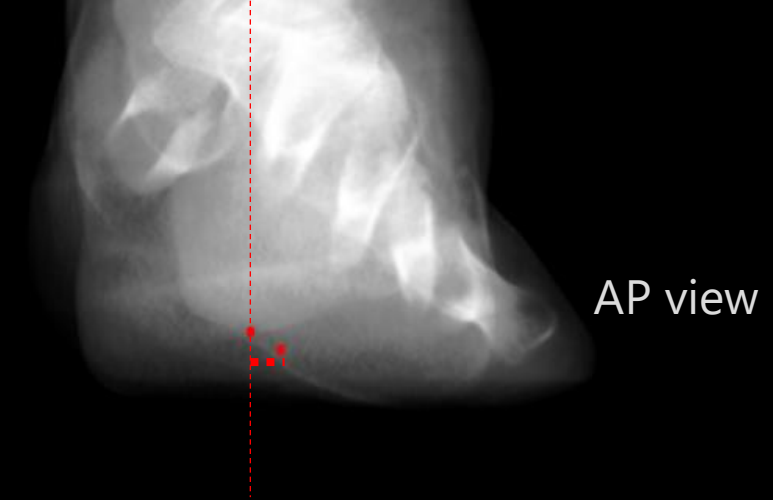5-6. Saltzman view (20deg-45deg)
- Tibia axis
- Calcaneus axis

45 deg view

20 deg view

3D view
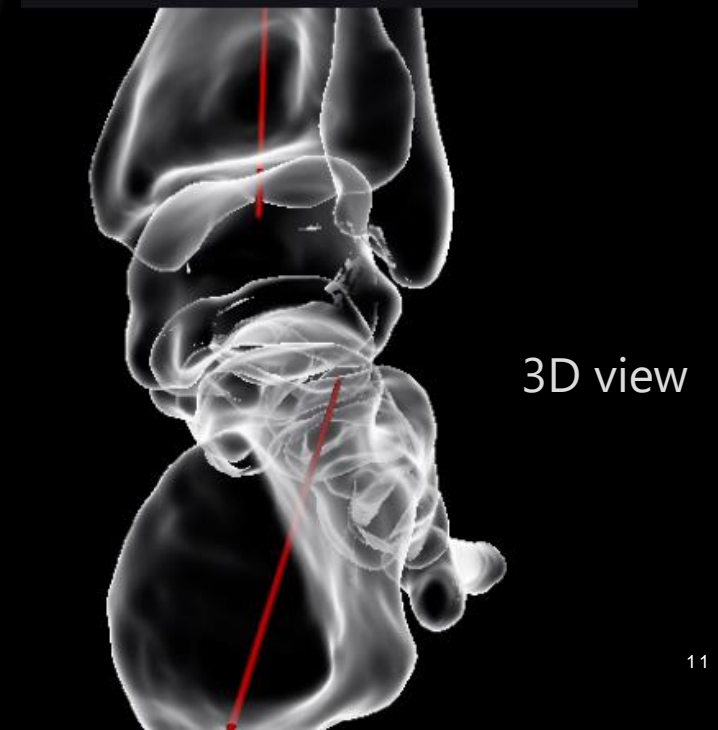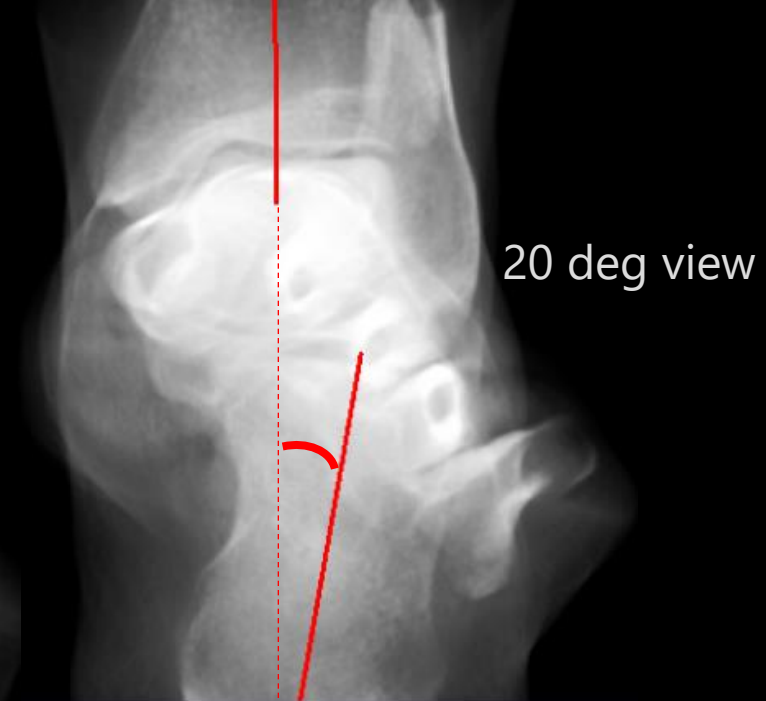
Bonelogic Foot and Ankle measurements

