Combined Tibial and Fibular Measurement for the Classification of Supramalleolar Deformity

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My disclosure is in the Final AOFAS Mobile App.
I have a potential conflict with this presentation due to: Acumed, Smith & Nephew

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My disclosure is in the Final AOFAS Mobile App.
I have no potential conflicts with this presentation.
Methods

- Multi-center retrospective case review
- Inclusion criteria: distal tibia +/- fibula deformity correction for ankle arthritis (joint preservation surgery), acute or gradual correction, symptomatic distal tibia +/- fibula deformity
- Exclusion criteria: neuroarthropathy, tibial nonunion, osteomyelitis, ankle fusion, TAA, tibial diaphyseal deformity
Subject Population

- 24 Subjects were identified that met criteria
- 19 Subjects had adequate radiographs
- Age: 8 - 59 (mean 40.3)
- 12 Male, 7 Female
- Diagnoses: 15 ankle arthritis, 12 tibial malunion, 6 congenital deformity, 2 ankle instability, 1 fibula nonunion
- 17 standard film radiographs, 2 digital
Methods

- Radiographic measurements of both lower extremities
- Contralateral limb used as comparison unless deformed
- Measurements within 5 degrees/5mm considered equal
- AP and lateral views of ankle to include tibia
- All measurements made by 2 people at separate times: author and trained research assistant.
Measurements

- AP view (9): LDTA, talocrural angle - TCA, fibular-transmalleolar angle - FTMA, fibular length, fibular tip to axis length, fibular angle, tibial deformity, CORA level of tibia and fibula
- Lateral view (5): ADTA, fibular angle, tibial deformity, CORA level of tibia and fibula
- Tibial axes: proximal anatomic axis (2 mid-diaphyseal points 10 cm apart), distal mechanical axis
- Fibula axes: proximal anatomic axis (2 mid-diaphyseal points in distal ½), distal line based on 2 points (1 cm above plafond, widest point distal to plafond)
AP and Lateral View Measurements

Fibular Angle

- LDTA
- TCA
- FTMA

Fibular length

- Tib. CORA
- Fib. CORA
- ADTA

Fib. Tip to Axis Length
Classification

- **Type 1: Equal Deformity**
  - Tibia and Fibula equally deformed in regard to normal limb

- **Type 2: Unequal deformity**
  - 2a: Tibia and Fibula both deformed, to unequal degrees in relation to normal limb
  - 2b: Tibia only deformed
  - 2c: Fibula only deformed
Classification Examples

Type 1: Equal Tib/Fib
Type 2a: Unequal Tib/Fib
Type 2b: Tibia Only
Type 2c: Fibula Only
Results:

• 40% of Unequal deformities were corrected to Equal
• 40% of Equal deformities stayed Equal post-operatively
• 2 Unequal-Tibia deformities were corrected into Unequal-Fibula deformities
• 2 pre-op and 2 post-op classification were unable to be determined due to inadequate radiographs
• Fibular tip-to-axis measurements had the highest correlation to the magnitude of AP view fibular deformity ($\rho = .76$)
Conclusions

1. This study demonstrates a simple 4 part classification system for distal tibia-fibula deformity

- Radiographic visualization of the fibula is essential

- Contralateral (normal) X-rays assist in defining fibula alignment

- Utilizing fibular anatomic axes was a useful method to describe deformity

- Further study will analyze the usefulness of this system on surgical planning and clinical results
References

- Beaman, Domenigoni. Distraction and deformity correction for ankle arthritis. LLRS, Toronto, 2004
- Workman, Beaman, Gellman. Ankle joint distraction for osteoarthritis: Results and prognostic indicators. Inman lectures, UCSF, 2007