Instant total contact casts (iTCC) have been proposed as an alternative to the gold standard of total contact casting for offloading diabetic foot ulcers. An iTCC involves placement of a non-removable walking boot on a patient in order to redistribute pressure. However, because the iTCC significantly reduces ankle and foot motion, and adds weight and length to the involved leg, patients wearing the iTCC may have reduced control over balance. However, the extent to which an iTCC influences balance is poorly understood. Therefore, one goal of this study was to test the hypothesis that wearing an iTCC negatively influences balance control. We also tested the hypothesis that balance can be partially restored by wearing a heel lift in the contra lateral shoe because a heel lift would decrease the leg length discrepancy and may enhance comfort.

12 healthy subjects participated in balance tests without an iTCC, with an iTCC, and with the combination of an iTCC and heel lift. The balance tests consisted of “static” tests (eyes open and closed on a firm and 6.2 cm thick foam pad), functional reach tests, and ambulation tests. The ambulation tests consisted of walking on a standard treadmill and on a treadmill mounted to an oscillating platform. The oscillating platform was a novel paradigm used to perturb frontal plane balance during walking. The platform moved continuously back and forth in the horizontal plane and appeared random to subjects. Tilt sensors placed on the lower body (greater trochanter level) and upper body (T3-T4 level) measured sway in the sagittal and frontal planes.

Results in iTCC compared to no iTCC conditions were consistent across tests. Functional reach was significantly reduced for anterior-posterior movements in iTCC compared to no iTCC. Sway measures were significantly increased wearing the iTCC compared to without the iTCC in all static and ambulatory tests. In unperturbed walking, the percentage of power contained at the cadence frequency was significantly reduced in iTCC conditions suggesting that subjects’ walking was less rhythmic with the iTCC. Results with the heel lift were mixed. The only significant effects of the heel lift were found in static tests, where sway was significantly reduced in heel compared to iTCC alone.

In conclusion, the increased sway and reduction in functional reach in iTCC vs no iTCC conditions support the hypothesis that an iTCC negatively influences balance. In treating older patients, or patients with a wound due to diabetes, where balance may already be impaired, it is important for the practitioner and patient to be aware that the addition of an iTCC could further compromise balance. Second, results only partially supported the hypothesis that adding a heel lift would enhance balance because only static sway was reduced with the heel lift. However, it is noteworthy that in no conditions did the heel lift negatively influence balance, suggesting that adding a heel lift for comfort and body symmetry may be appropriate with some patients.