7. Hindfoot Moment Arm (posterior, in mm)
- Tibia longitudinal axis
- Inferior point of the calcaneus

AP view

3D view

DISIOR
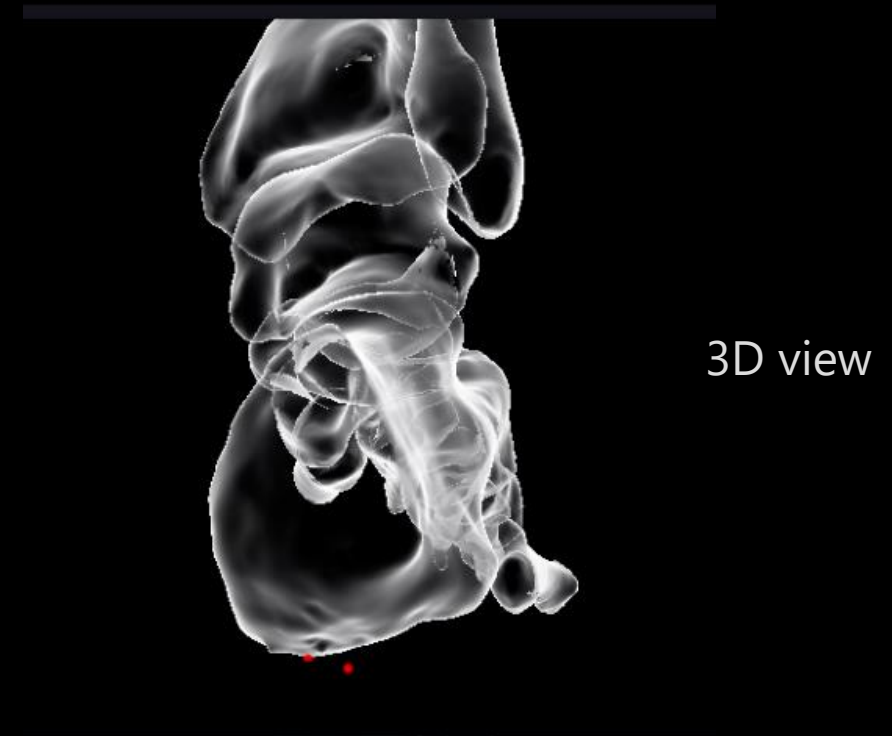
Bonelogic Foot and Ankle measurements

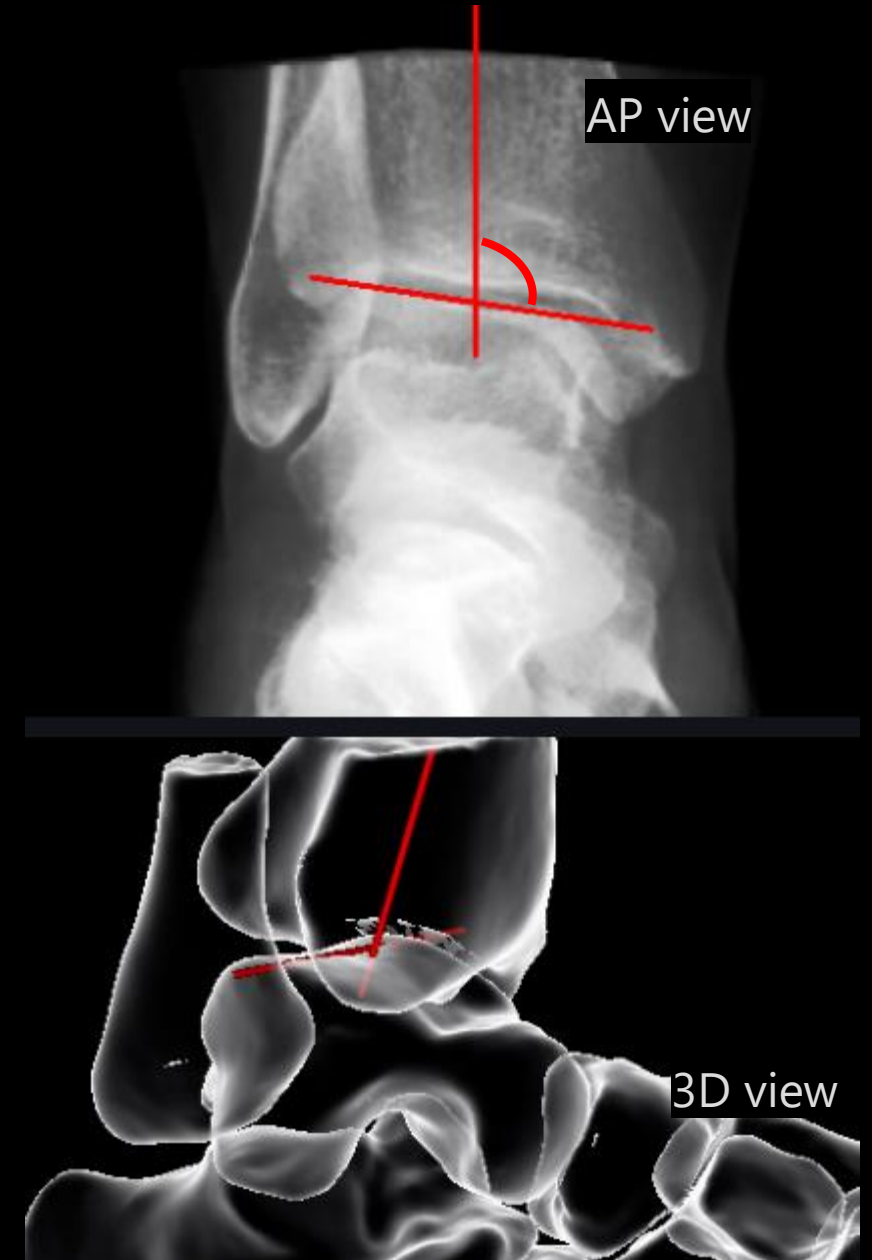8. Medial Distal Tibial Angle (MDTA)
- Tibia longitudinal axis
- Tibia distal articular surface mediolateral axis

