



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

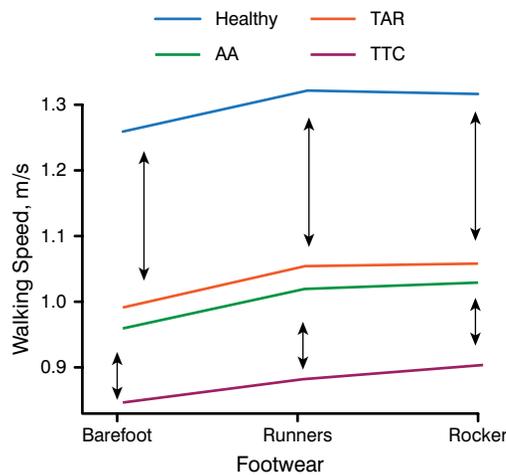
Arno Frigg, MD, University Hospital Basel, Basel, Switzerland, reported results from a study that examined functional outcomes among patients treated with total ankle replacement (TAR), ankle arthrodesis (AA), or tibiototalcalcaneal (TTC) ankle fusion and healthy controls under 3 conditions: barefoot, 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).

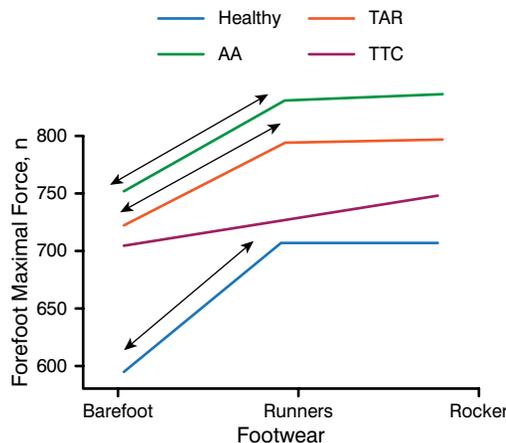
Relative to healthy controls, the TAR and AA groups had an increased forefoot MF regardless of whether the patients were barefoot or were wearing running shoes or rocker-bottom shoes; the differences were not significant

Figure 1. Walking Speed Results



AA, ankle arthrodesis; TAR, total ankle replacement; TTC, tibiototalcalcaneal. Reproduced with permission from A Frigg, MD.

Figure 2. Forefoot Maximal Force Results

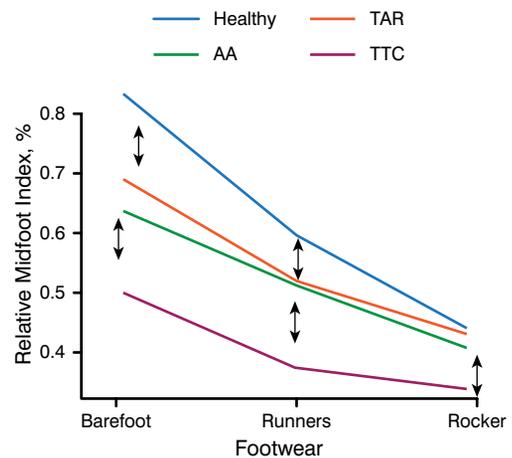


AA, ankle arthrodesis; TAR, total ankle replacement; TTC, tibiototalcalcaneal. Reproduced with permission from A Frigg, MD.

($P=.07$ to $.86$). There was no significant difference in forefoot MF between patients treated with TAR or AA in any of the conditions ($P=.7$ to $.9$). Patients treated with TTC ankle fusion had results that were inferior to those of both TAR and AA (Figure 2).

In patients who were barefoot, rMI was significantly smaller with the TAR and AA groups, relative to healthy controls ($P<.01$), but not significantly different between TAR and AA ($P=.35$). In running shoes, there was no difference between TAR and AA, but there was a significant

Figure 3. Relative Midfoot Index Results



AA, ankle arthrodesis; TAR, total ankle replacement; TTC, tibiototalcalcaneal. Reproduced with permission from A Frigg, MD.

difference compared with healthy controls ($P<.05$). In rocker-bottom shoes, there were no significant group differences ($P=.48$). TTC ankle fusion was associated with a significantly smaller rMI in all conditions compared with the other groups ($P<.001$; Figure 3).

This study found no measurable difference in running shoes or rocker-bottom shoes between patients treated with TAR and AA. In addition, an increased forefoot MF that might be a trigger for adjacent osteoarthritis was not found in patients treated with AA compared with those treated with TAR. Patients treated with TTC ankle fusion have an inferior functional outcome.

Prof. Frigg questioned whether there was any benefit for TAR over AA considering TAR's high rates of failure [Henricson A et al. *Acta Orthop*. 2011] and revision [SooHoo NF et al. *J Bone Joint Surg Am*. 2007] compared with AA.

Early and Delayed Weight-Bearing Outcomes the Same Following Microfracture

Written by Phil Vinall

Injury to the articular cartilage and subchondral bone of the talar dome rarely heals without treatment, and nonsurgical treatment is successful only 45% of the time [Verhagen RA et al. *Foot Ankle Clin*. 2003]. Neither approach is recommended for osteochondral lesions of the talus (OLTs), which are best treated by arthroscopic bone marrow stimulation with microfracture surgery,