Diabetes mellitus causes sensory and motor neuropathy. Neuropathy in patients with diabetes results in decreased protective sensation and tendon imbalance. Tendon imbalance, especially Achilles or gastrocnemius-soleus tightness, causes increased mechanical stress in the foot. This stress can cause foot pain and calluses, which can progress to forefoot ulcers. Less commonly, the increased stress in the foot causes the bone and ligaments of the foot to fail before the skin, resulting in the arch collapse of Charcot foot. Arch collapse can progress to plantar bony prominence and then midfoot ulceration. This increased stress in the foot can be decreased by tendon lengthening, which can resolve foot pain and ulcers.

Foot ulcers commonly become infected and can lead to amputation. Approximately 85% of patients with diabetes who have amputations have foot ulcers. Healing foot ulcers, preventing their recurrence, and preventing infection can prevent amputations in patients with diabetes. Foot ulcer treatment consists of managing infection, arterial problems, and high mechanical stress in the foot. Decreasing mechanical stress in the foot can be accomplished by methods such as shoe modification, walkers, total contact casts, and tendon lengthenings. Tendon lengthening procedures require less patient compliance than other methods. Achilles tendon lengthening and gastrocnemius-soleus recession (GSR) are primary or adjunctive treatments to optimize healing of foot ulcers. Treatment of foot ulcers with tendon lengthening has good support in the literature, both for healing ulcers and for preventing recurrence. Some authors have also recommended tendon lengthening to prevent forefoot ulcers in at-risk patients. For the Charcot foot, there is also evidence that primary GSR contributes to ulcer healing and mitigates progression of deformity, ulceration, and amputation. A more detailed literature review of the benefits of tendon lengthening for diabetic foot problems was previously published in this journal.

Plantar toe ulcers are often treated with percutaneous toe flexor tenotomies. Ulcers plantar to the metatarsal heads are treated with GSR. Posterior tibialis tendon lengthening is added to GSR for ulcers plantar to the fifth metatarsal head or base, and peroneus longus lengthening is added for ulcers plantar to the first metatarsal head. Midfoot ulcers are treated with GSR. Removal of plantar bony prominence percutaneously with a burr can also be helpful. Posterior tibial lengthening can be added for lateral midfoot ulcers, and peroneal tendon lengthening can be added for medial midfoot ulcers.

Gastrocnemius-soleus recession results in much fewer heel ulcers than does Achilles tendon lengthening. Tendon lengthening heals more ulcers faster than wound care and total contact casts with fewer complications and a much lower recurrence rate.

High mechanical stress from a tight Achilles tendon commonly causes foot pain. Foot pain from Achilles tendinitis, plantar fasciitis, midfoot arthritis, and metatarsalgia can also be relieved by GSR. In patients with diabetes, GSR has the advantage over other surgical treatments that it may prevent foot ulcers and Charcot foot.

Patients with diabetes have a higher complication rate with foot and ankle surgery. Tendon lengthening in the calf has fewer complications, including ulcers and amputation, than bony procedures in the foot. Tendon lengthening (GSR) can prevent foot ulcers and can probably prevent Charcot foot from developing in the future.
foot for patients with diabetes, smokers, and patients with foot ulcers, with infection, and/or without pedal pulses.

Belatti and Phisitkul\(^\text{22}\) noted a 47% decrease in major amputations in Medicare patients with diabetic foot ulcers between 2000 and 2010. In the same period, Achilles tendon lengthening increased 89% and GSR increased 575%. These authors believed that the main reason for the decrease in major amputation was the increase in tendon lengthening. Cychosz et al\(^\text{23}\) recently performed a literature review of diabetic foot ulcer treatment, giving the highest recommendation (supported by strong evidence) to tendon lengthening.

Available evidence seems to indicate that tendon lengthening is the most effective treatment for plantar diabetic foot ulcers with the least complications.\(^\text{5,6}\) Tendon lengthening can also relieve foot pain, prevent ulcers and Charcot foot, and stop progression of Charcot arch collapse to rocker bottom foot, midfoot ulceration, and amputation.\(^\text{5}\) Although tendon lengthening may be combined with other modalities, it should be performed as soon as possible to promote rapid healing before the ulcer becomes infected and to better prevent new, recurrent, and transfer ulcers, progression of deformity, and amputation.\(^\text{5,6}\) This author recommends tendon lengthening as an initial treatment for diabetic plantar forefoot and midfoot ulcers and Charcot of the midfoot.\(^\text{5,6}\)

**REFERENCES**