

Do Not Rely on Peak Plantar Pressure to Predict Ulceration

Although the number of ulcers available for study was small, it was found that baseline pressure was not indicative of ulceration, except for at the metatarsal heads.

BY LAURA SUAREZ, ASSOCIATE EDITOR

Peak plantar pressure has long been used as a marker for diabetic foot ulceration. However, a recent study presented in San Diego by William R. Ledoux, PhD, at the American Diabetes Association 65th Annual Meeting and Scientific Sessions, showed that increased peak pressure did not necessarily lead to an ulcer.

Previous studies, Dr. Ledoux said, have concluded that diabetic foot ulcers normally occur in patients with peripheral vascular disease, peripheral neuropathy, mechanical trauma and/or foot deformities. Other studies have uncovered the direct relationship between foot structure/function with peak plantar pressure, while other research has shown that patients with a history or incidence of diabetic foot ulcer have higher peak plantar pressure. However, the relationship between peak plantar pressure and location of the ulcer has not been as well explored in the literature, he said.

STUDIED FOR ULCER INCIDENCE

Dr. Ledoux and colleagues studied approximately 600 patients, half of whom had neuropathy, for an average of 2.45 years. Patients were an average age of 64.1 ± 10.8 years, and they were enrolled through the VA Puget Sound General Internal Medicine Clinic as part of the Seattle Diabetic Foot Study. All patients were monitored for diabetic foot ulcer incidence. For a sore to be considered an ulcer, it had to be present for 14 days, Dr. Ledoux said.

A total of 47 patients developed ulcers, a small sample size and a study limitation, Dr. Ledoux noted. Nineteen ulcers were located on the hallux and 10 on the heel; this accounted for nearly two-thirds of the ulcers.

At the time of enrollment, in-shoe pressure was measured over five steps with an F-Scan. Dr. Ledoux placed masks across eight areas of the foot: the heel, medial and lateral midfoot, the first metatarsal head, second through fourth

metatarsal head, fifth metatarsal head, the hallux and the toes. Average baseline pressure was 219.7 ± 18.0 kilopascals (kPa) at the ulcer sites and it was 194.1 ± 1.2 kPa at the sites that did not ulcerate. This difference was significant; however, the analysis did not account for specific ulcer location.

Plantar pressure in relation to ulceration was reanalyzed with a linear mixed effects model accounting for location. Dr. Ledoux and colleagues found that within a specific location, pressure was not higher in the presence of an ulcer than in its absence. "Plantar pressure at the nonulcer site was very similar to their plantar pressure at the ulcer site within a location," Dr. Ledoux said. Sites that produced the most ulcers (the heel and hallux) had above average pressures, and that lead to the overall ulcer site pressure being higher. However, in the metatarsals head locations, which accounted for 12 ulcers, the ulcer site had higher pressures whether location was accounted for or not. This seems to indicate that at least for the metatarsals heads, peak pressure is predictive.

"The take home message from this study is that perhaps peak plantar pressure is not the holy grail when trying to predict ulceration," Dr. Ledoux said.

Of the 137,000 yearly nontraumatic amputations that occurred between 1997 and 1999, patients with diabetes accounted for over 60% (or 82,000) of those amputations.

"Clearly there's a disproportionate number of amputations occurring in diabetic patients," Dr. Ledoux said. ■

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