

Umbilical Cord Tissue Allograft Defects for Ligamentous Injuries in Patients with Sinus Tarsitis: A Case Series

By: Robert Parker DPM, FAENS, FACFAS, FAMIFAS, John Shou PharmD, Naomi Lambert BS, Crislyn Woods BS, Tyler Barrett

Background

Sinus Tarsi syndrome is a condition that presents as lateral midfoot heel pain that is located in the space between the calcaneus, talus, and talocalcaneonavicular and subtalar joints (Tu, 2011). Patients with sinus tarsi syndrome generally complain of instability with functional activities and persistent anterolateral ankle discomfort (Helgeson, 2009). The etiology of this condition is not well understood. Still, recent literature describes the instability primarily stemming from ligamentous injuries, inflammation from damage to the synovium, and fibro tic tissue infiltration of the subtalar joint space (Helgeson, 2009). The incidence of sinus tarsi syndrome is unknown, but it is proposed that a large percentage of reported ankle sprain injuries include an injury to the subtalar joint ligaments (Hubbard, 2006). Treatment recommendations include balance and proprioceptive training, muscle strengthening exercises, bracing, taping, and foot orthosis. NSAIDs are often used to help with pain management. For patients who fail standard-care treatments and rehabilitation, the option of arthroscopy exists for a more precise examination of the joint and to allow for surgical treatment (Oloff, 2001). While surgery can be effective, it is invasive, and the mean return to total activity is four months.

Given that there are no single, optimal treatment options for sinus tarsi, there is a need for alternative interventions. This retrospective study assesses the efficacy of Wharton's Jelly (WJ) application to the damaged ligaments to minimize the pain associated with sinus tarsi. WJ is a loose connective tissue found in the umbilical cord that cushions and protects the vessels within the cord from external forces and stretching. It contains collagen types I and III, hyaluronic acid, proteoglycans, growth factors, and cytokines that supplement the damaged tissue. This retrospective case series presents the application of WJ to ligament defects in the sinus tarsi of five females who have all failed previous standard-care treatments.

