

December 11-14, 2008



***Surgical Review:***

**Equinus  
Deformity**

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## Equinus: The Root Of All Evil?

- Non-Diabetic Foot
  - Pes Planus
  - Hallux Abducto Valgus
  - Plantar Fasciitis
  - Neuromas
- Diabetic Foot
  - Charcot
  - Plantar forefoot ulcerations



## True Equinus



## Pes Planus Presentations



## The Evidence: Treatment

- Hill L (2003)
  - Survey of procedures conducted for Stage II PTT dysfunction
  - Hypothetical patient
  - Respondents were academic foot and ankle surgeons (104)
- 70% would address the equinus deformity
  - ◆ 22% → gastrocnemius recession
  - ◆ 36% → TAL
  - ◆ 12% → dependent on physical exam

Hiller L, Pinney SJ. Surgical treatment of acquired flatfoot deformity: what is the state of practice among academic foot and ankle surgeons in 2002. Foot Ankle Int. 2003;24(9):701-5.

## DIABETES AND EQUINUS

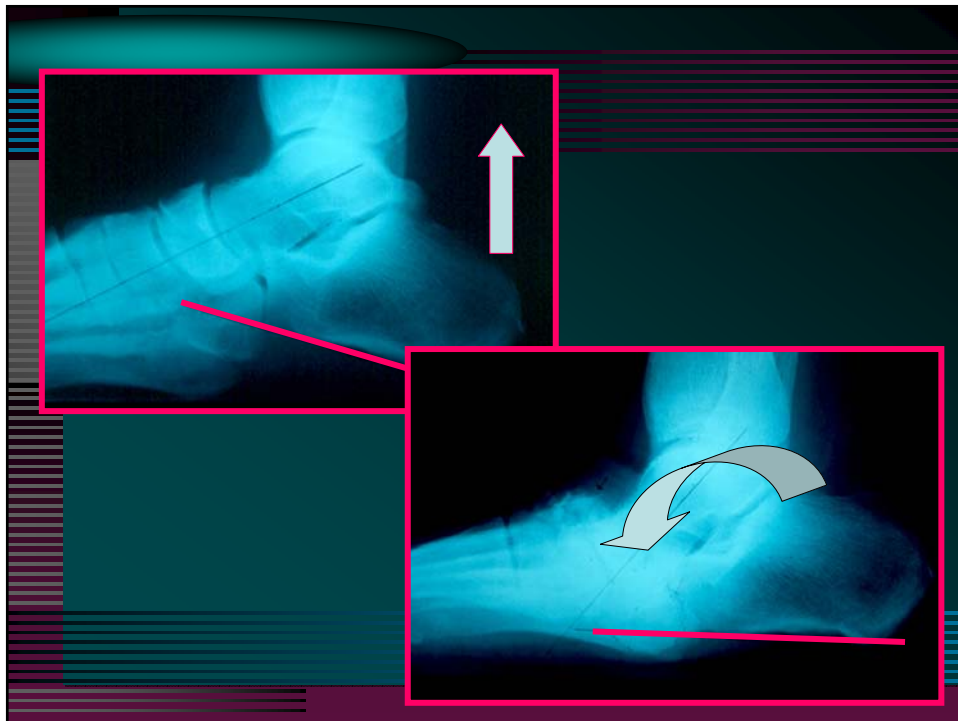
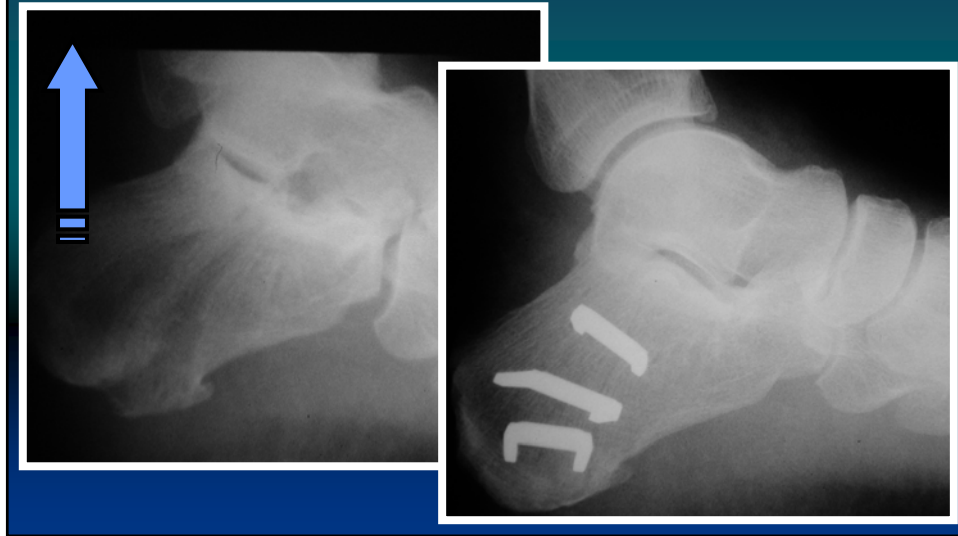
- **Lavery, Armstrong and Boulton**
  - JAPMA – 2002 (10.3% Prevalence)
- **Van Gils, et. al.**
  - Clin. Pod Med and Surg. - 2002
- **Grant et. al.**
  - JFAS, 1997
    - Increased Packing Density of Collagen Fibrils
    - Abnormal Morphology
    - Increased Collagen Thickening





