

Effects of simulated minor leg-length discrepancy on plantar pressure distribution in diabetic patients with neuropathic foot ulceration

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Leg-length discrepancy (LLD) is often overlooked unless gait becomes adversely affected. Little is known about the effect of LLD on plantar pressure distribution. In diabetic patients, minor degree of LLD can easily develop after using offloading devices that can be further affected by the abnormal gait performance secondary to neuropathy. However, the effect of LLD on plantar pressure distribution in diabetic patients with neuropathy had not been previously studied. Therefore, **the aim** of this work was to study the effect of minor simulated LLD on plantar pressure distribution in diabetic patients with neuropathic foot ulceration. The study included 28 diabetic patients with neuropathic foot ulcers (mean age: 53.7 ± 6.8 years; M/F: 16/12). All recruited patients had one ulcer only. In-shoe plantar pressure distributions were measured during walking by using F-scan (Tekscan Co., Boston, USA). All plantar pressure measurements were made on the affected foot while patients were walking at their normal speed and were wearing 2-cm thick outsole shoes. To simulate minor LLD, the contralateral leg length was changed by asking patients to walk under three different conditions: wearing shoes of the same sole thickness as that of the affected leg, walking barefooted and wearing 4-cm high platform sole shoes. The simulated modifications of the contralateral leg induce three different states of the affected leg: No LLD, 2 cm longer leg and 2 cm shorter leg. Peak pressures (PP), contact area (CA), maximum force (MxF) and pressure-time-integral (PTI) were measured beneath the affected foot in the three different conditions. **Results:** PP and PTI under the total foot significantly increased when short leg is simulated in comparison to no LLD (410.6 ± 176.6 KPa and 79.4 ± 21.1 KPa*S versus 378.4 ± 176.5 KPa and 73.7 ± 19.9 KPa*S). PP significantly increased at 4th MTH on the simulated short leg (242.5 ± 150.1 KPa) in comparison to no LLD (218.1 ± 146.2 KPa). PTI significantly increased at 2,3,4,5 metatarsal heads (59.9 ± 36.5 ; 69 ± 42.1 ; 70.6 ± 42.3 ; 63.9 ± 33.7 KPa*S respectively) when the leg become shorter in comparison to no LLD (51.8 ± 30.1 ; 58.4 ± 37.6 ; 60.3 ± 39.5 ; 57.2 ± 32.3 KPa*S respectively). There was no consistent effect of LLD on either CA or MxF of the total or different foot regions. **Conclusions:** The shorter leg of diabetic foot ulcer patients will be subjected to greater pressure load mainly at the 2nd, 3rd, 4th and 5th metatarsal heads. Notably, the PTI was the most affected parameter. Therefore, care should be given to avoid minor LLD as that could inadvertently develop on using many of the offloading devices.