The Effects of Menthol Concentration for Cooling of the Skin

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Background
Gels including menthol are often used for treatment of various pain conditions. They may be referred as “cold gels” because menthol induces cooling sensation through TRPM8 channels. Topical menthol gels typically consist of menthol, ethanol and adjuvants. The menthol percentage varies between manufacturers, but in many of the menthol-related studies, 3.5% menthol gel is used as one alternative compound.

Aim
The aim of this study was to investigate this issue with three different menthol concentrations.

Patients
Measurements were conducted with 10 healthy male subjects (age range 25–30 years).

Clinical methods
Three gels with different menthol concentrations (0.5%, 4.6% and 10.0%) were tested. In addition to menthol, the gels consisted of ethanol (8.0%), water and adjuvants. The gels were manufactured and random-coded for this study by Fysioline Ltd. (Tampere, Finland). The study was executed in a double-blinded fashion and the coding of the gel was revealed only after all analyses were performed. The effects of menthol gels were analyzed by infrared thermal imaging recordings acquired with a digital infrared camera (FLIR Systems, Inc., Wilsonville, OR, USA) and FLIR Research IR MAX software. The used FLIR A325-model has 320 × 240 pixel spatial and 0.05 °C thermal resolution. The patients subjective cooling effect was analyzed by VAS rating.

Results
All gels decreased the skin temperature significantly (P < 0.05). The median cooling time (±median absolute deviations) was 69 ± 16 min for 0.5% gel, 56 ± 7 min for 4.6% gel and 62 ± 20 min for 10.0% gel. However, there were no significant differences between the cooling times (P > 0.05).

Conclusions
As a conclusion, in contrast to our hypothesis, menthol concentration did not correlate with skin cooling. However, menthol concentration may have an effect on the experienced cooling sensation, as indicated by our finding of significant differences in VAS-rating between the gels.

VAS scale

No pain

Strongest level of pain

Clinical methods

No pain

Strongest level of pain

Results

No pain

Strongest level of pain

Conclusions

No pain

Strongest level of pain