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## Diabetic Charcot Arthropathy O.R.I.F. – Calcaneal Fracture

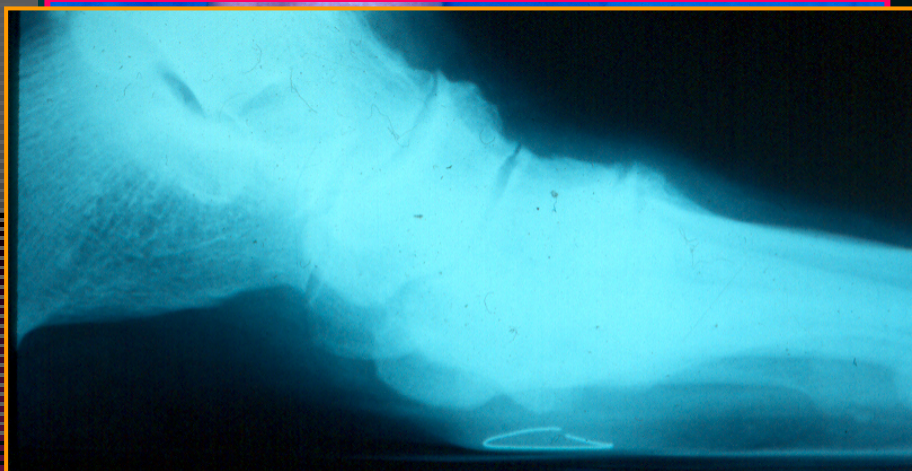


## EQUINUS AND FORE/MID ULCERS

- **Biomechanical Abnormalities and Ulcerations of the Great Toe in Patients with Diabetes**
  - Bofelli et.al., JFAS 2002
- **Plantar Forefoot Ulcerations with Equinus Deformity in Diabetic Patients: The Effect of Achilles Lengthening and Total Contact Casting**
  - Lin et.al., Orthopedics, 1996
- **The Forefoot to Rearfoot plantar pressures Ratio is increased in Severe Diabetes Mellitus...**
  - Caselli, Diabetes Care, 2002
- **Biomechanical Treatment Approach to the Diabetic Plantar Ulceration: A Case Report**
  - Mueller and Diamond, Physical Therapist, 1988

