HA is a naturally occurring biological substance that has proven safe to use for treating plantar fasciitis. The purpose of this prospective comparative study was to determine the efficacy of HA on plantar fasciitis that did not respond to common noninvasive treatment methods. Patients with pain in both heels for ≥ 10 months whose symptoms were not relieved by or who experienced recurrence after conservative treatment were enrolled. Plantar fasciitis was diagnosed as first-step pain, pain after < 40 minutes of walking, tenderness, and thickened plantar fascia on ultrasound.

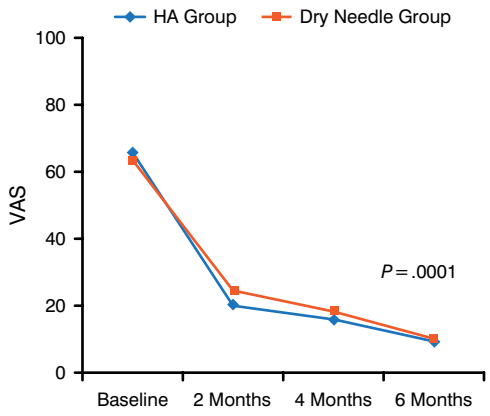
Of the 212 patients eligible for assessment, 81 were enrolled to receive HA on their right foot and dry needling on the left. Twenty patients were lost to follow-up, leaving 61 patients for the final analysis. Patients had a mean age of 46 years (more women than men), a mean body mass index of 29.4 kg/m^2, and a mean duration of symptoms of 14.9 months. Various treatment modalities were tried before enrollment, including stretching, physiotherapy, oral medications, steroid injections, and acupuncture.

Prior to treatment, patients received a prefabricated insole and plantar fascia–specific stretching education (3 minutes twice daily). Following injection of 1 ml of 1% lidocaine in each foot, 2 ml (20 mg) of sodium hyaluronate (3000 kDa/ml) was injected into the right foot under ultrasound guidance into 3 areas: the insertion of the plantar fascia to the calcaneus, the fascia itself, and the perifascial space. Dry needling was performed on the left foot. Both treatments were administered once per week for 3 weeks. Patients were assessed for pain every 2 months after injection using the visual analog scale (VAS) and the American Orthopaedic Foot & Ankle Society (AOFAS) Ankle-Hindfoot Scale. Plantar fascia thickness was assessed at 2 and 6 months.

Pain assessment with VAS showed a significant improvement compared with baseline in both groups ($P = .0001$). Patient-rated pain scores dropped from a mean of 65 for the HA group and 63 for the dry needle group at baseline to 19 and 24, respectively, at 2 months, and 9 and 9.7, respectively, at 6 months (Figure 1).

A significant difference between the HA and dry-needling arms for VAS was noted at 2 months ($P = .039$), but not at 4 or 6 months. The AOFAS score increased from 55.1 ± 13.9 to 84.0 ± 6.5 in the HA group and from 55.3 ± 12.7 to 83.8 ± 6.7 in the dry-needling group. The between-group difference was not significant. The thickness of the plantar fascia between baseline and follow-up in both groups was not significantly different, nor was it significantly different between the 2 arms. There were no major complications. Injection site pain was experienced by 18 patients, and tingling sensation by 6 patients; both conditions spontaneously resolved.

Figure 1. Mean VAS Decreases Following HA and Dry Needling



HA, hyaluronic acid; VAS, visual analog scale.

Reproduced with permission from K Lee, MD.

In addition to its direct therapeutic effect, HA acts as a scaffold with internal bleeding from multiple punctures, which can promote healing. With regard to dry needling, the blood clot from multiple punctures may have stimulated the healing process, or the needle itself may have had some role. Additional studies are needed in this area.

These findings are limited because this was not a randomized study and had a short follow-up period. In addition, the initial treatment varied from patient to patient, and there may have been varied effectiveness among the 3 injection target points.

Nevertheless, this first prospective comparative study with HA for management of plantar fasciitis showed that HA is clinically effective and safe. Furthermore, the clinical course during treatment may have been altered by introduction of the needle itself into the plantar fascia, the authors concluded, regardless of the use of the injection.

PODO More Effective Than Weil Osteotomy in Reducing Pressure Under Second Metatarsal

Written by Phil Vinall

Umur Aydogan, MD, Penn State Hershey, Hershey, Pennsylvania, USA, presented data showing that when compared with classic and modified Weil osteotomy, proximal oblique dorsiflexion osteotomy (PODO) is more effective in reducing average and peak pressures under the second metatarsal.

