

HOTFOOT: Acute Effects of Combined Foot Heating and Pneumatic Compression in Type 2 Diabetes: a Preliminary Report

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Background and Hypothesis:

Despite over 1.2 million annual U.S. Type 2 Diabetic (T2D) diagnoses, effective therapies for diabetic foot complications remain limited. We hypothesized that a device combining pneumatic compression and localized heating could increase leg blood flow and foot oxygenation in individuals with T2D.

Design and Methods:

Six healthy individuals (age: 67±3 years, A1c: 5.7 ± 0.38%) and five with T2D (age: 68±5 years, A1c: 7.06 ± 0.57%) were fitted with dorsal and plantar surface thermocouples and near-infrared spectroscopy sensors (OxiplexTS, ISS) over the metatarsal heads to assess foot temperature and oxygenation. Both legs were fitted with boot-like garments with a water-circulating pad and inflatable bladders (Aquilo Sports). After 30 minutes supine, heat (40°C) and intermittent compression (20 mmHg) were applied to one leg for 60 minutes, while the opposite leg served as control. Popliteal artery velocity and diameter were measured via Doppler ultrasound (GE Medical Systems) at baseline and after 60 minutes. A two-tailed paired t-test assessed differences between legs.

Results:

Foot temperature increased by 6.5 ± 1.2°C in healthy controls and by 6.6 ± 1.8°C in participants with T2D (p<0.01). NIRS-derived tissue oxygen saturation (StO₂) increased in the treated foot by 5.3 ± 4.6% in healthy participants (p = 0.01) and by 4.9 ± 10.3% in T2D participants (p = 0.325). Popliteal blood flow increased by 23.0 ± 15.8 mL/min in the treated leg vs. 3.6 ± 18.6 mL/min in the control leg (p = 0.167) in healthy participants. In T2D participants, blood flow increased by 75.8 ± 112.9 mL/min in the treated leg and 8.0 ± 10.7 mL/min in the control leg (p = 0.153).

Conclusion and Potential Impact:

Combined foot heating and compression increases foot oxygenation and leg blood flow in older adults with/without T2D. This accessible therapy may aid in managing diabetic foot complications.