

## **Negative pressure applied to the foot decreases the body core-great toe temperature gradient**

V Kulkarni, C Arkind, JG Brock-Utne

*Stanford University School of Medicine, California, USA*

**Introduction:** A new device that has recently been approved by the FDA for perioperative temperature control (VitalHeat, Dynatherm Medical Inc, Fremont, CA) utilises negative pressure applied to the human extremity along with a water heated thermal pad (1). A rise in skin temperature and consequent decrease in body core-great toe temperature gradient is known to occur with the vasodilation following lumbar sympathectomy, spinal and lumbar epidural anesthesia (2).

The aim of this study was to determine whether negative pressure applied to the foot increases local skin temperature and decreases the body core-great toe temperature gradient. The thermal component was not turned on during this study.

**Materials and methods:** Informed consent was obtained from 6 healthy adult volunteers (4 male and 2 female) to this IRB approved study. Core temperature was recorded every five minutes using a sublingual thermometer (Welch Allyn Ltd., Navan, Co. Meath, Republic of Ireland). Local skin temperature was measured using a surface thermocouple probe attached to the dorsum of the great toe (Mon-a-therm, Mallinckrodt Medical Inc., St Louis, MO).

Each volunteer lay supine with the feet exposed to room temperature (mean 23.8° C) for a period of half an hour. Vital signs were monitored using a finger pulse oximeter and non-invasive BP monitor applied to the other upper arm.

The left foot covered in a plastic flanged-sock was then placed in the perspex boot. The flange was stretched on to the rim of the boot to make it airtight.

Base line and control measurements of HR, SpO<sub>2</sub>, MAP and temperatures were documented. The left foot was then subjected to a negative pressure of -40mm Hg. All measurements were then repeated every 5 minutes for 30 minutes.

**Results:** The mean body core-great toe temperature gradient at base line was 7.5°C (range 3.3°C-14.8°C). This decreased over 30 minutes to 6.3°C (range 3.6°C-13.7°C) in the uncovered right foot. In the left foot subjected to a negative pressure of -40mm Hg the gradient decreased to 4.1°C (range 1.6°C -9.1°C) .

**Conclusion:** Negative pressure applied to the foot raises local skin temperature rapidly and decreases the body core-great toe temperature gradient probably from dilatation of superficial vessels.

### **References:**

1. Grahn D, Brock-Utne JG, Watenpaugh DE, Heller HC: Recovery from mild hypothermia can be accelerated by mechanically distending blood vessels in the hand. *J Applied Physiol* 1998; 85(5): 1643-8.
2. Walsh JA, Glynn CJ, Cousins MJ, Basedow RW: Bloodflow, sympathetic activity and pain relief following lumbar sympathetic blockade or surgical sympathectomy. *Anaesthesia Intensive Care* 1985, Feb; 13(1), 18-24.