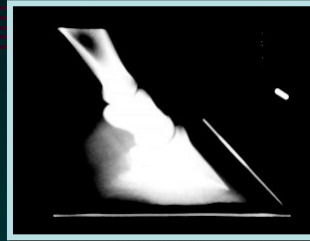


## DRAMATIC EFFECT OF ACHILLES



## Defining Equinus

- **Classic Root definition:**
  - “The minimal range of ankle joint dorsiflexion that is necessary for normal locomotion is 10°”
- **Practical definition:**
  - Inability to passively dorsiflex the foot to greater than neutral at the ankle joint



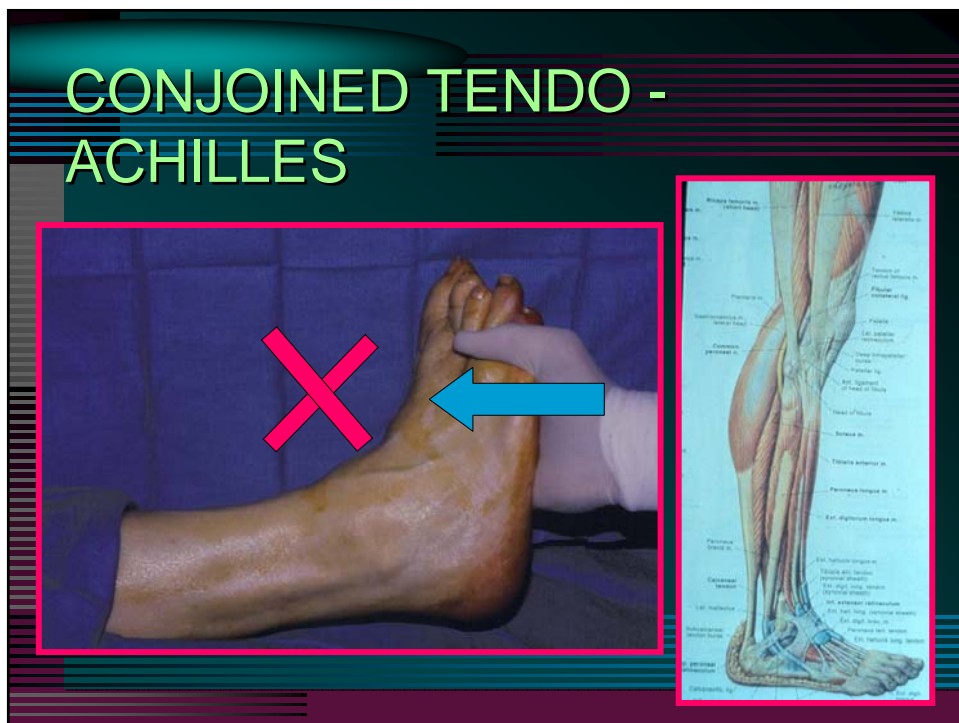
Root ML, Orien WP, Weed JH. Normal and abnormal function of the foot, Clinical biomechanics, vol 2. Los Angeles, Clinical Biomechanics Corp, 1977 pp 37-41.

## Types of Equinus

- **Non-Spastic**
  - Osseous
  - Soft Tissue
    - Gastroc-Soleal
    - Gastrocnemius
- **Spastic**



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## Definition of a “Hill-Billy”



