

Monitoring Cooling Agents Applied to the Skin of Normal Subjects by Quantitative Thermal Imaging

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Topical agents are now available for localised skin cooling. These are particularly useful in minor trauma, often occurring through sporting injuries. In the past packs of ice were the only practical way of applying localised cooling, which are effective and provide extreme cold for a limited time while the ice melts. Commercial products are more readily available, the most common being in aerosol form. In order to quantify the effects of cooling we have tested different methods for applying cooling products to the skin.

Methods

After a stabilisation period, six subjects received an ice pack application to the lumbar back for 10 minutes, and the skin temperature over the area was monitored for 60 minutes at 3 minute intervals. The results were compared to twelve subjects who received a gel (Deep Freeze, Mentholatum Co. Ltd.) applied to a 10x10cm area also to the lower back monitored for 60 minutes. In this study each region of interest was analysed to generate graphs of the cooling effects of the two treatments. All procedures were carried out in a controlled temperature 23°C and under strict laboratory conditions.

In a further experiment, a new gel dressing (Deep Freeze Cold Patch, Mentholatum Co Ltd. designed to adhere to the skin) was applied to one forearm and one thigh of 12 normal volunteers. The same environmental conditions were used and the subjects stabilised before baseline temperature measurements were obtained. Localised cooling was effectively achieved by this new method of application, with the increased acceptability of clean dry dressing that remained in place on the skin throughout the 3 hours contact time of the test.

Results

Temperature decrease of 3.5°C was found in comparing the treated mid thigh area, with the contra lateral control area. In the forearms of the same subjects, similar findings were obtained. The cooling effect of a single cold patch dressing was significant for up to two hours, with slight continuing activity in most subjects for a further hour. In these experiments an A40 FLIR infrared imaging system connected by firewire to a digital computer with C THERM image processing software was used. For the patch study, the dressings were peeled back from the skin for each image to be recorded, then immediately replaced in the same position. The temperatures were sampled at 15 minute intervals for one hour, then 30 minutes for the remaining two hours. The two sites were tested on different days in each volunteer.

Conclusion.

Modern preparations for the application of localised cooling to the skin are effective, and more comfortable than the use of ice packs. Furthermore, while the aerosol is convenient for immediate application as on a sports field, the cold patch gel is suitable and convenient for longer term home application.

The objective data from these studies supports the conclusion that Deep Freeze gel based products when applied to the skin are better tolerated, and can be used for longer periods than conventional icepacks where localised skin cooling is found to be beneficial. Non-contact thermal imaging is the ideal technique for monitoring the local effects of these products on the skin.