

The Effect of Pneumatic Compression in Adults with Chronic Limb Edema. A Preliminary Study.

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PURPOSE

The purpose of this study was to explore the feasibility of home-based pneumatic compression treatments in reducing edema. The secondary purpose was to explore the effects of this treatment on function in adults with diabetes and people post-stroke.

BACKGROUND

- Pneumatic compression devices have been shown to attenuate lower extremity edema.¹
- The use of layered compression bandages was found to be safe and effective in treatment of chronic lower extremity diabetic edema.²
- No clearly effective treatment is available to alleviate hand edema after stroke.³
- A scarcity of research has investigated the effectiveness of a home-based pneumatic compression treatment in adults with edema related to diabetes or stroke.

PARTICIPANTS

Four people with diabetic edema and 2 people post-stroke with edema in the affected wrist participated in this study.

Diabetes (n = 4)	Stroke (n = 2)
Age = 58 ± 15.0 (years)	Age = 67 ± 4.2 (years)

METHODS

- All participants underwent 5 baseline outcome-measure sessions over 2 weeks prior to the pneumatic intervention.
- Participants were asked to engage in one-hour-home-based daily pneumatic compression therapy (NormaTec PCD, NormaTec Industries, Newton Center, MA) for 8 weeks. The outcome measures were assessed weekly.

METHODS

- In the diabetes group, the dependent variables included volumetric measurement (VOL) of the lower limbs, active range of motion (AROM), the Michigan Neuropathy Screening Instrument (MNSI), and the 10-Meter-Walk (10MW).
- In the stroke group, the dependent variables included the VOL of the upper extremity, AROM of wrist, grip strength, Fugl-Meyer Upper Extremity motor test (FMUE), and Wolf Motor Test (WMT) of the affected side.
- Using the two-standard-deviation points (2SD) method, we compared the means of all intervention data to the baseline values.

RESULTS

- In the diabetes group, 2 subjects showed decrease of edema beyond the 2SD of the baseline values (post-intervention VOL $1955.0 \pm 106.1 \text{ cm}^3 < 2\text{SD } 2011.6 \text{ cm}^3$; VOL $890.5 \pm 41.49 \text{ cm}^3 < 2\text{SD } 903.28 \text{ cm}^3$), and the other 2 subjects showed decrease of edema lower than baseline mean, but not beyond the 2SD of baseline values (VOL $2000.88 \pm 57.22 \text{ cm}^3 < \text{baseline } 2158.00 \pm 142.33 \text{ cm}^3$; VOL $1695.50 \pm 35.87 \text{ cm}^3 < \text{baseline } 1744.40 \pm 30.40 \text{ cm}^3$).
- All 4 diabetic subjects showed increase of AROM (dorsi-flexion & plantar-flexion) bilaterally beyond the 2SD of the baseline values. No significant change in MNSI or 10MW was observed.
- In the stroke group, 1 subject showed decrease of edema in the affected arm beyond 2SD of the baseline (intervention VOL $857.1 \pm 34.6 \text{ cm}^3 < 2\text{SD } 912.9 \text{ cm}^3$) and increase of AROM (intervention active-wrist-flexion $3.0 \pm 0.0^\circ > 2\text{SD } 2.0^\circ$). No significant functional change was observed in either stroke participants.

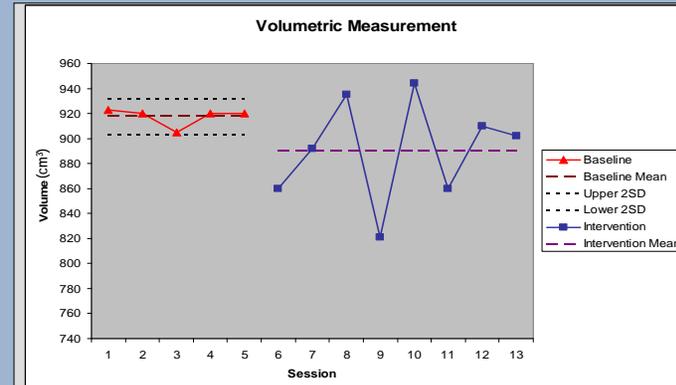


Figure 1. The volumetric measurement has shown a decrease below the lower 2SD boundary of the baseline in a diabetic subject's lower extremity. 2SD - two-standard-deviation.

CONCLUSION

This pilot project demonstrated that 1) home-based pneumatic compression treatment is feasible; and 2) it can inconsistently reduce limb edema and increase AROM in people with diabetes and people post-stroke. Future investigation with a larger sample size is planned.

IMPLICATIONS

Physical therapists may be able to prescribe this home-based pneumatic compression treatment to partially alleviate patient's edema and gain some range of motion in order to aid other task-specific interventions.

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