Could Failure of the Spring Ligament Complex be the Primary Driving Force Behind the Development of the Adult Flatfoot Deformity?

Foot & Ankle Category: Hindfoot

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Introduction
The purpose of this study was to demonstrate the relative association of MRI diagnosed spring ligament and tibialis posterior tendon pathology to radiographic evidence of the planovalgus foot deformity.

Methods
156 MRI scans performed on a T1.5 unit between 2008-11 were selected for retrospective analysis. Exclusion criteria included: patients under 18 years, deep infection, prior trauma or surgery to the limb. Scans were interpreted by the lead author and a consultant musculoskeletal radiologist for pathology in relation to the tibialis posterior and spring ligament complex (superio-medial and medio-plantar components). Lateral weight bearing radiographs of the foot were used to separate patients into planovalgus or normal groups based on radiographic measurements. Chi squared (p values) and odds ratio (OR) were employed to test significance (SPSS version 17.0).

Results
96 females, 60 male scans, mean patient age 46 years (range, 18-86) comprised the final analysis. Overall prevalence of MRI diagnosed spring ligament and tibialis posterior pathology was 27% and 19% (40 and 30 of 156) respectively. MRI spring ligament abnormalities were strongly associated with radiographic flat foot deformity: talar first metatarsal (Meary’s angle) $\geq 5^\circ$ OR (odds ratio) 9.6 ($p = 0.001$), $\leq 20^\circ$ calcaneal pitch OR 2.74 ($p = 0.006$) and $\geq 45^\circ$ talocalcaneal angle OR 2.24 ($p = 0.029$). MRI evidence of tibialis posterior tendon pathology (Conti classification I, II or III) was also associated with radiographic evidence of flat foot deformity although this failed to reach statistical significance: talar first metatarsal (Meary’s angle) $\geq 5^\circ$ OR 2.15 ($p = 0.06$), $\leq 20^\circ$ calcaneal pitch OR 1.29 ($p = 0.54$) and $\geq 45^\circ$ talocalcaneal angle OR 1.92 ($p = 0.11$).

Conclusion
Our investigation demonstrates that when the spring ligament and tibialis posterior tendon are assessed independently, spring ligament pathology displays the stronger association (odds ratio of 9.6 vs 2.15 respectively) and possibly greater importance in respect to adult flat foot deformity.