Biomechanical evaluation of metatarsal osteotomies for Hallux Rigidus. A cadaveric testing

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Disclosure

• **No conflicts to disclose**
• Biomechanical evaluation of metatarsal osteotomies for Hallux Rigidus. A cadaveric testing
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• Our disclosures are in the AOFAS mobile App.
• We have no potential conflicts with this presentation
Introduction

• Osteotomies for hallux rigidus
  – Alternative to fusion or cheilectomy

• Why should we use Osteotomies?
  – Following the idea that a shortened plantar fascia distorts joint biomechanics, lowering the center or rotation and restricting range of motion (ROM)

• Osteotomy objectives:
  – Joint decompression
  – Recover joint kinetics, normal center of rotation and ROM
  – Delay fusion and other procedures

Shariff R, Myerson MS. Foot Ankle Clin. 2015 Sep;20(3):493-502
Hypothesis

• In a hallux rigidus biomechanical cadaveric model, osteotomies of the first metatarsal decrease metatarsophalangeal (MTP) joint stiffness and improve the MTP range of motion.
Methods

• Study conditions
  1. Control (intact)
  2. Hallux Rigidus cadaveric model (no osteotomy, shortened plantar fascia)
  3. Hallux rigidus model, with retrocapital vertical metatarsal osteotomy achieving 5 mm of shortening
  4. Same as above, but osteotomy achieves 5 mm of lowering of the distal fragment
  5. Same as above, but osteotomy achieves 5 mm of shortening AND 5 mm of lowering
Methods

- Oxford foot model: all extensors and flexor tendons under 50% stance phase tension phorce)

- For each study group
  - Ciclic pull of EHL with tensile testing machine (Kinetecniks®, Santiago Chile)
    - evaluated MTP stiffness
    - evaluated MTP ROM
      - 8 high definition cameras

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Results

• Condition of 5 mm head shortening AND lowering
  – MTP stiffness returns to normal values

• Conditions with shortening OR lowering alone
  – MTP stiffness still increased

• All osteotomies recovered MTP ROM to normal values
Discussion

• Dorsal Queilectomy and/or Moberg Osteotomy are classically indicated for Hallux Rigidus condition
  – Creating space for the hallux to glide and rotate
  – They DO NOT try to recover normal Joint biomechanics
• No proved Hallux Rigidus Cadaveric model exists
• In this setting, a previously developed Hallux Rigidus cadaveric model with a shortened plantar fascia was used
Discussion

• Osteotomies for hallux rigidus should shorten AND descend the metatarsal head to increase MTP range of motion and decrease MTP stiffness

• Osteotomies that only shorten OR descend alone only improve ROM, but not MTP stiffness

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References


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