Ankle Motion and Off-Loading in Short Leg Cast and Low and High Fracture Boots
Nickolas Nahm, MD; Michael Bey, PhD; Serena Liu, BS; Stuart Guthrie, MD

Purpose: The choice to use short leg casts (SLCs) or fracture boots is often subjective. By preventing motion and redistributing force to the proximal leg, these devices promote healing and protect the foot and ankle. This study compares the impact of SLCs and low and high fracture boots on ankle motion and off-loading. We hypothesize that SLCs more effectively immobilizes and offloads the ankle compared to the high and low fracture boots.

Methods: Skeletally mature, healthy subjects were recruited. High-speed dynamic radiography was utilized to determine tibiotalar motion in the sagittal plane in weight-bearing (WB) and non-weightbearing (NWB) in a shoe (control), SLC (fiberglass), and low (Aircast Short Pneumatic Walker, DJO Global) and high fracture boot (Aircast Foam Pneumatic Walker, DJO Global). Sensors (F-Scan Sensor, Tekscan) captured plantar surface forces, and force was expressed as a percentage of body weight (% BW).

Results: A total of 20 patients (10 male and 10 female) were included. Mean age was 29 years (range, 18-59 years) with a mean body mass index of 23 (range, 18-32). In NWB, the low fracture boot (2.2 ± 2.0°), high fracture boot (2.3 ± 1.6°), and SLC (2.3 ± 1.5°) had significantly less motion compared to control (3.6 ± 2.1°, P ≤0.026). During WB, the SLC (3.4 ± 1.4°) and high fracture boot (4.8 ± 2.0°) had less motion compared to the low fracture boot (7.8 ± 3.4° P ≤0.001). Finally, the SLC (172.6 ± 48.3% BW) and low (165.1 ± 36.2% BW) and high (154.5 ± 32.9% BW) fracture boots were associated with less peak plantar surface force compared to control (195.0 ± 43.8% BW, P ≤0.087).

Conclusion: The SLC and high fracture boot immobilize the ankle in NWB and off-load and immobilize the ankle in WB. The low fracture boot also immobilizes the ankle in NWB, but in WB, the low fracture boot only off-loads the ankle and does not immobilize. Therefore, the low fracture boot is more suited for NWB conditions while the SLC and high fracture boot are effective in WB and NWB.