The Effect of ***HyProCure***® on Tarsal Tunnel Compartment Pressures in Hyperpronating Feet

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Purpose

The primary goal of this study was to quantify the effect of extra-osseous talotarsal stabilization (EOTTS) using the ***HyProCure***® device on pressure within both the tarsal tunnel and porta pedis**.** It was hypothesized that these pressures would decrease following EOTTS.

Background

Tarsal tunnel syndrome is characterized by a wide array of neurologic symptoms extending from the bottom of the toes, ball and arch of the foot, heel and proximally into the lower leg. Most cases are diagnosed as idiopathic but a strong pathomechanic etiology has been named as the leading cause of this disorder. Increased pressure within the tarsal tunnel and/or the porta pedis will lead to negative effects on the posterior tibial nerve. Displacement of the talus on the tarsal mechanism has been theorized to increase the pressures in the tarsal tunnel and porta pedis. A pressure of 25-30 mmHg or greater has been proven to impair intraneural blood flow. Therefore, stabilization of any existing pathologic mal-alignment of the talotarsal mechanism should lead to a decrease in these pressures and could lead to alleviation of the associated symptoms. Surgery to decompress the tarsal tunnel has historically been linked with a significant recurrence rate.

Methods

- Pressures in the tarsal tunnel and porta pedis were measured in 9 fresh-frozen cadaver specimens using an intracompartmental pressure monitor system.
- Pressures were measured with the foot in the neutral and the hyperpronated position, before and after stabilization using ***HyProCure***®**.**
- 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.

Results

- The pressure within the ***tarsal tunnel*** with the hindfoot in *neutral position* with and without ***HyProCure***® was **3** ± 3 mm Hg and **4** ± 3 mm Hg, respectively (*P* = .159).
- Upon *maximum hindfoot pronation* without stabilization, the pressure increased to an average of **32** ± 16 mm Hg
- Following the placement of ***HyProCure***®**,** the pressures decreased to 21 ± 10 mm Hg (*P* < .001).
- The pressure in the ***porta pedis*** with the hindfoot in *neutral position* with and without ***HyProCure***® was **2** ± 2 mm Hg and **2** ± 2 mm Hg, respectively (*P* = .168).
- Upon maximum hindfoot pronation without stabilization, the pressure rose on average to **29** ± 15 mm Hg.
- Following the placement of ***HyProCure***®, the pressures normalized to **18** ± 11 mm Hg (*P* < .001).

Talotarsal joint stabilization wtih *HyProCure*® lead to a 34% average decrease in tarsal tunnel pressures and an average 38% decrease in porta pedis pressures.

Clinical Significance and Conclusions

- Talotarsal dislocation (partial) leads to excessive hindfoot motion contributing to elevated pressures within the tarsal tunnel and porta pedis.
- Pressures greater than 25 mmHg have been shown to decrease blood flow within the nerve. Decreased blood flow has been named an etiologic factor of neuropathy.
- ***HyProCure***® has been scientifically proven to significantly decrease the pressures within both the tarsal tunnel and porta pedis.