Most metatarsalgia can be relieved with shoe modifications and orthotics; however, resistant cases may need surgery. Surgical options for these patients include plantar condylectomy, Weil osteotomy, modified Weil osteotomy, and PODO. Only a few studies have evaluated these approaches. However, none (1) used loading more complex than axial force on the tibia, (2) directly compared all the approaches, or (3) included Achilles tension. Dr Aydogan presented results from a study that compared the effects of the classic Weil, modified Weil, and PODO in specimens obtained from cadavers, on the basis of physiologic loading of the tibia under a variety of Achilles tendon tensions.

Specimens (6 left-right pairs of feet; 9 women; 3 men) from cadavers with an average age of 51.3 years were prepared by removing the tissue around the distal tibia to the bone (about 4 in) and exposing and stripping the Achilles tendon of muscle. The distal tibia was then potted with chemical cement in ~3 in of PVC pipe, which was then fixed with screws in a fixture on the material testing system. This process also generated the downward force (445 N) on the tibia to simulate bodyweight (100 lb). The foot rested on the center of the pressure pad, which was clamped to a load cell used to ensure that the downward force remained constant. The load cell was fixed to a bearing platform, which allowed the foot to settle into a natural position. The exposed Achilles tendon was attached to a cable via a liquid-nitrogen freeze clamp. The line of action of the cable approximated the physiologic angle of the Achilles and was attached to a load cell and pneumatic actuator used to generate the force on the Achilles tendon (0, 300, 600 N).

Six feet received classic Weil procedures, followed by modified Weil osteotomies; 6 received PODO. Surgeries were evenly split between foot orientation and sex. Measurements were taken before treatment and after each surgery for Achilles force (0, 300, anatomy check, and 600 N). All 5 metatarsals were regions of interest. Average pressure, peak pressure, and contact area were measured.

There was no decrease in second metatarsal average pressure with classic Weil; there was a trend toward a reduction in pressure in the second metatarsal with the modified Weil, but the difference was not significant. PODO was associated with a significant decrease in pressure in the second and third metatarsals and an increase for the first metatarsal, compounded by high loading of the Achilles tendon.

Dr Aydogan concluded that PODO is the most effective surgery for reducing average and peak pressures under the second metatarsal. The Weil osteotomy with and without modification did not significantly change plantar pressure beneath the second metatarsal and may be effective through an alternate mechanism. Increasing Achilles tension increases the second metatarsal plantar pressure. In cases where the Achilles tendon is tight, lengthening may increase the effect of the procedures, especially in PODO.

Study Questions Benefit of TAR Compared With AA

Written by Phil Vinall

Arno Frigg, MD, University Hospital Basel, Basel, Switzerland, reported results from a study that examined functional outcomes among patients treated with total ankle replacement (TAR), ankle arthrodesis (AA), or tibiotalocalcaneal (TTC) ankle fusion and healthy controls under 3 conditions: barefoot, wearing standardized running shoes, or wearing standardized rocker-bottom shoes. The study showed no difference in functional outcomes among patients treated with TAR or AA. Patients treated with TTC ankle fusion had inferior results in all conditions.

The study included 126 postsurgical patients (28 who received TAR, 57 who received AA, and 41 who had undergone TTC ankle fusion) and 35 healthy volunteers. Clinical evaluation was based on American Orthopaedic Foot & Ankle Score and Short Form-36 scores, radiographs, and postoperative complications. Patient follow-up was a mean of 4.1 years (range, 2 to 6 years). Functional evaluation was based on the results of dynamic pedobarography [Frigg A et al. *Clin Biomech (Bristol, Avon).* 2012] and a light gate. The primary outcome measures were the following: walking speed, maximal force (MF) in the forefoot, and relative midfoot index (rMI), a measure of the relative difference in MF between the average of the hindfoot and forefoot and the midfoot (ie, the extent of the midfoot's MF depression).

There was no significant difference in walking speed between TAR and AA whether patients were barefoot or wore running shoes or rocker-bottom shoes ($P = .52$ to .62). Both were walking significantly slower by about 0.3 m/s compared with healthy controls ($P < .01$) in any condition. Patients treated with TTC ankle fusion were significantly slower than the other groups in all conditions ($P < .05$; Figure 1).

Relative to healthy controls, the TAR and AA groups had an increased forefoot MF regardless of whether the patients were barefoot or were wearing running shoes or rocker-bottom shoes; the differences were not significant