3D view

DISIOR
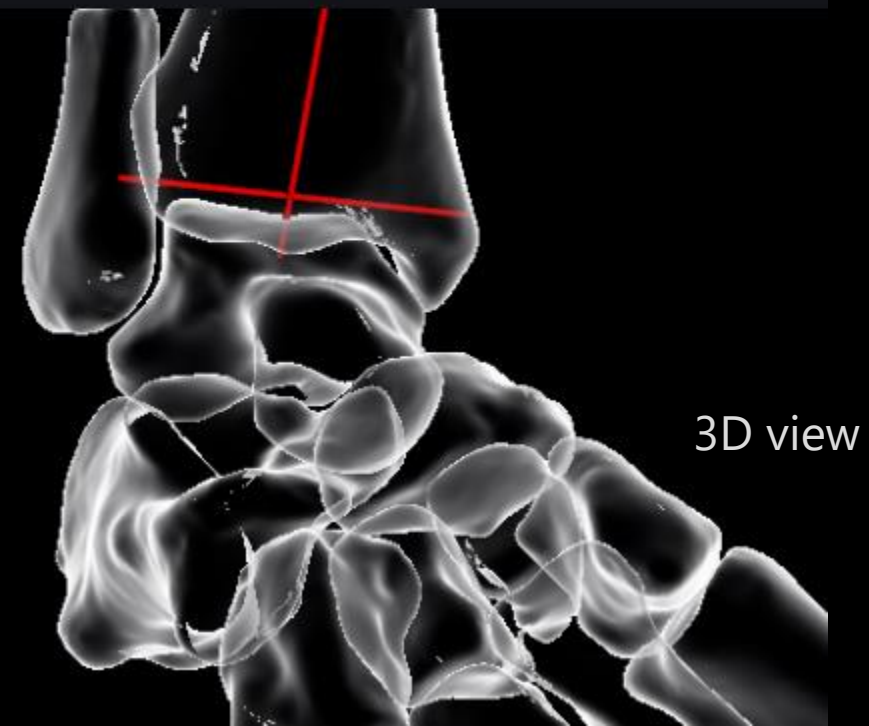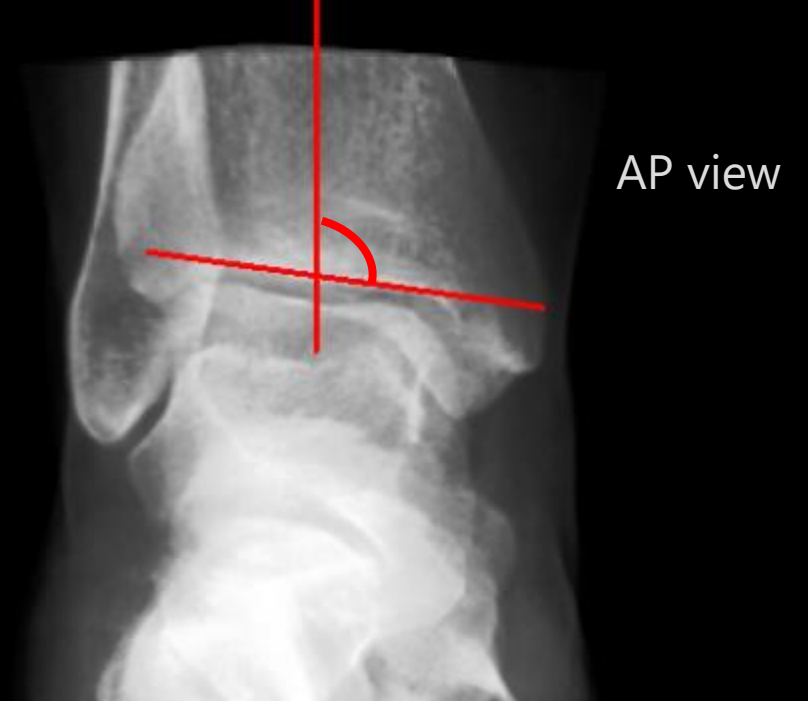
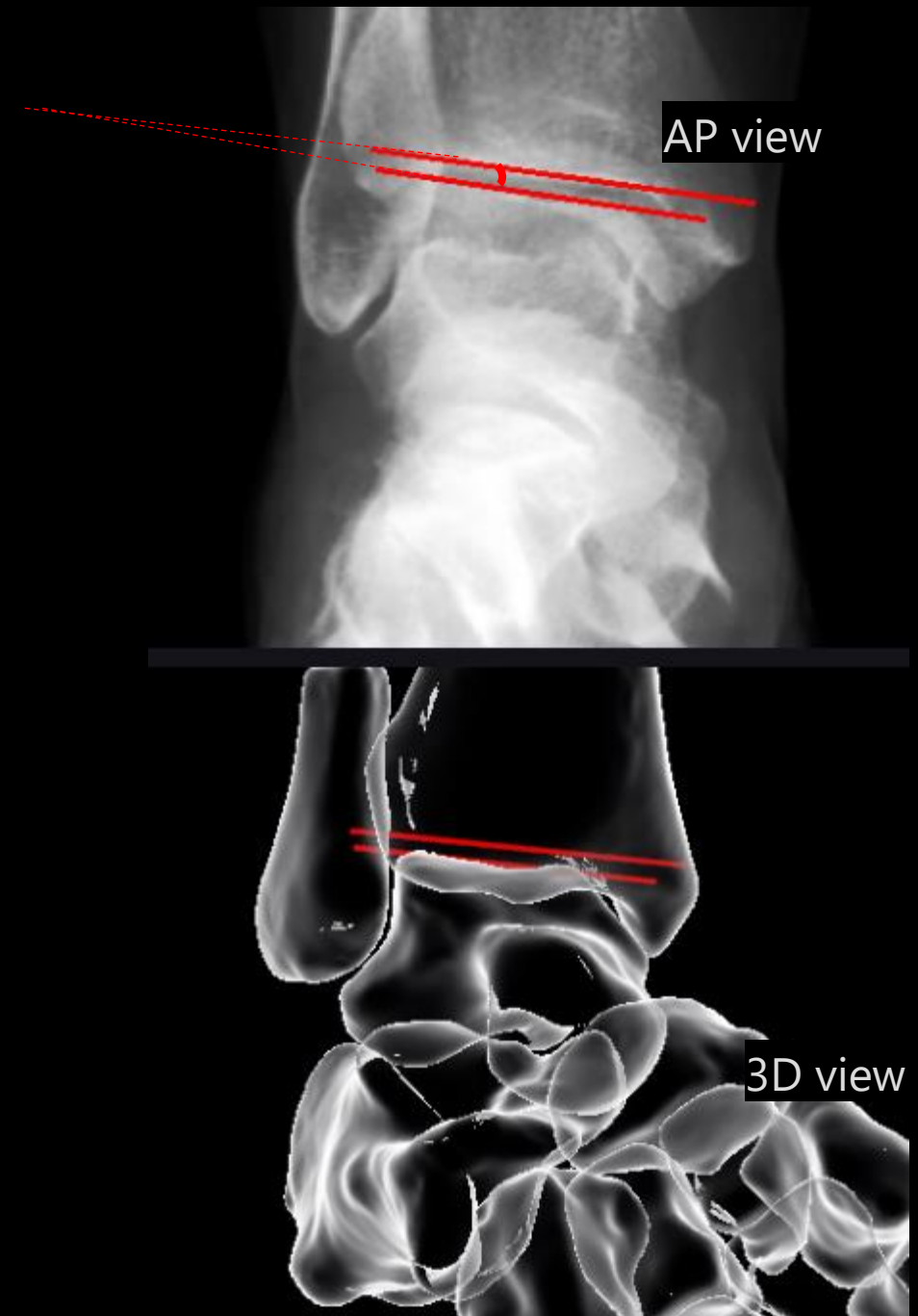# Bonelogic Foot and Ankle measurements

