Recurrence Following Ankle Ligament Repair

- Is it recurrence or persistence?

- Recurrence is most commonly seen in the obese, ligamentous laxity and primary repairs attempted with insufficient ligaments.

- Persistence is most commonly observed in patients with multi-direction ankle instability associated with insufficiency of the deltoid ligament and/or those with associated structural deformity. The role of syndesmotic instability poorly understood.

Deltoid ligament:

Anatomy:

- **Superficial**: Consists of four ligamentous bands from an anterior to posterior direction includes (i) tibionavicular (ii) tibiospring (iii) tibiocalcaneal and the (iv) superficial tibiotalar bands
- **Deep**: (i) deep anterior and (ii) posterior tibiotalar
- Campbell et al (JBJS 2014) found tibionavicular, tibiospring, and posterior tibiotalar to be constant ligaments
- Authors can’t agree on which the important/constant portions of the ligament are other than the deep posterior tibiotalar portion
- Function – superficial deltoid arms limit talar abduction, while the deep deltoid fibres limits talar External Rotation, both do pronation to a similar extent

Medial ankle instability

Diagnosis: Improved understanding of medial ankle instability is resulting in an increased frequency of diagnosis. Entity is not well documented historically or well reported in the literature; therefore, the clinician needs to understand what they are looking for in order to diagnose with accuracy.

History:

- Both eversion and inversion mechanisms recalled by patients with confirmed medial sided instability
• Pain and instability reported equally as main complaint
• Sensation of ankle ‘giving way’ into eversion
• Inability to trust the ankle, but vague
• Medial ankle pain
• Lateral pain during dorsiflexion

Physical

• Valgus stress test advocated by Hintermann
• External rotation stress test not described in any articles I could find
• Always assess lateral ligaments also
• Anterior drawer test positive in all patients in Hintermann study on 51 patients with medial instability
• 77% of patients in Hintermann study had lateral instability in addition to medial
• Valgus and pronation of the hindfoot that corrects with activation of the posterior tibial tendon
• Maintained ability to do single leg heel raise

Imaging

• Hintermann found stress x-rays unhelpful in isolated medial instability
• Biomechanical study demonstrates that ER stress test with the heel held in varus is more reliable at demonstrating MCS widening than if the heel is in neutral or valgus. With both deep deltoid sectioning and with deep deltoid and syndesmosis disruption
• MRI: high sensitivity and specificity to detect superficial and deep deltoid ligament tears when compared to surgical findings (~90% sens/spec)

Treatment

• Disappointing results with repair/medial reefing reported by Hintermann
  o Advocated for lateral opening calcaneal osteotomy to support repair
• Hintermann found that the tib post tendon was not ruptured in any case, indicating that this is a distinct entity from PTTD

Haddad describes a 2-limbed reconstruction similar to the one we performed for the medial side. Biomechanical assessment demonstrated similar resistance to external rotation and valgus stress, but decreased resistance to internal rotation compared to the intact deltoid (cadaver)

**NON-NEUROMUSCULAR FLEXIBLE PES CAVUS**

Subtle lower extremity mal-alignment, in the form of Non-neuromuscular Flexible Pes Cavus (NnFPC) is common. The medial arch of the foot is made possible by the presence of static and dynamic supports. Without the structural integrity of the plantar fascia, talonavicular capsule, the calcaneonavicular
(spring), deltoid, talocalcaneal interosseous and the long / short plantar ligaments, a pes planus (flat foot) or collapse of the medial arch would result. Therefore, by definition, a cavus foot is a relatively rigid structure and the term “flexible” must be used with caution. Flexibility of a Pes Cavus foot refers more to the ability to correct the foot structures to a neutral position. In particular, this refers to the flexibility of the plantar flexed first ray, tightness of the plantar fascia, contractures of the gastrocnemius muscle, and the ability to rotate the subtalar joint complex past a neutral to an everted position.

The clinical implications of NnFPC are variable. A NnFPC deformity plus or minus any varus deformity of the tibia can be tolerated for many years. It is only when the patient presents with pathology that the treating surgeon is asked to assess the significance of the subtle foot malposition and consider the role that it plays in the pathophysiology. For example, a varsity football player with a mild varus hindfoot may present in his early twenties with recurrent ankle instability, whereas a less active person may present only in their late forties, if at all. Therefore, it can be difficult for the surgeon to decide how aggressive to be in correcting mild to moderate hindfoot / midfoot cavus deformity. Consider the patient presenting with a mild flexible cavovarus foot and a history of recurrent ankle instability: when does one restore the unstable ankle to its pre-morbid condition, and when does one become more aggressive and perform osteotomies to create an appendage that the patient never had?

Unfortunately, little is known about the natural history of the NnFPC foot, and without this insight, treatment recommendations rely more on case studies and professional opinion (Level IV and V evidence) than on tested clinical algorithms.

References

1/ Deltoid ligament injuries: diagnosis and management.
   Hintermann B, Knupp M, Pagenstert GI.

2/ The ligament anatomy of the deltoid complex of the ankle: a qualitative and quantitative anatomical study.
   Campbell KJ, Michalski MP, Wilson KJ, Goldsmith MT, Wijdicks CA, LaPrade RF, Clanton TO.
   J Bone Joint Surg Am. 2014 Apr 16;96(8)

3/ The deltoid ligament: an in-depth review of anatomy, function, and treatment strategies.
   Savage-Elliott I, Murawski CD, Smyth NA, Golanó P, Kennedy JG.

4/ Anatomic study of the deltoid ligament of the ankle.
   Panchani PN, Chappell TM, Moore GD, Tubbs RS, Shoja MM, Loukas M, Kozlowski PB, Khan KH, DiLandro AC, D’Antoni AV.
   Foot Ankle Int. 2014 Sep;35(9):916-21
5/ Manoli A, Graham B. The subtle cavus foot, "the underpronator".  
Foot Ankle Int. 2005;26(3):256-263.

6/ Maskill MP, Maskill JD, Pomeroy GC. Surgical management and treatment algorithm for the subtle cavovarus foot.  
Foot Ankle Int. 2010;31(12):1057-1063.

7/ McCluskey WP, Lovell WW, Cummings RJ. The cavovarus foot deformity. Etiology and management.  

NOTES