

# Syndesmotic Instability in Stage IV Posterior Tibial Tendon Dysfunction

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## Purpose

Determine the incidence of syndesmotic disruption in late stage adult acquired flatfoot. Aim of this study is to determine if there is a role in addressing the syndesmosis in late stage flatfoot reconstruction. There is a possibility that by addressing syndesmotic instability, the deltoid repair will be longer lasting ultimately preventing valgus talar tilt and osteoarthritis of the ankle joint.

## Methodology

Chart review performed which identified patients with late stage flatfoot (stage 3 and 4). Patients with an MRI were included in this study. Patients with previous trauma were excluded. All MRIs were read by attending radiologists which made a positive or negative read on both the deltoid ligament and syndesmosis.

## Literature Review

Adult acquired flatfoot is a challenging clinical condition which is well described and classified in the literature. In 1996, Myerson recognized the presence of deltoid ligament failure in late stage adult-acquired flatfoot deformity and added a fourth stage to the original classification by Johnson and Strom. Stage 4 is visible on a weight-bearing AP radiograph by valgus tilt of the talus within the ankle mortise and is associated with deltoid insufficiency. Ankle valgus remains a concern post hindfoot fusion as noted by Hyer et al.

Cadaveric studies have shown that the syndesmosis plays a secondary role to the deltoid ligament in stabilization of the ankle joint. A cadaveric study by Boden et al transected the syndesmosis in 1.5 cm segments. The study was split into two groups, one with an intact deltoid ligament and the other with a transected deltoid. They concluded that when the deltoid was intact there was minimal increase in syndesmotic widening, compared to the sectioned deltoid group which had increased widening of the syndesmosis.

## Results

Twenty five patients were identified in our study; 24 stage 3 and 1 stage 4. The patient with a stage 4 flatfoot had both syndesmotic and deltoid disruption. No patients with stage 3 deformity had MRI findings of syndesmotic disruption. However, 6/24 stage 3 patients did have findings of deltoid disruption on MRI.



Figure 1. Axial MRI ankle and AP ankle views confirm syndesmotic disruption in stage 4 adult acquired flatfoot.

## Analysis & Discussion

A prospective study is currently taking place at our institution to further investigate syndesmotic disruption in late stage flatfoot. It seems that syndesmotic injury is present in the progression of late stage deformity as noted by the stage 4 patient with both deltoid and syndesmotic disruption. This is further demonstrated by the lack of syndesmotic injury in stage 3 patients. Our goal is to better determine the presence and severity of syndesmotic injury in late stage deformity, and to address this at the index procedure to prevent ankle joint valgus.

A study by Massri-Pugin et al. examined the role of the deltoid ligament in stabilizing the ankle syndesmosis. The study concluded that the syndesmosis became unstable after disruption of the deltoid ligament as well as a portion of the syndesmosis (AITFL and IOL).

It is possible that reinforcing the syndesmosis at the time of deltoid repair during a late stage flatfoot repair would prevent ankle joint valgus after hind foot fusion.

## References

- Boden, SD, Labropoulos, PA, McCowin, P. Mechanical Considerations for the Syndesmosis Screw. A Cadaver Study. *J Bone Joint Surg AM.* 1989 Dec;71(10):1548-55
- Crim J, Longenecker L. MRI and surgical findings in deltoid ligament tears. *AJR Am J Roentgenol.* 2015; 204(1):W63-9
- Fitzgibbons TC. Valgus tilting of the ankle joint after subtalar (hindfoot) fusion: complication or natural progression of valgus hindfoot deformity? *Orthopedics.* 1996;19(5):415-423.
- Friedman MA, Draganich LF, Toolan B, Brage ME. The effects of adult acquired flatfoot deformity on tibiotalar joint contact characteristics. *Foot Ankle Int.* 2001;22(3):241-246.
- Hyer CF, Galli MM, Scott RT, Bussewitz B, Berlet GC. Ankle valgus after hindfoot arthrodesis: a radiographic and chart comparison of the medial double and triple arthrodeses. *J Foot Ankle Surg.* 2014;53(1):55-58
- Masri-Pugin J, Lubberts B, Vopat BG, Wolf JC, DiGiovanni CW, Guss D. Role of the Deltoid Ligament in Syndesmotic Instability. *Foot & Ankle International* 2018;39(5) 598-603.
- Miniaci-Coxhead, S. L., B. Weisenthal, J. P. Ketz, and A. S. Flemister. "Incidence and Radiographic Predictors of Valgus Tibiotalar Tilt After Hindfoot Fusion." *Foot & Ankle International*. U.S. National Library of Medicine, May 2017. Web. 08 June 2017.
- Myerson MS. Adult acquired flatfoot deformity. *J Bone Joint Surg.* 1996;78A:780-792.
- Resnick RB, Jahss MH, Choueka J, Deltoid ligament forces after tibialis posterior tendon rupture: effects of triple arthrodesis and calcaneal displacement osteotomies. *Foot Ankle Int.* 1995;16(1):14-20.
- Song SJ, Lee S, O'Malley MJ, . Deltoid ligament strain after correction of acquired flatfoot deformity by triple arthrodesis. *Foot Ankle Int.* 2000;21(7):573-577.
- Younger AS, Sawatzky B, Dryden P. Radiographic assessment of adult flatfoot. *Foot Ankle Int.* 2005;26(10):820-825