The Biomechanical Evaluation of Revision First Metatarsophalangeal Arthrodesis: A Cadaveric Study

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Disclosures

• My disclosure is in the Final AOFAS Mobile App.

• I have a potential conflict with this presentation due to:
  – The study was sponsored by Orthohelix/Tornier
  – One or more authors are paid consultants of Tornier
Study Goals

1) To investigate stiffness of a dual mini-plate construct versus a standard MP arthrodesis plate in the setting of severe bone loss

2) To evaluate arthrodesis interface motion when an interpositional graft is used.
Materials/Methods

- Twelve matched pairs of fresh, frozen cadaveric foot/ankle specimens
- Interpositional graft/gap model (saw bone)
- 6 matched pairs (no interpositional graft)
  - Dual mini plate
  - Standard revision MP fusion plate
- 6 matched pairs (+ interpositional graft)
  - Dual mini plate
  - Standard MP plate
Materials/Methods

• Static testing
• Cantilever bending model
  – 6 mm/min until failure
  – Failure defined as: 5 mm of plantar gapping or hardware failure
• Extensometers used to measure displacements at healing interfaces
Materials/Methods

• Data Collected
  – Load vs Displacement/ Load vs Plantar gapping

• Data Calculated
  – Stiffness
  – Strain at the arthrodesis interface
    • Proximal/distal interfaces (+ interpositional graft)
    • Singular interface (-interpositional graft)
Results

• No significant difference in stiffness between the groups

• Proximal interface strain,
  – + interpositional graft = 26% (p < 0.05)
  – - interpositional graft = 16%

• Failure most commonly occurred at proximal interface
Conclusions

- No construct differences were observed in terms of stiffness in a novel gap model MP arthrodesis construct with and without interpositional saw bone graft.
- The dual mini-plate is an alternative option for fixation when asymmetric bone loss is either seen on the phalangeal or metatarsal head side.
- The high degree of plantar gapping of the proximal interface with the placement of the bone block may have implications for healing potential across the arthrodesis site.
References


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