9. Medial Talar Articular Surface Angle
- Tibia longitudinal axis
- Talus trochlea articular surface axis

AP view

3D view

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Bonelogic Foot and Ankle measurements

10. Talar Tilt Angle (medial)
- Tibia distal articular surface mediolateral axis
- Talus trochlea articular surface axis

AP view

3D view

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Bonelogic Foot and Ankle measurements

11. Medial Talocrural Angle
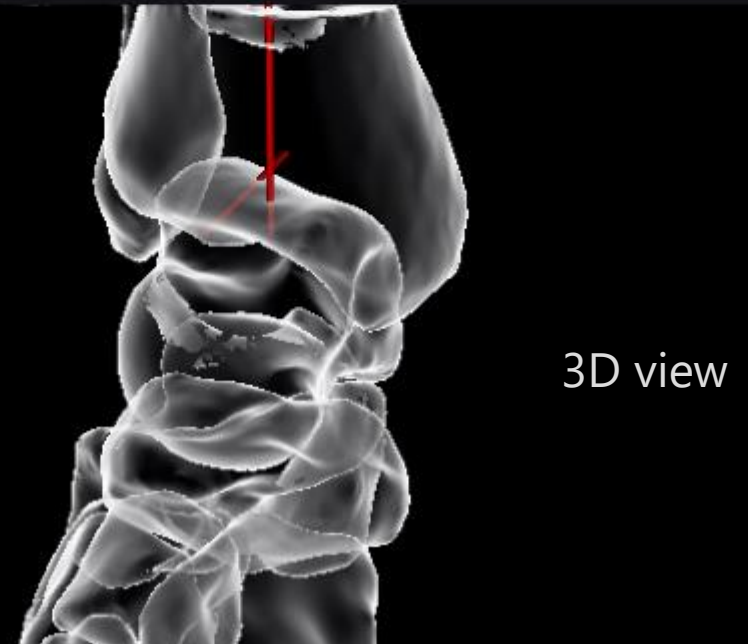- The axis connecting distal tips of lateral and medial malleoli
- Tibia distal articular surface mediolateral axis