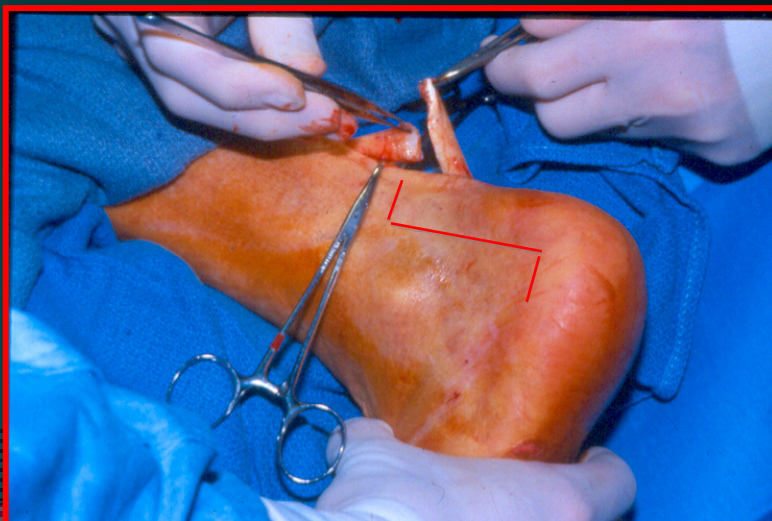
## OPTIONS FOR LENGTHENING

- **Open TAL**
- **Semi-open TAL**
- **Percutaneous TAL**
  - Two, Three Cuts
  - Transverse Tenotomy
- **Gastroc Recession**