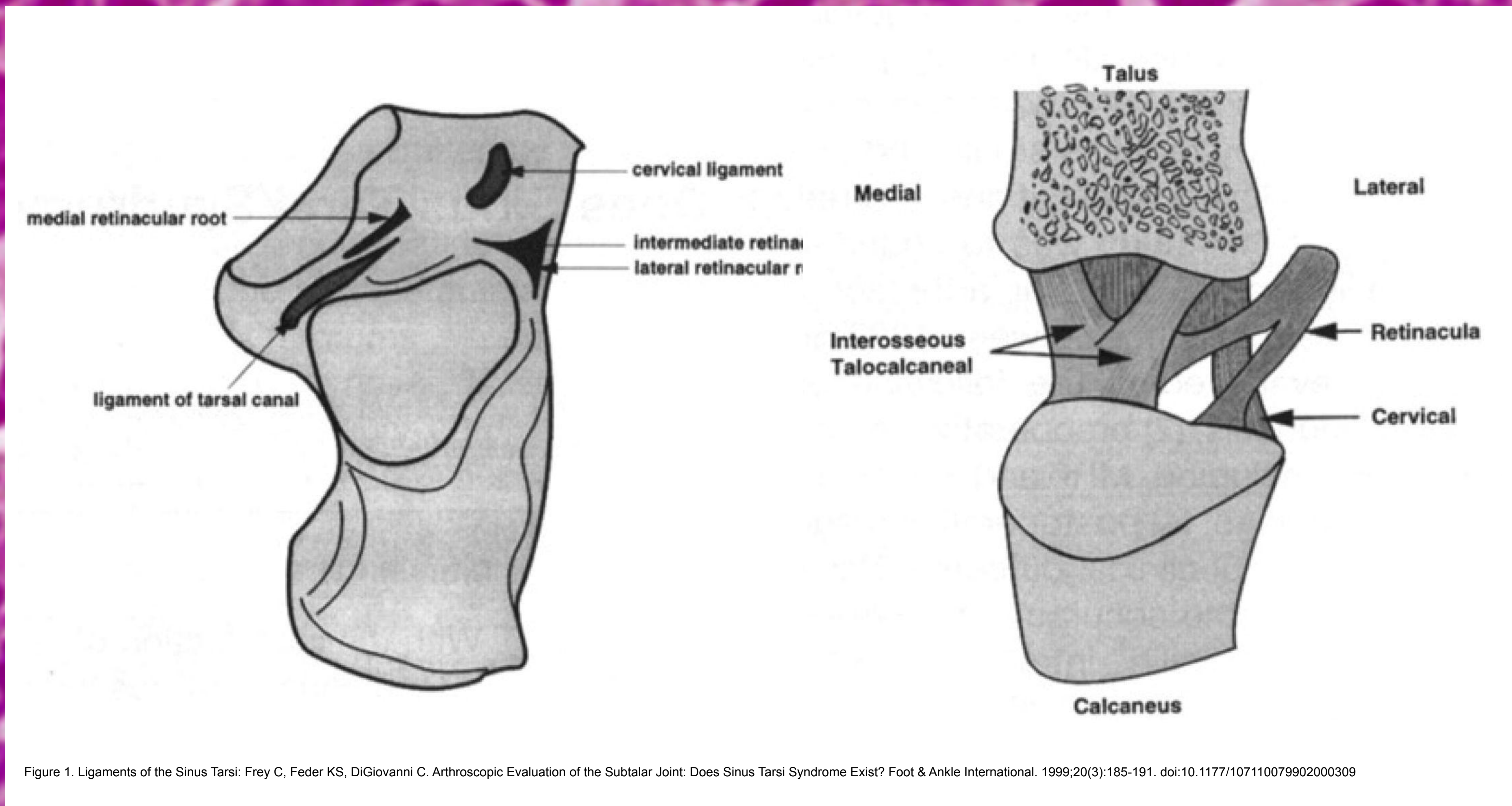
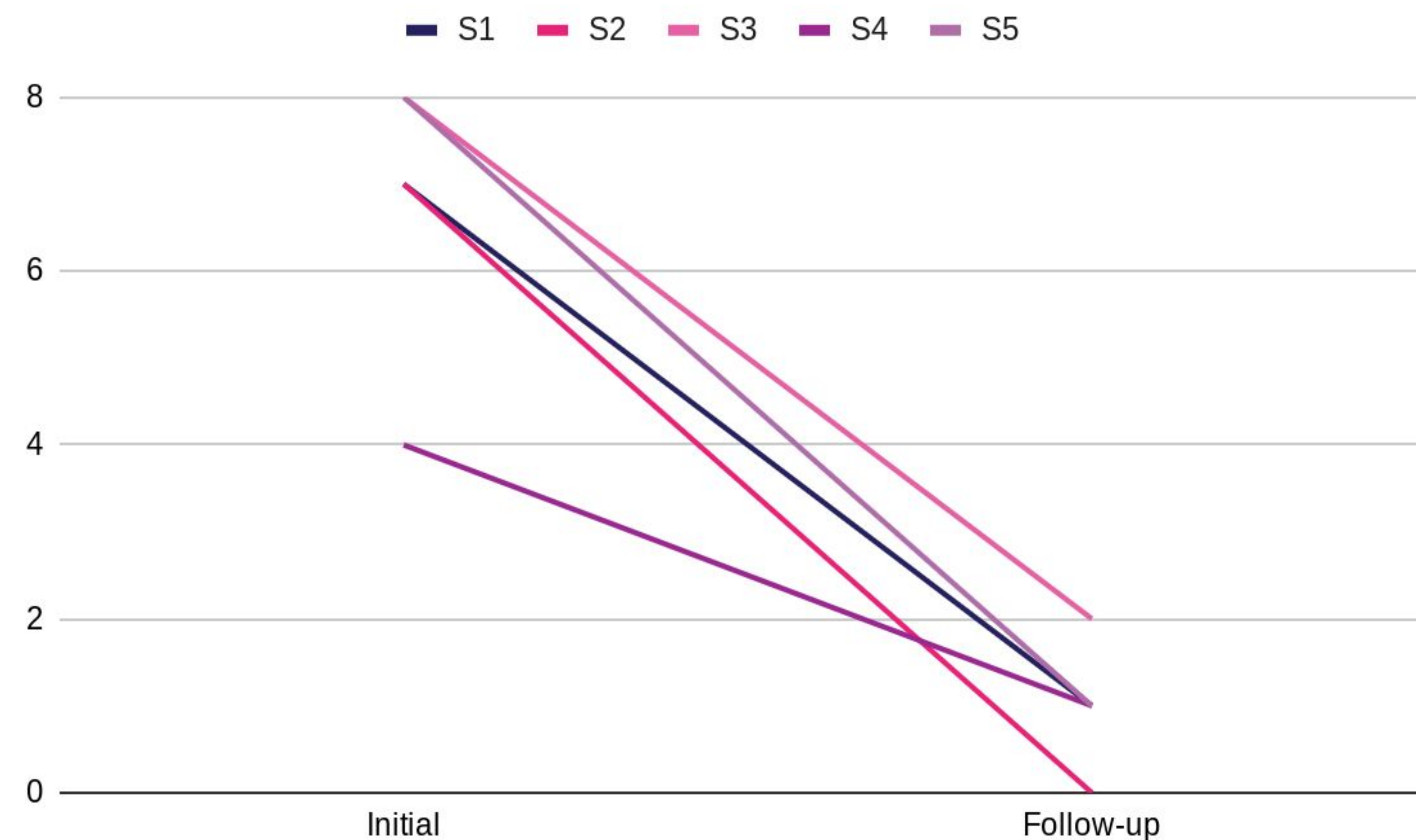


Figure 1. Ligaments of the Sinus Tarsi: Frey C, Feder KS, DiGiovanni C. Arthroscopic Evaluation of the Subtalar Joint: Does Sinus Tarsi Syndrome Exist? Foot & Ankle International. 1999;20(3):185-191. doi:10.1177/107110079902000309