AP view

3D view

DISIOR
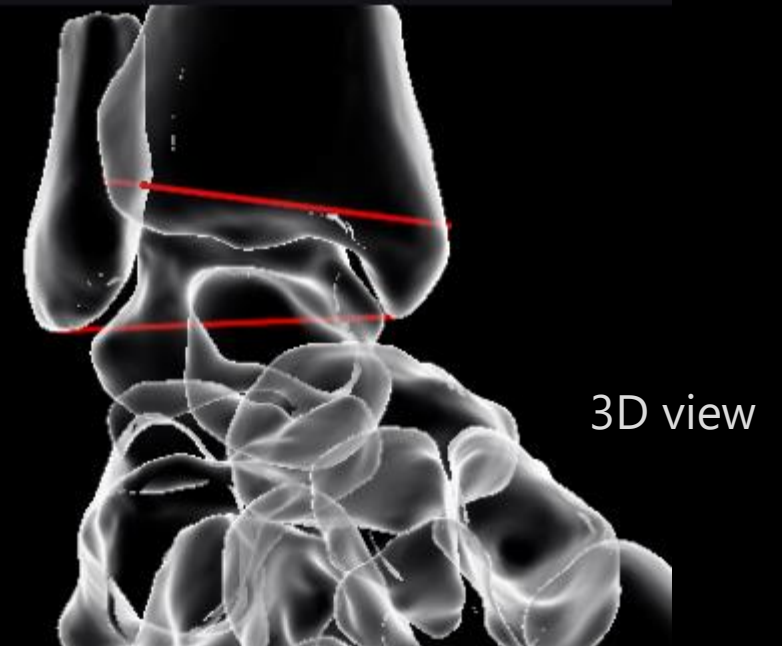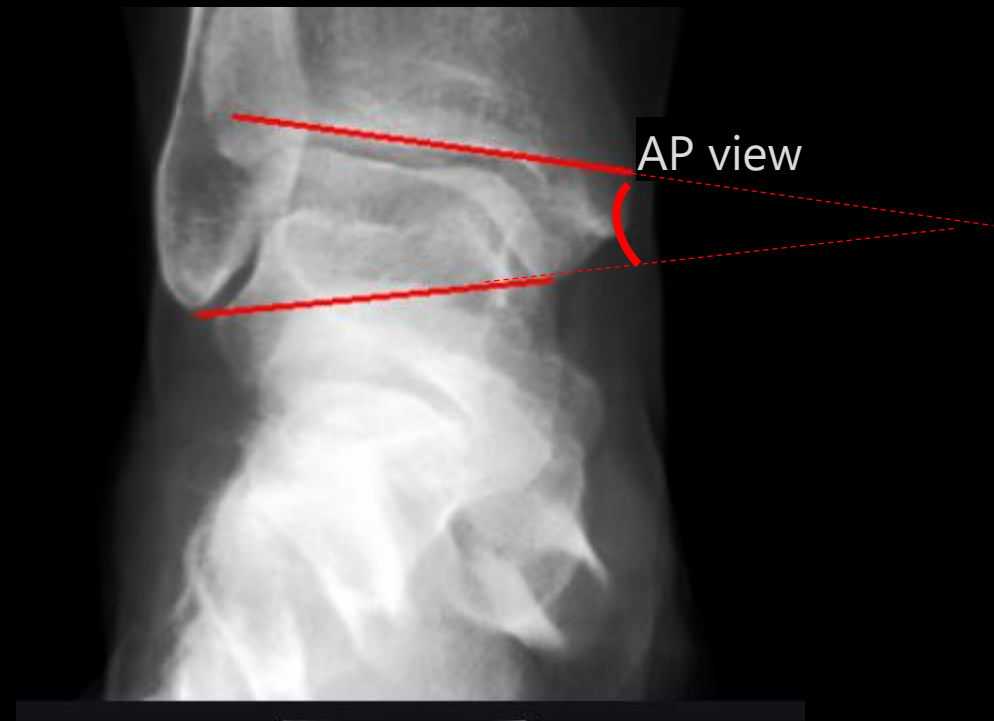
Bonelogic Foot and Ankle measurements

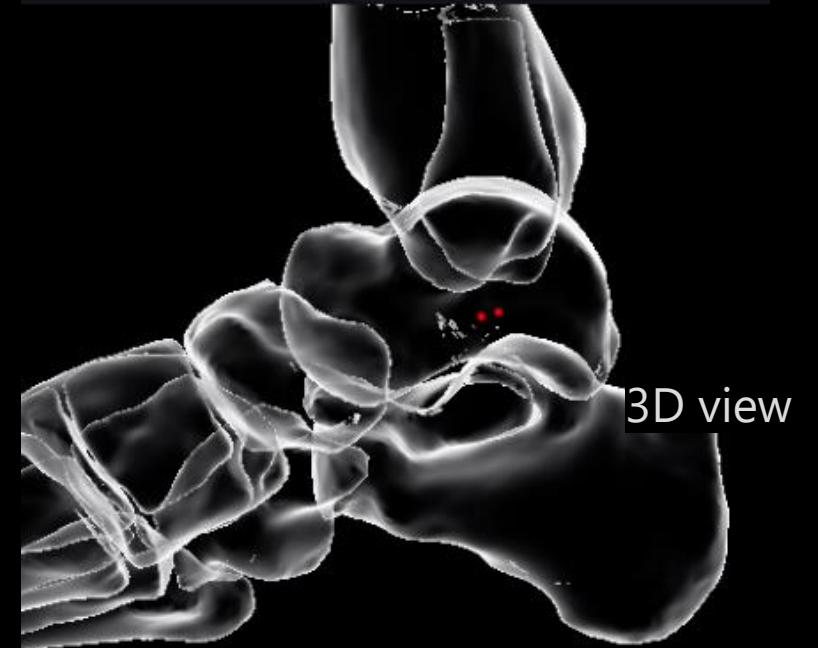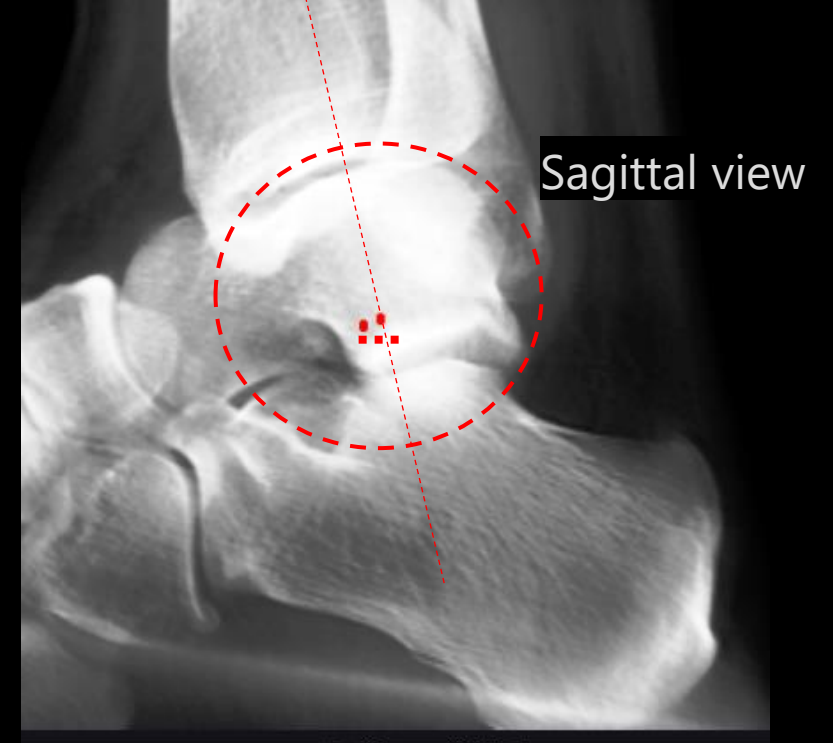12. Tibial Lateral Surface Angle (sagittal)
- Tibial longitudinal axis
- Anteroposterior axis of tibia distal articular surface

