

Diabetic Foot Neuropathy and Tarsal Tunnel Syndrome: A New Paradigm for Treatment?

Researcher has found tarsal tunnel syndrome and diabetic neuropathy look essentially the same with ultrasound.

BY CONNI BERGMANN KOURY, EDITOR-IN-CHIEF

Both diabetic and nondiabetic patients alike can get relief from the symptoms of carpal tunnel with a relatively common surgical procedure. Can today's diabetic foot specialists learn something from this?

In 2000, Doohi Lee, MD, president of Texas Diagnostic Imaging, in Plano, Texas, began to apply his carpal tunnel syndrome research to tarsal syndrome. "At that time, the issue of tarsal tunnel syndrome was *in vogue*," he said in an interview with *DIABETIC MICROVASCULAR COMPLICATIONS TODAY*. "I began by examining the tibial nerve in nondiabetic patients using ultrasound."

The format for Dr. Lee's research was to establish the characteristics of the normal and abnormal tibial nerve in patients with tarsal tunnel syndrome. Along the way, he began to look at the tibial nerve in diabetic patients. "What I was taught in medical school, and this is still being taught some 20 years later, is that diabetic neuropathy is an in-vessel disease. It is because of this thinking, patients are often told by their doctors there is nothing that can be done for them."

To Dr. Lee's surprise, he found that, on ultrasound, the tibial nerve of symptomatic diabetic patients was massive. "The first one I did, I could not even find the tibial nerve. I thought I was looking at a tendon. So this totally contradicted the theory that the nerve should be normal in patients with foot neuropathy.

This began the next phase of his research, concentrating

on diabetic patients. Dr. Lee and colleagues have found that symptomatic diabetic patients on the whole have larger tibial nerves than nondiabetic patients with tarsal tunnel syndrome. The presentation of the tibial nerve, in both sets of patients, is very similar. Additionally, diabetic patients without symptoms of foot neuropathy have normal tibial nerves.

THE RESEARCH

In the study, Dr. Lee and colleagues compared the tarsal tunnel and tibial nerve of diabetic patients with symptoms of foot neuropathy with a control group of nondiabetic patients with symptoms of tarsal tunnel syndrome. Both groups were evaluated by a single experienced operator using high-frequency ultrasound with a linear array transducer (10 MHz to 14 MHz). In the control group, 85 patients aged 32 to 71 years (41 men, 44 women) were evaluated. For the disease group, 187 patients aged 41 to 75 years (94 men, 94 women), were evaluated.

The tibial nerve cross-sectional area was calculated by multiple measurements of the short and long axes through the tarsal tunnel. According to Dr. Lee, other features and abnormalities of the tibial nerve and tarsal tunnel were documented. The mean area and features such as focal compressions, local masses and nerve contour abnormalities were noted. The mean, standard deviation and variance values were calculated from the data for each group, as well



Figure 1. Images show tarsal tunnel ultrasound.

as ANOVA to establish association.

In the nondiabetic control group, the mean area of the tibial nerve was 256 mm² (SD = 1.8). All of the patients with diabetes had abnormal tibial nerves, with a mean area of 27.7 mm² (SD = 2.3). In the ANOVA analysis, $P < .05$ compared with the control group, according to the abstract. The predominant features included diffuse enlargement of the tibial nerve (87%) and focal compression of the distal tibial nerve (64%). Local vascular encroachment (45%) and tenosynovitis of the flexor hallucis longus tendon sheath (26%) were also observed, according to the abstract.

WHAT IT MEANS

“I want to wake people up and get them to think about the idea that there is a correlation between tarsal tunnel syndrome in nondiabetic patients and diabetic neuropathy,” Dr. Lee said in the interview with *DIABETIC MICROVASCULAR COMPLICATIONS TODAY*. “When you look at the ultrasound of nondiabetic patients with tarsal tunnel syndrome, it is almost identical to diabetic neuropathy. I came up with the term *diabetic tarsal tunnel syndrome* to describe the abnormalities.”

Dr. Lee said that ultrasound is an accurate and useful modality for evaluating the tarsal tunnel and its contents in both diabetic and nondiabetic patients. “This study demonstrates the high degree of correlation in the abnormalities of the tibial nerve between nondiabetic tarsal tunnel syndrome and diabetic foot neuropathy,” he said. “They are essentially the same disease, opening the possibility of treatment and relief of symptoms for patients suffering from diabetic foot neuropathy.”

Dr. Lee is in the process of classifying the four major types of compression that he has observed in the tarsal tunnel.

Diabetic patients who are asymptomatic will typically present with normal nerves. “I have had patients who have neuropathy in one leg and not the other, and the leg with symptoms has a large nerve, while the other one is normal,” Dr. Lee said. “Of course, sorbitol metabolism has an effect, but really there is a much more focal component of this disease.”

The most important thing is to create awareness in order for clinicians to look at these data and offer treatment to appropriate patients. “For me, it is not an untreatable disease.

If you take a diabetic patient with carpal tunnel syndrome to a hand surgeon, that surgeon will do a carpal tunnel release. So why is it that we will do this for a diabetic person with neuropathy of the hand and not the feet?”

Dr. Lee said that he has seen diabetic patients that have been treated with a tarsal tunnel release, and they have done tremendously well. “Immediately they get pain relief and then a more gradual restoration of nerve function depending on the severity of the abnormality.”

He is also in the process of corroborating the ultrasound studies with nerve conduction velocity (NCV) testing. “I have found that some patients with compression of the tibial nerve on ultrasound would not be classified as having neuropathy according to the NCV studies.” He said that it has led him to think that perhaps clinicians are not looking at the NCV in the right way.

“NCV may not be a correlative test, but maybe it has more of a prognostic value. Even though the nerve is compressed, the nerve is still functional and firing. If this patient has a surgical release performed, then there is a much greater chance of full recovery. With both ultrasound and NCV, we have a better picture of the patient’s status and can also offer a prognosis for after surgery.”

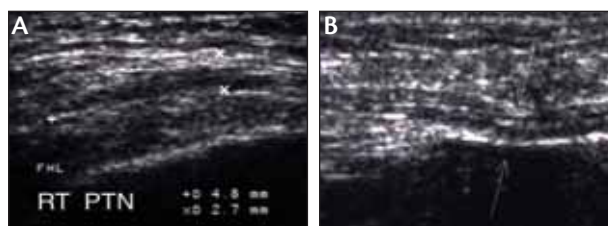


Figure 2. Tarsal tunnel syndrome ultrasound: distal compression (A) and compression by fibrosis (B).

If the terminology were changed from *diabetic foot neuropathy* to *diabetic tarsal tunnel syndrome*, then there would be more of an understanding that this is a treatable condition, Dr. Lee said. “We need a paradigm shift. Clinicians should look at the ultrasound data and see that it’s possible to treat compression in diabetic patients and stop the slippery slope of diabetic foot complications.” ■

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