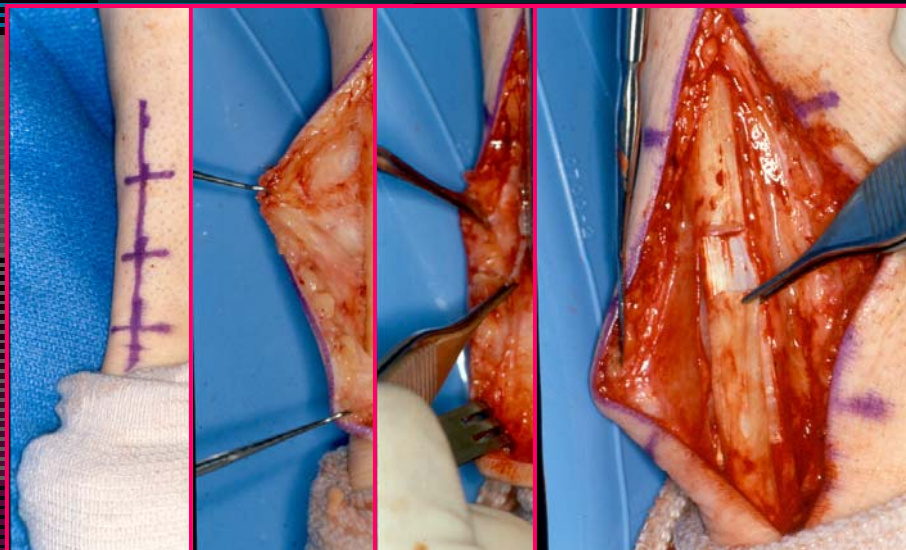




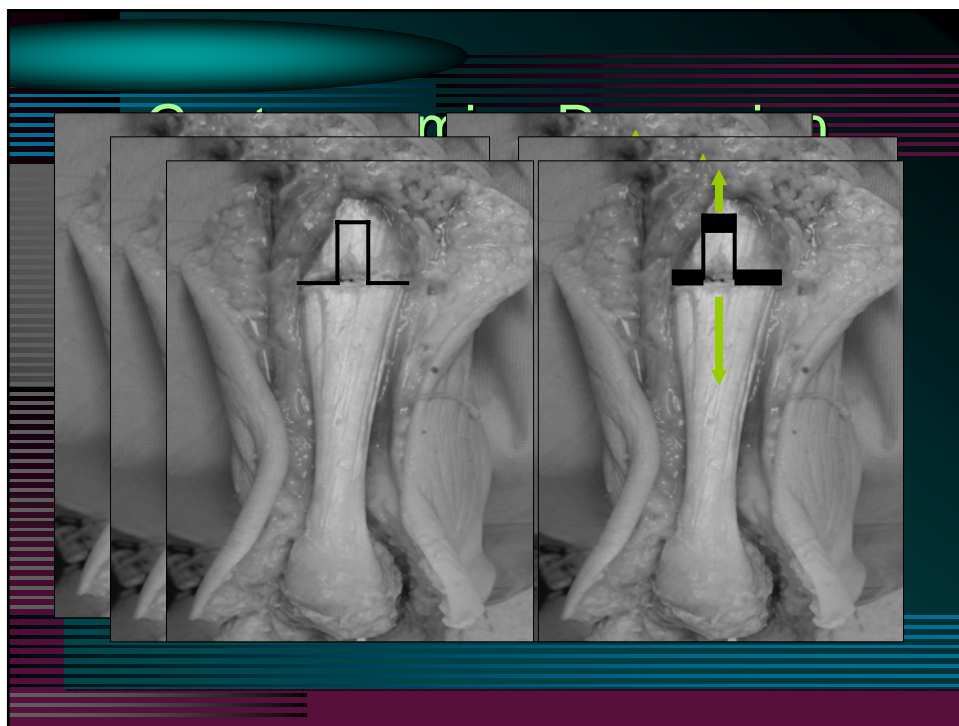
## STANDARD APPROACH



## MEDIAL APPROACH



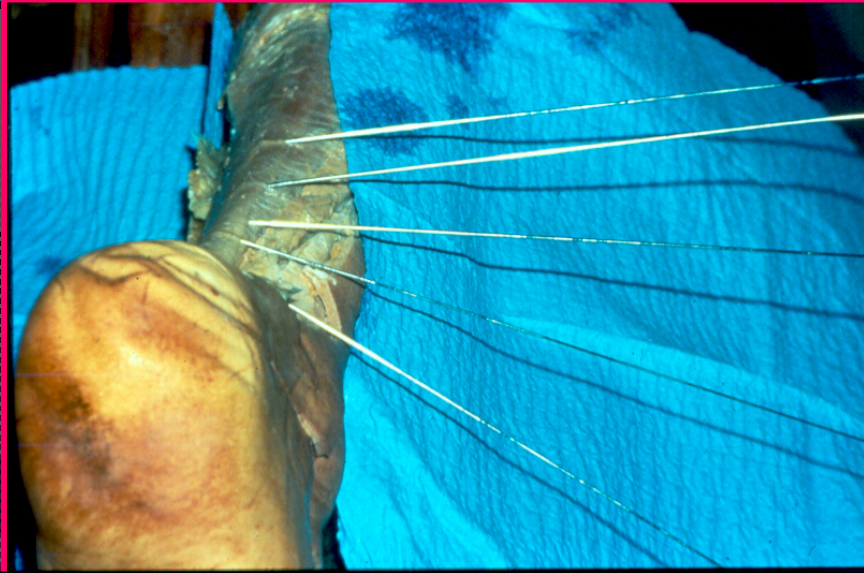
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## Gastrocnemius Recession



