UIAA Mountain Medicine Centre Information Sheet 10

Intended Distribution: Mountaineers, Skiers, Trekkers
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FROSTBITE - PRACTICAL SUGGESTIONS

Frostbite means that skin and underlying tissue actually freeze. This condition rarely occurs in still air below -10°C but may do so at higher temperatures in high winds due to the wind chill effect). It cannot be emphasised strongly enough that frostbite need not happen even at extremes of altitude, temperature and fatigue: frequently a degree of carelessness is the chief cause.

Recognition

Below -10°C, any tissue that feels numb for more than a few minutes may become frostbitten. Although all climbers are well aware of having suffered from numb cold feet or hands for hours at a time with no ill effects, it is important to realise that while being frost-bitten the subject is senses no more than this familiar numbness. It is wise therefore to have some idea of the temperatures in unfamiliar terrain: many miniature portable thermometers are available, so clip one on your sack or outer jacket zipper tab. If you feel the numbness and the temperature is particularly low it's time to act - flexing the fingers and toes, stamping the feet, clapping your hands or placing them in the armpits or groin should all bring back some sensation. If not, assume some degree of frostbite (probably frostnip) and perform more specific re-warming with warm water as below.

In early (superficial) frostbite in the unthawed state, the skin is yellow-grey, painless, numb and leathery to the touch - pain (lots of it!) occurs as re-warming takes place. In deep frostbite, the tissue is hard, white and obviously frozen like a piece of chicken from a freezer, and medical advice must be sought as soon as possible.

Emergency treatment

For all but trivial frostbite (e.g. a cheek, a fingertip) evacuation to a place of safety is essential. If the feet are frostbitten the difficult decision has to be made about the patient moving on foot. There are no absolute rules but in general, it is better to move for six hours with frozen feet to a place of safety than to thaw the feet at a high camp. Walking on vulnerable inflamed unfrozen tissue can cause further injury.

Once safe, re-warming should begin immediately. Avoid smoking (nicotine contracts blood vessels), but alcohol may be helpful (it dilates blood vessels) - however only provided hypothermia does not co-exist. If possible, immerse the frostbitten area in a saucepan of hand hot water - 39-42°C is optimal. If you have no thermometer heat the water until it is "really quite hot" to the touch, about as hot as your elbow can stand: take great care not to scald the patient! Immerse for periods of 20 minutes, moving fingers and toes if possible, but do not knock or rub the frozen tissue.

Thawing may be extremely painful, but perseverance is the key! After thawing, wrap gently in clean bandages, separating fingers and toes. The victim must use thawed tissue as little as possible - this may require them being nursed, fed and helped at the lavatory by colleagues. If a hot water container is not available, warm the affected parts in a warm sleeping bag (or on the abdomen, groin or armpits) for several hours. Above 5500m, oxygen should be given if it is available.

Further progress of frostbite

A few hours after thawing the tissue swells and during the first two days giant blisters form. Try not to break them, these blisters will settle during the first week albeit to leave tissue hideously discoloured, and if gangrenous, shrunken and black. This carapace, or shell

separates in several weeks. If the frostbite is superficial, pink new skin will appear beneath the carapace, if deep, the end of a toe or finger will gradually separate off - an unsightly but usually painless process.

By far the most important emergency treatment after re-warming is to keep the skin as clean as possible to avoid any infection.

Risks and implications of frostbite

The disability caused by frostbite often leads to increased risks in descending difficult ground and usually means abandoning a climb. Anything more than very trivial frostbite means the end of climbing for the patient for a few months at least. It is wise to warn newcomers to cold conditions of these implications - adequate clothing, spare gloves and dry socks should always be carried; boots should not be too tight and if using plastic boots, consider carrying spare inners.

Long term management

There are widely disparate views on the use of drugs in frostbite, a tacit admission that few are really effective. It is imperative to keep damaged tissue free of infection: antibiotics may be necessary, and tetanus toxoid prophylaxis is often recommended.

It is extremely difficult to predict the outcome in the first few weeks after frostbite, and remarkable recoveries occur. Surgery is usually best avoided for several weeks or even months, until it is clear that there is no other alternative.

Summary

Frostbite on a climb is a major emergency, yet with competent nursing care most cases can be looked after in the field, e.g. at a Himalayan base camp. Frostbite can frequently be avoided, but when it does occur, it increases the risks both to the sufferer and their colleagues. Rapid re-warming is recommended and strict adherence to hygiene, but surgery is usually best delayed for at least several weeks, or months.

Updated October 2002 by Dr Charles Clarke FRCP

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