

Diabetes complications make patients more likely to fall down stairs

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New research presented at this year's annual meeting of the European Association for the Study of Diabetes (EASD) in Vienna, Austria, shows that people suffering from diabetic peripheral neuropathy (DPN)—a complication of diabetes that affects the nerves in the limbs—are likely to sway more during stair climbing, and thus are more likely to fall. Steven Brown, Manchester Metropolitan University, UK, is the lead author on this research, which has been conducted by researchers at Manchester Metropolitan University and the University of Manchester, UK.

Patients with DPN are known to display unsteadiness during walking and as a result be at increased risk for falling. Whilst some studies have found increased postural sway during quiet standing and walking on level ground in patients with DPN, no data exist on objective measures of balance during stair walking. Since walking on stairs is one of the most dangerous daily activities in terms of fall risk, this study investigated the underlying mechanisms of unsteadiness in patients with DPN during stair ascent and descent.

Motion and force data were collected for 22 diabetes patients with DPN with a mean age of 57 years, and 40 diabetes patients without DPN (also mean age 57 years), plus 32 healthy non-diabetic controls (mean age 50 years). All patients were from Manchester or the surrounding area. Movement data was collected using a 10-camera 3D motion analysis system from reflective markers placed at anatomical locations on the body to calculate whole-body centre-of-mass (CoM). The centre-of-

pressure (CoP) under the feet was measured using 4 force platforms mounted into the middle 4 steps of a 7-step staircase, which participants ascended and descended at least 3 times. Balance was quantified by assessing the separation between the centre-of-mass and centre-of-pressure (CoM-CoP separation) in the medial-lateral plane (i.e. side-to-side).

The researchers found that during stair ascent the DPN group showed significantly higher maximum CoM-CoP separation of 13cm, compared to 10cm for both the diabetes patients without DPN and the control group; and also significantly increased variation in CoM-CoP separation: 7cm for the DPN group, 5cm for the diabetes only group, and 6cm for the control group.

During stair descent differences were also evident: the DPN group again showed significantly higher maximum CoM-CoP separation, a mean of 15cm versus 13cm for diabetes patients without DPN and 12cm for controls. The DPN group also saw significantly increased variation in CoM-CoP separation of mean 8cm versus 7cm for both the diabetes patients without DPN and control group. The DPN group also displayed a significantly wider stance width compared to the other groups during stair descent only: mean for DPN 17cm versus 15cm for both diabetes patients without DPN and control groups.

No differences in any variable were observed in the [diabetes patients](#) without DPN compared to the control group during stair ascent or descent.

The authors conclude: "Diabetes patients with peripheral neuropathy display greater extremes in magnitude of medial-lateral sway during stair ascent and descent as well as displaying higher variability during stair ascent and descent. This indicates that patients with DPN have difficulty regulating control of balance during this challenging task. A larger and

more variable medial- lateral sway means that patients with DPN are more likely to lose control of balance and experience a fall during what is known to be an activity —using stairs —where the risk of falls is already very high."

The authors acknowledge that, while it would be impractical to suggest patients with DPN avoid stairs completely, they are at higher risk of a fall and should take measures to keep themselves safe. "Avoiding particularly steep and/or long flights of stairs may be advisable, especially if an elevator is available as an alternative," say the authors. "Using a handrail on stairs if available could also help patients with DPN prevent falls." They add that "Since our research has identified details regarding how patients with DPN sway, and therefore how they are most at risk, this may allow future research to target balance interventions to improve the medial-lateral balance in this population."

The research team is doing further investigations various aspects of gait and how diabetes and DPN affects how these patients walk on level ground and on stairs, to identify and further understand factors that may contribute to unsteadiness and in turn the increased risk of falls. They add: "Many issues that affect balance in patients with DPN stem from deterioration of muscle size and function, so whilst it is not currently possible to positively improve the sensory deterioration, we have been looking at elements that we can positively influence, such as strength training and interventions to help vision focus and avoidance of obstacles. We are investigating the impact of such interventions and how they might translate to improvements in gait and balance control."

Provided by Diabetologia

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