Introduction

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Simplified Technology for Cyrotherapy

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Goals of cyrotherapy on the skin – freezing techniques for cyrodermatology – application techniques in cyrodermatology – small unit for liquid freezing - methods- results - advantages of the liquid freeze system

Introduction

Various freezing techniques have proven to be successful in dermatology for decades (1). The goals of cyrotherapy range from isolated pigment cell damage in naevi through to metaplastic processes in the presence of keloids, skin infiltration, granulomae, cyrocoagulation with angiomae and vesiculose separations for papillomae and precancerous stages up to the destruction and necrosis with malignant tumours (2, 3). Liquid nitrogen (N2) in sprays and in closed probes are predominantly used as well as CO2 snow (2,4,5) for some purposes . Tables 1-3 provide a brief synopsis of the indications, freezing and application techniques.

A process was sought which can be used for the most frequent indications with minimal transport and procurement effort, also outside the treatment centres.

Method

A small unit for "liquid freezing" with N2O at 88.8°C (Cyroswiss GmbH, Basle, Switzerland) which can be operated with common whipped cream cartridges, was used for 25 capillary angiomae in infants covering a surface of up to 10 mm, 25 precancerous actinic keratoses and 25 exophytic verrucae vulgares compared to just as many lesions which were treated with N2 with closed probes (for angiomae) or using sprays (precancerous stages, verrucae), test of the zero hypothesis with Chi-square test, minimum post observation period 2 months.

Results

Out of 25 angiomae treated with liquid freezing, in 3 of 25 cases treated with N2 cooled probes no follow-up was possible. Three to four times further treatment was

necessary due to further growth. For 18 or 19 angiomae the growth ended with the first treatment . In the same time 9 still growing angiomae of the same size were not treated immediately at the request of the parents, 7 of which were treated after 4 weeks following further growth. 16 angiomae not growing any more of the same size were not treated right from the start. In the case of precancerous stages (fig. 2) using the methods mentioned 24 of 25 foci had disappeared on the follow-up examination for virus warts (fig. 3) 21 of 22.

Discussion

The apparently better results compared with the standard procedure (4) are due to the limitation to small therapeutically favourable tumours. The process is less suited for larger ones.

The results of liquid freezing are comparable to those attained with N2 (4, 6, 7) for 3 frequent indications in practice for superficial cyrotherapy. For larger areas, a great number of lesions and those for which compression is necessary as part of the cyrotherapy, such as in the case of thick angiomae as well as in the case of very high treatment frequencies, N2 spray processes or nitrogen cooled probes with compression possibility are more favourable. However a probe is also being developed for the liquid freeze system enabling compression on limited areas. This technique is additionally applicable interstitially, in special situations (not for vascular lesions due to the risk of an embolism which cannot be excluded easily) because the coolant applied is usually used to process foodstuffs and is free of germs.

The whipped cream cartridges can be procured reasonably almost everywhere as catering supplies and compared with liquid nitrogen can be easily stored without the need for any special equipment. The unit with its fine needle probe requires careful handling. It is however so compact and practical (fig. 1) that it is suitable for home and consultant visits. (table 4)

Small units for liquid freeze therapy are equivalent to the spray and probe techniques using N2 for important dermatological indications in cyrotherapy. Where cyrotherapy is not used on a very large scale these units are economically reasonable and possible where N2 cannot constantly be procured.

Summary

Cyrotherapy using liquid freezing with N2O is almost always possible wherever liquid nitrogen cannot constantly be procured. The N2O cartridges can be procured reasonably everywhere, are easy to transport and to store. For important dermatological day-to-day indications such as small capillary haemangiomae, papillomae and actinic keratoses both processes are comparably effective.

Table 1
Goals of dermatological cyrotherapy

Table. 2
Freezing techniques applicable in cyrodermatology

Table. 3
Application techniques in cyrodermatology

Table 1

Invasive malignant tumours and cutaneous metastases
Destruction through cyronecrosis
Healing with scar

Precancerous stages and papillomae,
seborrhoic keratoses

Vesiculose separation from the corium
Epithel replacement from hair follicles and glandular ducts without scars

Haemangiomae and angiectasis
Partial obliteration through damage to the endothelium
Impulse for further regression

Granulomae, erythematodes etc.
Infection, circulation alteration, decomposition and metaplasia

Pigmental and naevus cell naevi
Pigment cell damage without further destruction
Colour approximation

Table 2

1. Liquid coolants stored in insulated containers
   N2: evaporation temperature 77.4 K (-195.8°C)
2. Expansion of compressed gasses (Joule Thomson Effect)
   N2O: attainable 184.4 K (-88.8°C)
   CO2: attainable 194.7 K (-78.5°C)
3. Thermal electric cooling
   (principle of the Peltier Cascade)
   Attainable approx. –32°C
   (up to maximum –42°C)

Table 3

4. N2
   Open spray procedures
   Closed probe cooled with N2
   Application stick pre-cooled with N2

5. N2O
   Open contact probe epicutaneous
   Open interstitial probe application
   Closed application surface

6. CO_2
   Topical application of CO_2 snow,
   made into a slurry by adding acetone

7. Thermal electric cooling:
   closed metal probe

Gas cartridge
Can be easily stored, transported, purchased reasonably everywhere (catering supplies)

Units
Small and easy to transport, suitable for consultant and home visits

Application
Precise application, easy handling, possibility of interstitial use

Table 4
Advantages of the liquid freeze system
Literature