3D view

DISIOR

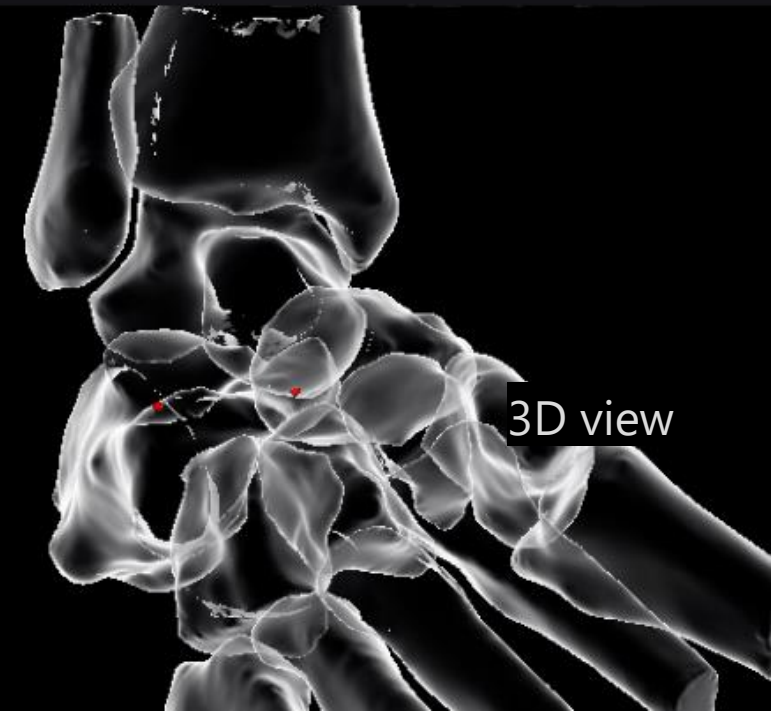# Bonelogic Foot and Ankle measurements

13. Lateral Talar Station (sagittal, in mm)
- Tibia longitudinal axis
- Talus trochlea articular surface axis

Sagittal view

3D view

DISIOR

Bonelogic Foot and Ankle measurements

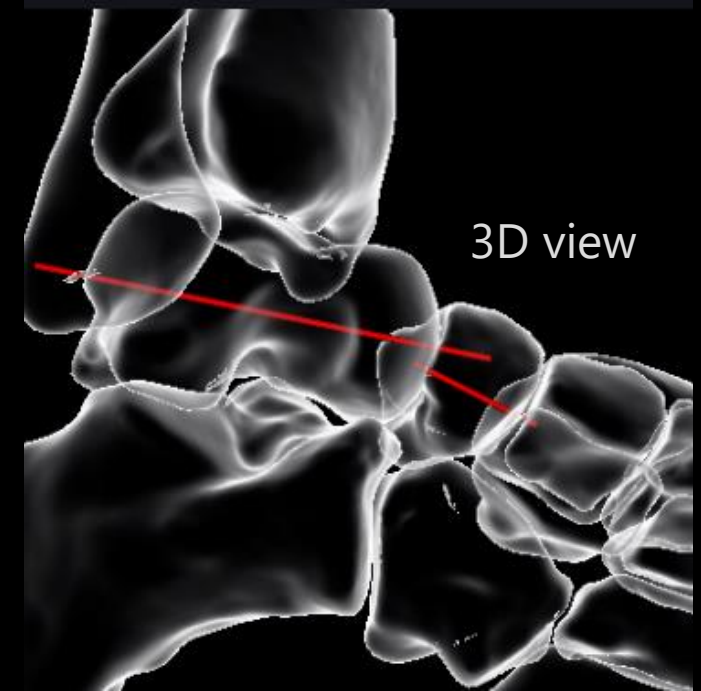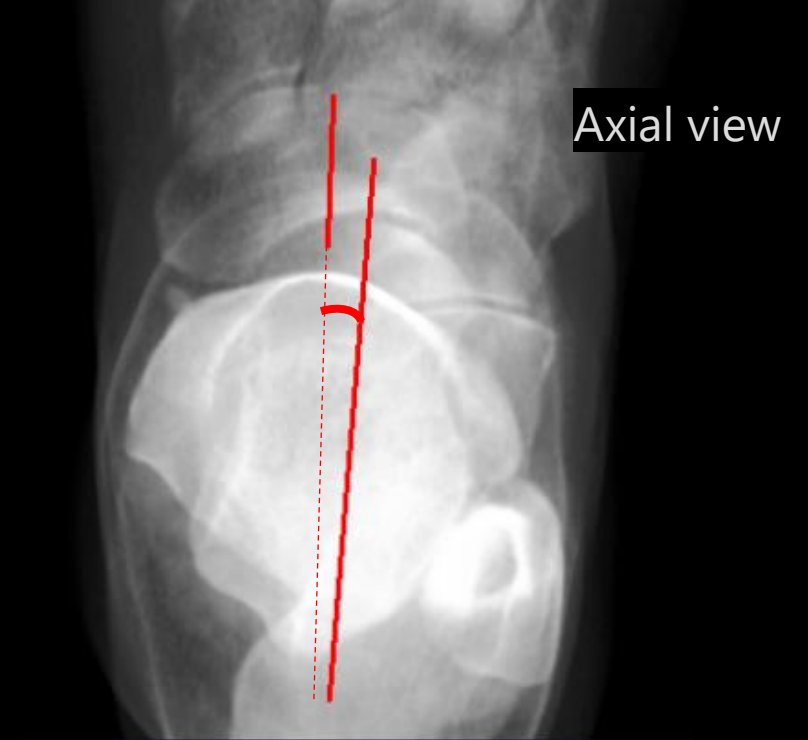14. Lateral Talocalcaneal Coverage (sagittal, in mm)
- Talus head most inferior point
- Calcaneus anterior column most superior point
- Positive when calcaneal point is above talar point, otherwise negative

