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Plantar Weight Revert the Liability of Diabetic Foot Ulcers with Toe Deformity

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Abstract

Diabetes is one of the most common chronic diseases in the world. The aim of this study was to quantitatively evaluate the foot load-bearing characteristics of diabetic patients with fifth toe deformity through comparative analysis with diabetic patients with normal foot and healthy. Six female diabetic neuropathic subjects with fifth toe deformity and six age-matched diabetic neuropathic subjects without any foot deformity participated in the test. walk test. The dynamic pressure of bare feet is measured with Novel's EMED force plate. Maximum pressure and pressure-time integration for all 7 foot zones (backfoot, midfoot, forefoot lateral, forefoot center, medial forefoot, big toe, and toes) other pins) were collected. Peak pressure was significantly higher in patients with toe deformity in the posterior forefoot, midfoot, and big toe region than in the control group. Meanwhile, the force retention time was longer in the big toe area of the deformed group compared with the control group, and the center of pressure was mostly located in the big toe region during the toe-leaving phase. Diabetics with fifth toe deformity may experience decreased contact area on the sole of the foot in the rest of the toe and increased load on the big toe. Outcomes showed that 5th toe deformity was associated with potential ulcer risk, especially in the big toe region.

Keywords: Diabetes; Foot Care

Introduction

Diabetes is one of the most common chronic diseases affecting people's daily lives. It is estimated that the number of people with diabetes worldwide will exceed 365 million by 2030. Diabetic feet suffer from foot ulcers or foot deformities that impair normal mobility. It is the outcome of long-term load on the soleus surface during walking that has changed or shifted to specific regions in patients with diabetes mellitus and peripheral neuropathy. Excessive pressure in the unprotected foot is considered a major risk factor for plantar ulceration, which is the most common precursor to lower extremity amputation in diabetics. Peripheral neuropathy can cause lower extremity damage and even disability in people with diabetes. Due to impaired sensation in the foot nerves, foot injuries can be easily missed, increasing the risk of ulcers or skin damage. At least 15% of these ulcers outcome in some form of foot amputation. A previous study showed that the feet in early diabetic patients tend to have toe deformities and muscle imbalances in the feet or lower extremities [1-3], which then cause abnormal pressure on the soles of the feet. When human foot structure and human mobility are damaged or dysfunctional, foot pressure and foot load distribution will change accordingly. It is clear that the occurrence of diabetic foot ulcers is largely due to changes in the bearing properties of the foot. And diabetic feet can change the distribution of pressure in the legs, leading to uneven distribution of blood flow in the legs, thereby destroying the blood supply to the feet, eventually leading to foot ulcers and even amputation. However, there are rare reports of kinetic changes in toe deformity, which is an early sign of diabetic foot deformity and a major cause of foot load changes. Therefore, this study aimed to measure the soleus pressure of diabetic patients with fifth toe deformity. Analysis of the pressure distribution in the soles of the feet in normal gait was conducted, and the foot load characteristics in the fifth toe deformed foot were illustrated by comparison with patients with diabetes mellitus. line with normal and healthy feet, aims to provide useful suggestions for the design of footwear for diabetics, relieve pressure, relieve pain in the patient's deformed foot, and reduce the incidence of diabetes [4-7].

Statistical analysis

Novel pressure plate EMED Novel GmbH, Munich, Germany was used to measure plant pressure data. Before the test, the participants had to adjust their walking speed by placing their right foot on a pressure pad, which was mounted in the middle of the aisle. During testing, subjects walked along an aisle in a straight line at a chosen and comfortable speed to exercise their normal gait characteristics. Each participant walked six consecutive trials to demonstrate their normal gait. In order to accurately and thoroughly illustrate the characteristics of plantar load, the foot has been divided into seven anatomical regions, namely, posterior forefoot, midfoot, lateral forefoot, central part of the forefoot. The middle of the forefoot, the big toe, and the other toes [8]. For each zone, peak pressure, pressure-time integral, and pressure center trajectories were collected, and the mean of the six walk tests was used to analyze the data to minimize errors.

To summarize these characteristics, the maximum pressure of the deformity band, the central area of the forefoot, and the big toe are relatively concentrated. Notably, in other areas of the toe, the pressure peak of the deformed group was also significantly lower than that of the control group; The pressure value of the other area of the toe was only one third of the value displayed in the control group while the peak pressure value in GT was 32% higher than the value appearing in the control group. When comparing pressure-time integrals, the forefoot, midfoot,big, big toe, and other toe parts showed significant differences. But for the pressure-time integral in the GT and CFF regions, the strained group was significantly larger than that in the control group. The comparison outcomes with the peak pressure characteristics show different patterns, mainly in the RF, LFF and MFF regions. For the RF region, the pressure-time integral did not show any significant

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difference, but in the LFF and MMF regions, no significance was shown in the peak pressure value [9,10].

Discussion

Pressure-time analysis of the deformed toe group showed a significant reduction in the lateral and medial regions of the forefoot and other toes, while the big toe decreased significantly more than the control group . When combining phase centers of the percentage of pressure lines in the gait cycle, the time of center of pressure used in the forefoot was significantly lower than in the control group and in the toe area. , it was significantly higher than the control group. group while walking. Several studies have reported that the duration of plantar pressure in diabetics is significantly longer than normal, which may be another reason why diabetics are more prone to plantar pressure abnormalities. The present outcomes confirm recent reports that the pressure-time integral of the lesion area was significantly lower in diabetic patients with toe deformity compared with the control group, compared with the histogram. central pressure line, can be a major factor. contributing factors to injury. The pressure-time integral of the deformed group is significantly smaller than that of the control group in the OT region, which indicates that the deformed group is less used in this region to counteract the pressure in order to reduce the impact on the region. . The present outcomes confirm recent reports from which it was found that the pressure-time integral of the lesion was significantly lower than that of the control group with a pressure distribution over the background of complete diabetes. of the injured area. This condition can cause the maximum pressure to be transferred to the vicinity and cause the maximum pressure to be assigned to the wrong region. The pressure from the deformity group was mainly concentrated in the mid-forefoot area and the corridor area. Regarding the pressure on the other toes, the stress load is mainly borne by the corridor and the OT zone is exposed to less load. In contrast, the pressure load of the control group in the big toe and other toes was shared by the big toe and other toes. This would be directly related to the risk of localized ulcers, although the subjects in this study did not yet have any signs of ulcers. Therefore, considering these factors, functional soles or shoes can be adapted and used to relieve pressure or loads on these areas, which can have preventive or even remedial effects.

Conclusion

This study found that the big toe and forefoot are the load-bearing parts of the foot in the 5th toe deformity group and are the most susceptible to foot ulceration due to the long-term effects of the collapse. Changes in pressure distribution in the soles and center of pressure trajectories should be considered when analyzing and treating plantar ulcers associated with diabetic deformity. Quantitative illustration of the foot load characteristics of fifth toe deformity can be of great benefit to diabetics to understand their foot load status and to physicians or rehabilitative therapists function to develop protocols that prevent or even restore foot ulcers associated with fifth toe deformity and other injuries. Some functional shoes are needed to reduce the risk of ulcers in the affected areas, normalizing the distribution of diabetics with fifth toe deformity.

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