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Abstract

Cryoscopy: a novel enhancing method of *in vivo* skin imaging

- *Arjen F. Nikkels*[1,1]*Department of Dermatopathology, University Hospital of Liège, Liège, Belgium and*
- *Gérald E. Piérard*[1,1]*Department of Dermatopathology, University Hospital of Liège, Liège, Belgium*
- [1]Department of Dermatopathology, University Hospital of Liège, Liège, Belgium

Address:
Dr A.F. Nikkels
Department of Dermatopathology
CHU du Sart Tilman
B-4000 Liège
Belgium
Tel: +32 4366 2499
Fax: +32 4366 2976
e-mail: af.nikkels@chu.ulg.ac.be

Abstract

Background: It is a common observation that superficial freezing of normal skin and skin tumors may create a transient superficial whitening effect. In this respect, cryoscopy refers to the direct observation by dermoscopy, with or without digital recording, of the visual alterations of the frozen tissues.

Aims: To define the optimal method of cryoscopy and to describe the cryoscopy patterns of normal skin and selected skin lesions.

Materials and methods: The influence of (a) different cryogenic sources [solid carbon dioxide (−78.5°C), liquid nitrogen (N_2, −196°C), and a mixture of dimethyl ether and propane (−57°C)], (b) various application methods (spraying, cotton chill tips, copper plate), and (c) freezing time was assessed with regard to clinical feasability, visualization quality, and persistance time of the whitening effect. Cryoscopy patterns of normal skin, callosities and of histologically proven seborrheic keratoses, verrucous hamartomas, molluscum contagiosum, keratoacanthomas, viral warts, condylomas, actinic keratoses, dermatofibromas, skin tags, basal cell carcinomas, angiomas, and melanocytic naevi were assessed.

Results: The cryoscopy images of skin highlighted the skin lines. They appeared similar regardless of the freezing source and the application method. The aspects differed according to the nature of the lesions. The cotton chill tip method provided a longer whitening period compared with the other cold sources, both in normal and lesional skin. Hence, it represented the most convenient way for performing digital recording cryoscopy. On normal skin, cryoapplication was limited to about 1.5 s due to pain, resulting in whitening times ranging from 6 to 9 s, which was too short for easy digital recording. On all studied skin tumors, a 10-s N_2 freezing time was not experienced as painful, and blanching time persisted for 20–34 s, allowing easy digital recording. The whitening time was longer with increasing freezing time on both normal and lesional skin. Every single examined normal skin site and all the skin lesions showed a strong whitening effect, except heavily cornified structures, including some keratoses, callosities, and viral warts. Increased contrast of the skin surface texture was observed in almost every studied lesion.

Conclusion: The N_2 cotton chill tip technique appeared to be the most convenient technique for cryoscopy and provided longer whitening periods compared with the other freezing sources. Pain prevented its use on normal skin, but a series of exophytic skin lesions was conveniently accessible to cryoscopy. The differences in whitening periods of various epidermal components resulted in increased visual contrast, creating typical cryoscopy images for the different exophytic skin tumors. Cryoscopy represents a novel *in vivo* skin imaging technique that is rapid, non-invasive, cost-effective, and easily performed. It shows both investigative and diagnostic potentials. It is remarkable that cryoscopy pictures closely resemble those yielded by skin capacitance imaging.