3D view

DISIOR

Bonelogic Foot and Ankle measurements
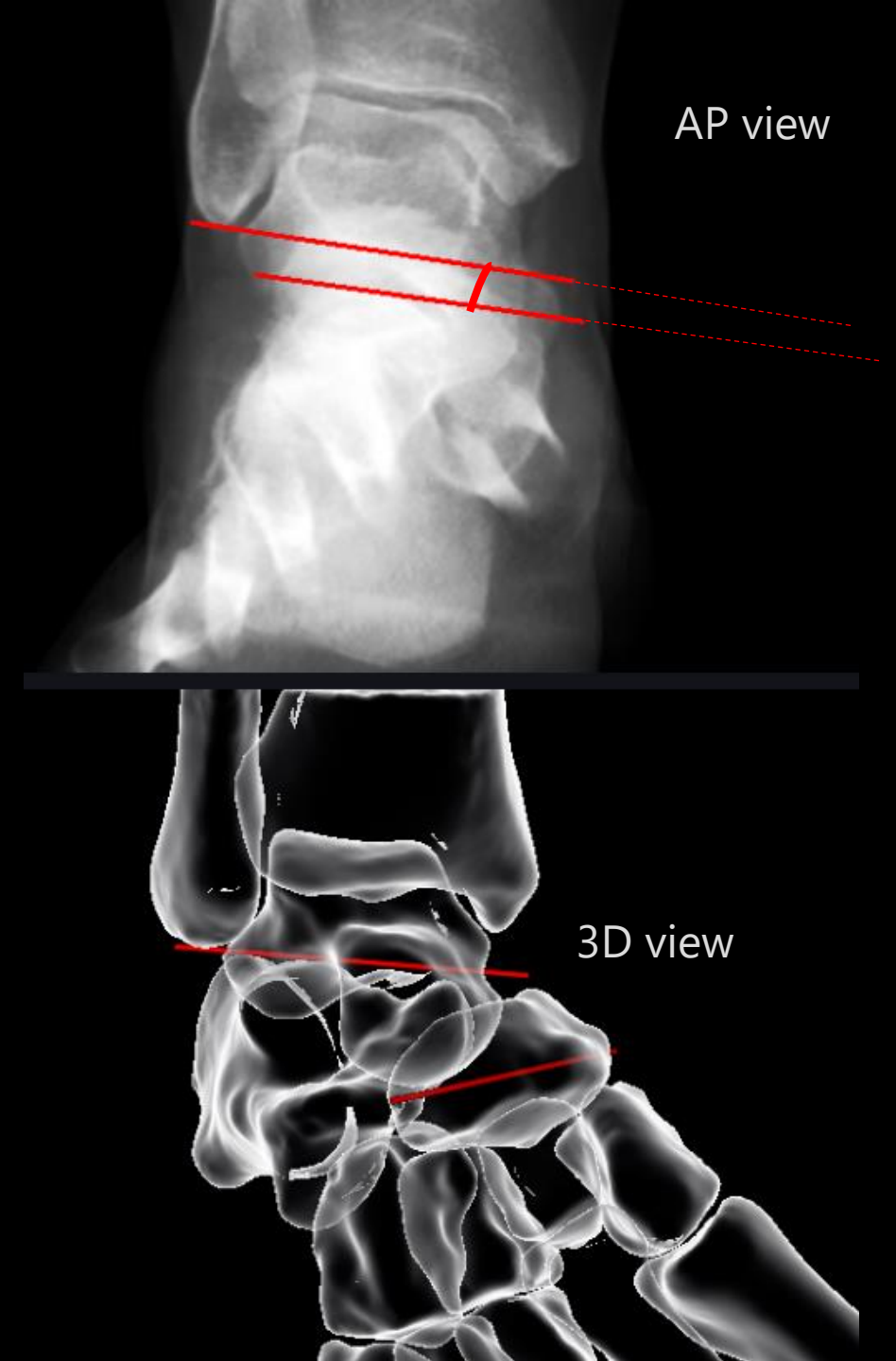
15. Talonavicular coverage (axial view)
- Talus anterior-posterior axes
- Navicular axis