VAS Score from initial visit to final visit



Resources

1. Tu, P., & Bytowski, J. R. (2011). Diagnosis of heel pain. *American family physician*, 84(8), 909–916.
2. Helgeson K. (2009). Examination and intervention for sinus tarsi syndrome. *North American journal of sports physical therapy* : NAJSPT, 4(1), 29–37.
3. Hubbard, T. J., & Hertel, J. (2006). Mechanical contributions to chronic lateral ankle instability. *Sports medicine (Auckland, N.Z.)*, 36(3), 263–277. <https://doi.org/10.2165/00007256-200636030-00006>
4. Oloff, L. M., Schulhofer, S. D., & Bocko, A. P. (2001). Subtalar joint arthroscopy for sinus tarsi syndrome: a review of 29 cases. *The Journal of foot and ankle surgery* : official publication of the American College of Foot and Ankle Surgeons, 40(3), 152–157. [https://doi.org/10.1016/s1067-2516\(01\)80081-8](https://doi.org/10.1016/s1067-2516(01)80081-8)
5. Saxena, A., Ramdath, S., Jr, O'Halloran, P., Gerdesmeyer, L., & Gollwitzer, H. (2011). Extra-corporeal pulsed-activated therapy ("EPAT" sound wave) for Achilles tendinopathy: a prospective study. *The Journal of foot and ankle surgery* : official publication of the American College of Foot and Ankle Surgeons, 50(3), 315–319. <https://doi.org/10.1053/j.jfas.2011.01.003>
6. Brandl, A., Egner, C., Reisser, U., Lingenfelder, C., & Schleip, R. (2023). Influence of high-energy laser therapy to the patellar tendon on its ligamentous microcirculation: An experimental intervention study. *PLoS one*, 18(3), e0275883. <https://doi.org/10.1371/journal.pone.0275883>

Acknowledgements

The authors would like to thank Desiree Horning, administrator, and the staff Stacy, Laura and Greta, at Parker Foot and Ankle for their contribution to data collection and filing.



Methods

This study consists of five female patients who present with either left or right foot pain in the sinus tarsi aspect of the foot. Two patients presented with right-sided pain, and three with left-sided pain. All patients signed informed consent for the collection of their data under an IRB-approved retrospective observational study. The age distribution of the cohort ranged from 50 to 72 years old. Each individual received extracorporeal pulse-activated therapy (EPAT), a single application of 1cc CryoPlus (75mg of WJ per 1 mL), and class IV laser therapy.

Before applying the tissue allograft, most patients received EPAT at 11 Hrtz, 3.0 bars, and 3212 to 3421 pulses to the affected tissue. One patient received EPAT at 11 Hrtz, 1.5 bars, and 3423 pulses. While the patient received EPAT, CryoPlus was thawed slowly per laboratory guidelines in a 35-degree bath. The allograft was transplanted along the sinus tarsi throughout the inflamed tissue utilizing MyLab 15.0 MHz real-time diagnostic ultrasound guidance with a 4 cm transducer head. After the application, two of the five patients were placed in a prefabricated Pneumatic Ankle-Foot Orthosis (Aircast foam walker). Finally, all patients were scheduled twice weekly for class IV laser therapy sessions for the two weeks following the tissue supplementation to provide photobiomodulation as an anti-inflammation and tissue healing stimulation modality. All patients were prescribed optional non-anti-inflammatory medication to help combat discomfort. After the initial application, all individuals were assessed at a follow-up visit approximately 80 days after the WJ application to evaluate pain improvement via a visual analog scale and to ensure no adverse side effects.

Results

The cohort's initial average visual analog scale (VAS) score was 6.8, with a final VAS average of 1. The cohort had an overall 85.29% improvement in pain. All patients reported an improvement in pain. The least improved patient still had an improvement of 75%. One patient reported a pain improvement of 100%. No adverse reactions were reported.

Conclusion

This study exemplifies significant pain improvement of the sinus tarsi after applying WJ in combination with EPAT, laser therapy, and, in some cases, a pneumatic boot. The results align with other literature's positive outcomes regarding each element used in the care procedure as stand-alone applications. EPAT has been reported to show successful outcomes in treating Achilles tendinopathy (Saxena, 2011). Class IV laser therapy was utilized to reduce pain and inflammation and to improve tissue modality. Additionally, laser therapy decreases erythrocyte deformability and platelet coagulation, resulting in membrane revitalization, viscosity reduction, and erythrocyte stress adaptation (Brandl, 2023). EPAT and laser therapy also promote blood flow, stimulating the body's healing process. For patients who used a pneumatic boot, it stabilized and limited the range of motion to prevent further injury. Further research regarding the use of WJ for sinus tarsi ligament defects could be completed to compare the efficacy of WJ to standard-care treatments and surgery. A larger, more diverse, and randomized study would be beneficial in future studies to define dosage protocols further and confirm safety and efficacy.