

Evaluating **Plantar Fascia Strain** in Hyperpronating Cadaveric Feet Following an Extra-Osseous TaloTarsal Stabilization Procedure

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Purpose

The primary goal of this investigation was to quantify strain on the medial band of the plantar fascia in feet exhibiting talotarsal instability, before and after an extra-osseous talotarsal stabilization (EOTTS) procedure. It was hypothesized that the excessive strain placed on the plantar fascia in hyperpronating cadaveric feet would be reduced significantly after the insertion of the **HyProCure**[®] EOTTS device.

Background

The plantar fascia functions to stabilize the plantar arch(s) of the foot. Instability of the talotarsal mechanism (i.e., hyperpronation) results in the partial displacement of the talus on the tarsal mechanism and results in excessive strain acting on the medial band of the plantar fascia. Eventually, the critical threshold is reached igniting a painful stimulus.

Methods

- A miniature differential variable reluctance strain gauge was used to quantify the plantar fascia strain in 6 fresh-frozen cadaver foot specimens exhibiting flexible instability of the talotarsal joint complex.
- The blinded sub-investigator was instructed to maximally pronate the talotarsal mechanism by applying maximum force to the 4th & 5th metatarsal heads. A pressure sensor was placed under the 4th & 5th metatarsal heads ensuring that the same maximum pressure was applied for each reading.
- The strain was measured as the foot was moved from its neutral to maximally pronated position, before and after intervention using the **HyProCure**[®] EOTTS device.

Results

- The mean plantar fascia elongation was **0.83 ± 0.27 mm** (strain **3.62% ± 1.17%**) prior to EOTTS and **0.56 ± 0.2 mm** (strain **2.42% ± 0.88%**) after insertion of **HyProCure**[®], (N = 18, variation reported is ± 1 SD).
- The average plantar fascia strain decreased by **33%**, and the difference was statistically significant with $p < .001$.

EOTTS with *HyProCure*[®] decreased strain to the plantar fascia band by an average of 33%.

Clinical Significance & Conclusions

- Plantar fascial strain increases with pathologic displacement of the talus on the tarsal mechanism.
- Attention must be directed to reducing strain on the plantar fascia by stabilizing the talotarsal mechanism.
- When external measures fail to stabilize the talotarsal mechanism, internal measures must be considered.
- **HyProCure**[®] stabilizes the talus on the tarsal mechanism thereby decreasing the excessive forces acting on the medial column of the foot.
- The reduction in forces leads to decreased strain acting on the medial band of the plantar fascia.
- The EOTTS procedure offers a possible treatment option for plantar fasciopathy in cases in which the underlying etiology is abnormal talotarsal biomechanics.