Axial view

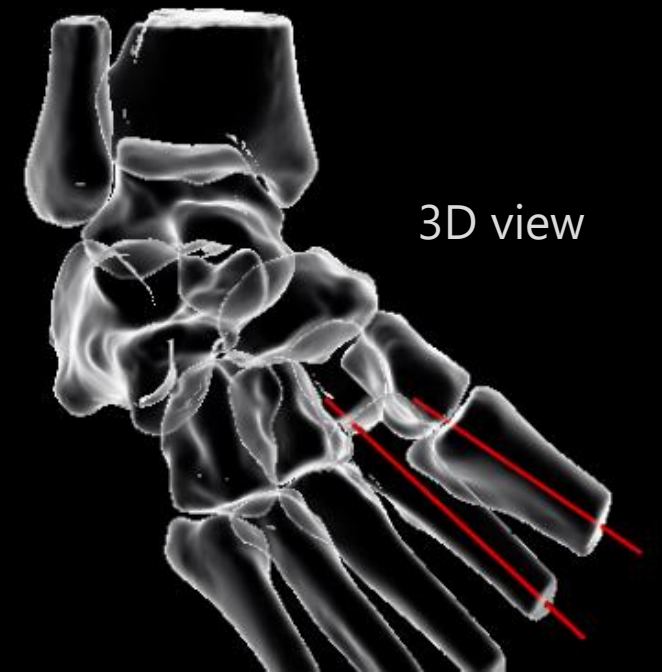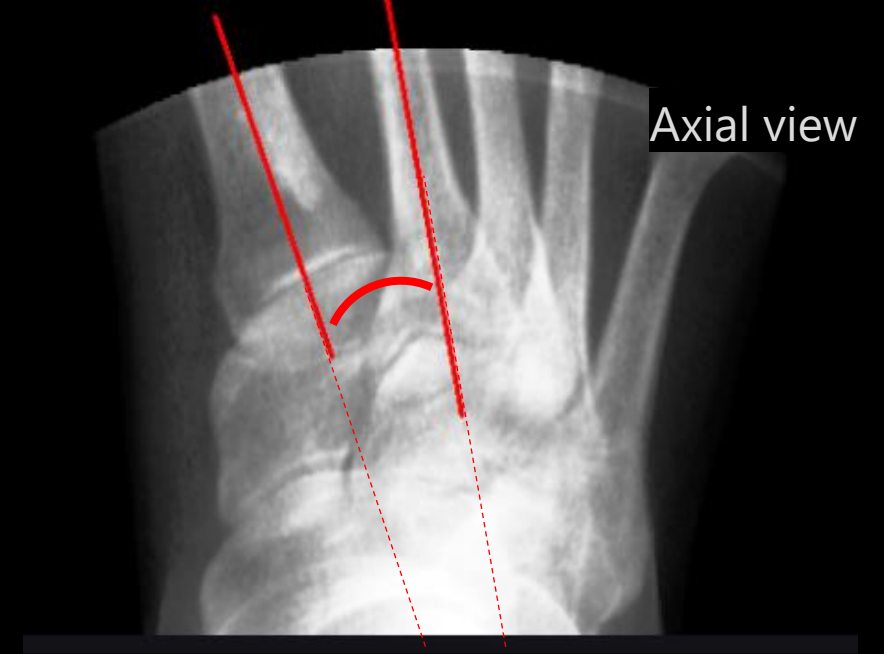3D view

Bonelogic Foot and Ankle measurements

16. Talonavicular torsion
- Talus mediolateral axes
- Navicular perpendicular axis

AP view

3D view

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Bonelogic Foot and Ankle measurements

17-18. Intermetatarsal angles (sagittal-axial)
- Metatarsal longitudinal axis

Axial view

Sagittal view
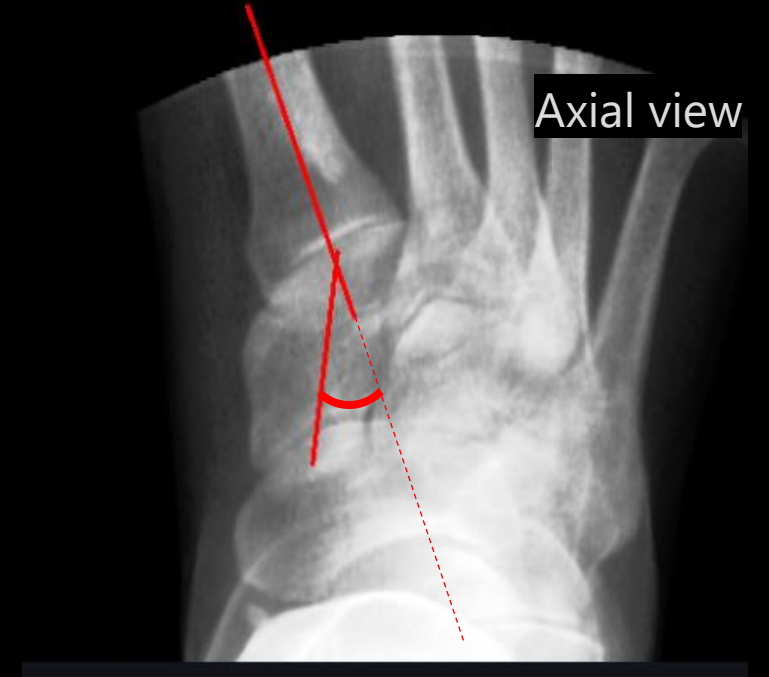

3D view

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Bonelogic Foot and Ankle measurements

19-20. Tarsometatarsal angles (sagittal-axial)
- Metatarsal longitudinal axis
- Cuneiform longitudinal axis

Axial view

Sagittal view

3D view

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