

Comparing the effects of acupuncture with neuromuscular stimulation on short-term lower limb blood flow: an observational study

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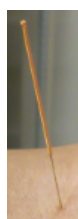
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Introduction

Enhancing training or injury recovery is a fundamental aspect of achieving optimal athletic performance. Little evidence is available to support many of the popular recovery or treatment aids.[1] Neuromuscular stimulation and acupuncture benefit some athletes; which may be due to an increase in blood flow to the healing area.

The firefly™ device stimulates the peroneal nerve to activate the calf skeletal-muscle pump and was shown to increase lower limb blood volume and velocity in the arterial, venous and microcirculatory systems. [2] Acupuncture has been used to treat a range of disorders; point Bladder 40 (UB-40) is indicated for musculoskeletal problems of the lumbar, hip, thigh, knee and calf region.[3] It is currently unclear whether either intervention causes changes in blood flow to the Achilles tendon region and foot.

Aims



Acupuncture

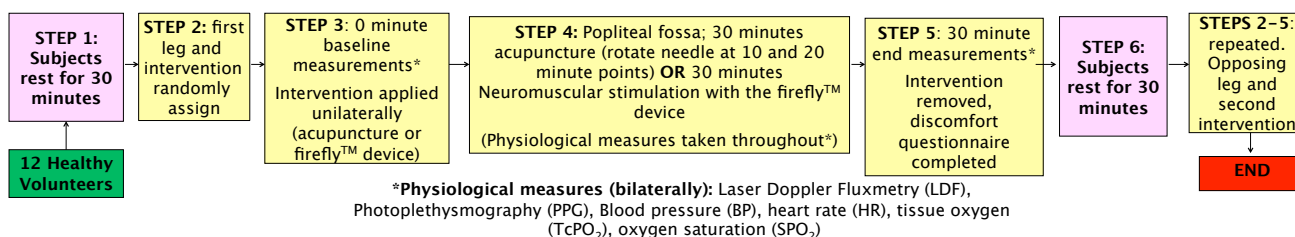
The primary aim is to investigate the effect acupuncture (UB-40) asserts on short-term lower limb blood flow, in comparison to neuromuscular stimulation (firefly™ device), in healthy subjects. Local effects observed in the treated leg (ipsilateral) and systemic effects presenting in the contralateral leg, are also investigated.

In addition, thermography will assess general perfusion of the posterior knee, calf and ankle region. Tolerance of the interventions will be investigated using discomfort questionnaires. Finally, safety of the interventions are also considered.



The firefly™ device

Methodology



Results

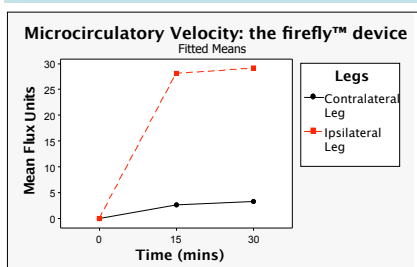


Figure 1: Laser Doppler Fluxmetry. The firefly™ significantly increased microcirculatory velocity in the ipsilateral leg by 30.0 flux units (306%) ($p \leq 0.001$). The contralateral side did not significantly change ($p \geq 0.05$)

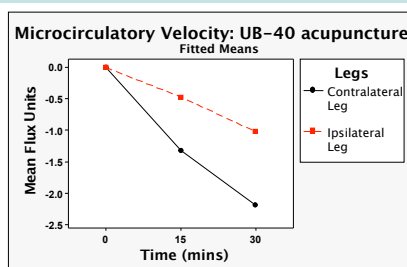


Figure 2: Laser Doppler Fluxmetry. Although UB-40 acupuncture decreased microcirculatory velocity by 1.01 flux units (11%) in the ipsilateral leg and 2.19 flux units (18%) in the contralateral leg, neither were significant ($p \geq 0.05$)

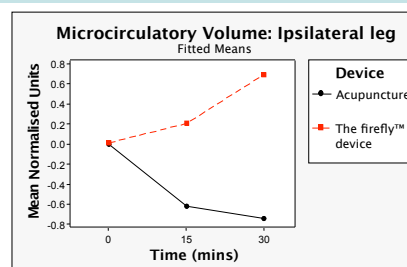


Figure 3: Photoplethysmography ipsilaterally. A significant difference was discovered between the firefly™ and acupuncture ($p \leq 0.001$). UB-40 acupuncture significantly decreased microcirculatory volume by 0.75 normalised units (36%) ($p \leq 0.05$). The firefly™ produced no significant change

Temperature

During firefly™ the ipsilateral knee temperature increased ($p \leq 0.05$), contralateral knee and ipsilateral Achilles remained constant ($p \geq 0.05$) and both calves and contralateral ankle decreased ($p \leq 0.05$). Throughout acupuncture temperature remained constant bilaterally at all sites ($p \geq 0.05$).

Safety measures

No changes were detected in safety measures; BP, HR, TcPO₂, SPO₂ ($p \geq 0.05$)

Discomfort questionnaire

Discomfort data revealed no difference between the interventions ($p \geq 0.05$), rated minimal sensation/mild discomfort.

Conclusions

The firefly™ considerably increased peritendinous microcirculatory velocity, which could benefit injury healing and training recovery, without significantly increasing calf muscle metabolic activity. UB-40 acupuncture decreased microcirculatory volume and maintained a stable temperature bilaterally. Strong evidence for the clinical use of UB-40 is still lacking. Future studies should use patients with pathologies, to relate blood flow changes to clinical improvement.

References

- [1] Barnett A. Using recovery modalities between training sessions in elite athletes: does it help? Sports Med. 2006;36(9):781-96
- [2] AT Tucker AM, DS Bain, L-H Chen, M Azzam, H Dawson and A Johnston. Augmentation of venous, arterial and microvascular blood supply in the leg by isometric neuromuscular stimulation via the peroneal nerve. Int J Angiol. 2010;19(1):31-7. Epub 2010
- [3] Quirico PE. Teaching Atlas of Acupuncture: Clinical Indications: Thieme; 2007