## TORSION OF THE TENDO-ACHILLES



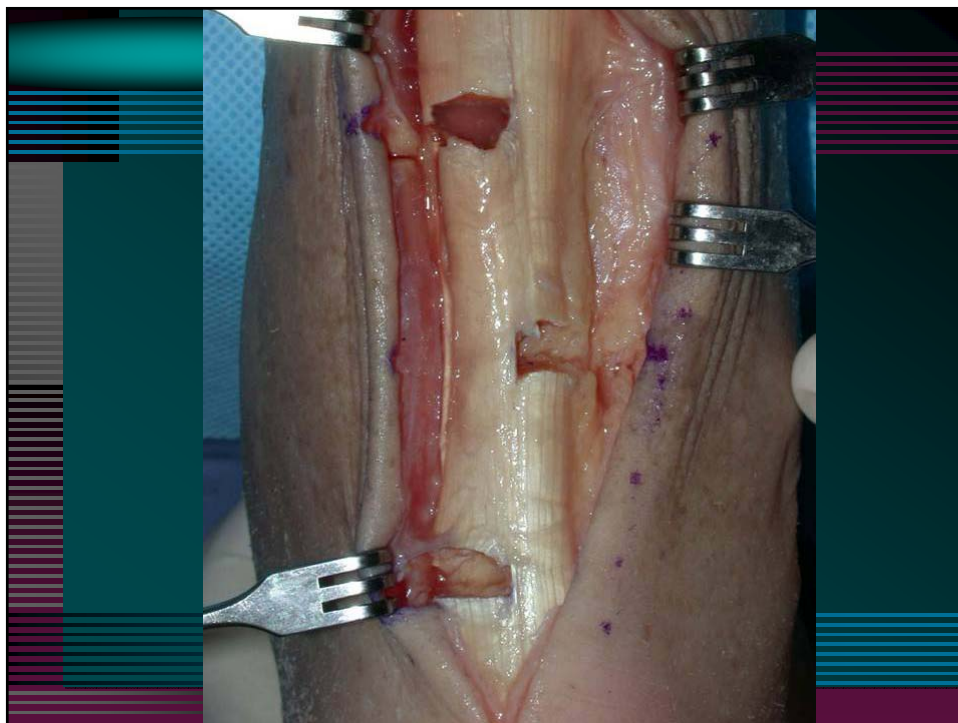
## PERCUTANEOUS LENGTHENING

- **Hoke**
  - 3 percutaneous incisions each cutting half the tendon
  - accomodates varying degrees of tendon rotation



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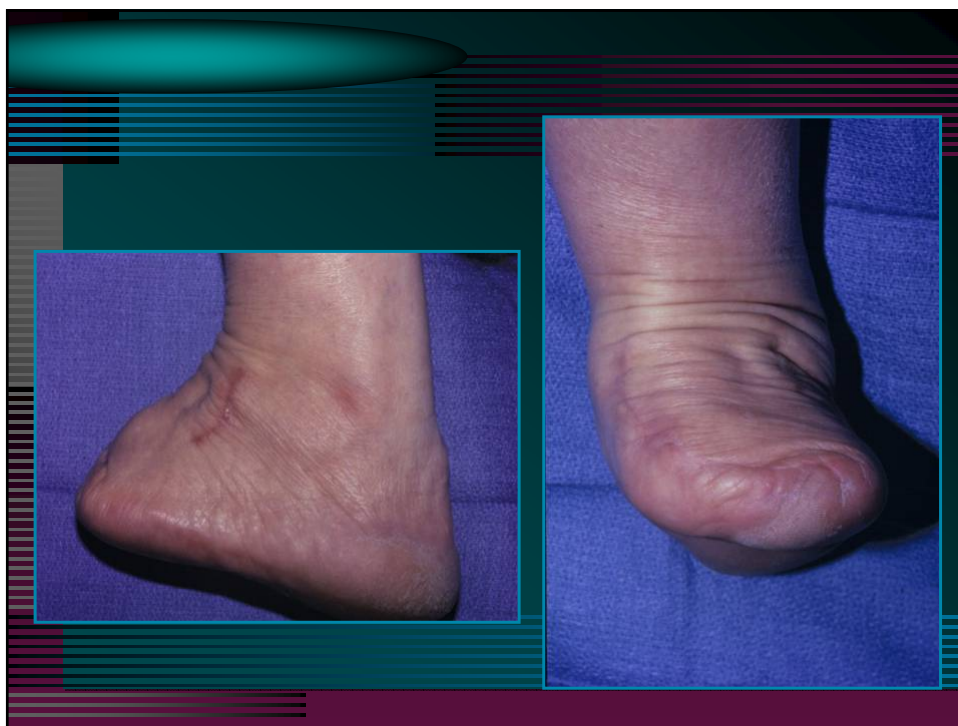
## PERCUTANEOUS LENGTHENING



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## Expected Consequences

- Flexor Substitution
- Calcaneal Bursitis
- Plantar Ulcerations



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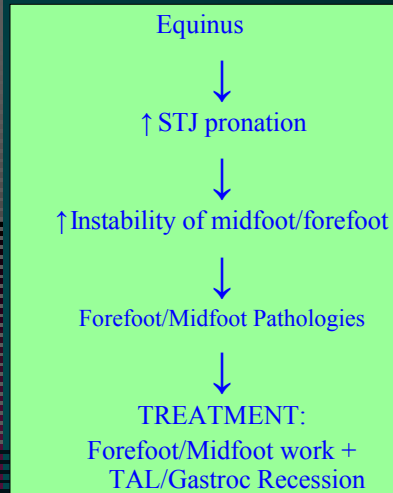
## Treatment

- Surgical Goal is to lengthen the Achilles tendon
  - Tendo-Achilles Lengthening (TAL)
  - Gastrocnemius Recession

## The Dogma: Non-Diabetic Foot

- The triceps surae is a deforming force in the development and/or aggravation of foot pathology.
- Triceps surae lengthenings (including TAL's and gastrocnemius recessions) are an effective means of reducing or eliminating this deforming force.

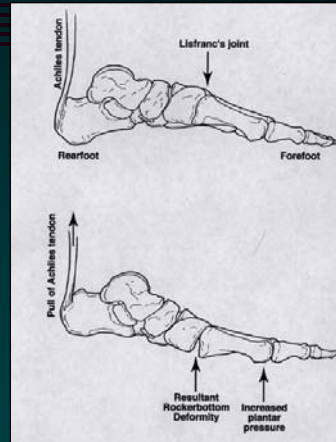
## Pathologic Algorithm for the Non-Diabetic Foot



## The Dogma: Diabetic Foot

- The Achilles tendon is a major pathologic force in the production of plantar forefoot ulcerations and Charcot arthropathy.
- Triceps surae lengthenings (including TAL's and gastrocnemius recessions) are an effective means of healing plantar forefoot ulcerations.

## Pathologic Algorithm



Armstrong DG, Lavery LA. Elevated peak plantar pressures in patients who have charcot arthropathy. J Bone Joint Surg. 1998;80A(3):365-369.

Lavery LA, Armstrong DG, Boulton AJM. Ankle equinus deformity and its relationship to high plantar pressure in a large population with diabetes mellitus. J Am Pod Med Assoc. 2002;92(9):479-482.

## CONCLUSIONS: Non-Diabetic Foot

### Equinus and Foot Pathology Causation, Correlation or Association?

- Little direct evidence to support causation
- More likely a deforming force in subset of the general population

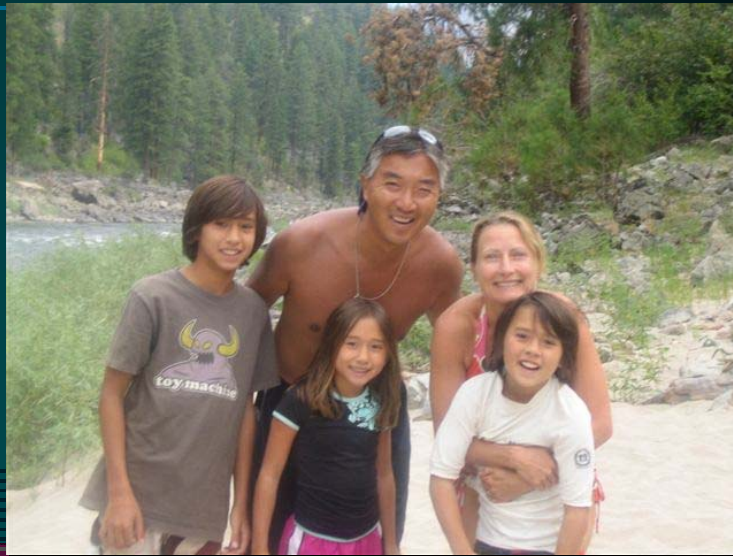


## CONCLUSIONS: Diabetic Foot

### Equinus and Wounds Causation, Correlation or Association?

- Triceps surae lengthening is an effective initial treatment modality for plantar forefoot ulcerations
- Triceps surae lengthening may need to be repeated
- Increasing the range of motion at the ankle joint may not be the goal
- There are other forces at work including “shear”

Thank you... Dr. Zgonis





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