



AUSTRALIAN RESUSCITATION COUNCIL

GUIDELINE 9.3.6

COLD INJURY

Exposure to cold conditions can lead to generalised cooling of the body (hypothermia) or localised cold injury. The latter may be either Freezing Cold Injury (frostbite) or Non-Freezing Cold Injury (NFCI or trench foot).

FREEZING COLD INJURY

Frostbite results from the freezing of tissues causing ice crystal formation and blocking of small blood vessels. The areas most commonly affected are those exposed to cold, windy conditions (e.g. the face, inc. ears), and those with the most peripheral blood supply (e.g. fingers and toes). Frostbite can most simply and usefully be classified into superficial frostbite in which only the skin is frozen and can still be moved in relation to the underlying tissue; and deep frostbite which involves deeper tissues. The vast majority of cases that occur in Australia are of the superficial type.

Management of Superficial Frostbite

- Seek shelter. Get out of the cold and wind.
- DO NOT rub the frozen tissue.
- DO NOT use radiant heat to rewarm the part.
- Rewarm the affected part immediately by gently placing the affected fingers in the opposite armpit, or by placing a warm hand over a frostnipped cheek or ear. Feet can be reheated on the warm abdomen (under clothing) of a companion. Rewarming can be very painful.
- Ensure that re-freezing does not occur. Once the colour and consistency of the skin have been restored the person can safely resume normal activity provided they increase their insulation and are especially vigilant against recurrence.

Management of Deep Frostbite

- Seek shelter. Get out of the cold and wind.
- Remove constrictive or damp clothing if dry replacement clothing is available.
- Wrap in warm blankets and give warm fluids by mouth.
- If tissue is still frozen at time of presentation, the best tissue survivability results from placing the injured part in a warm water bath with circulating water (40-42°C, that is, comfortably hot to the back of a rescuer's hand) until the affected part thaws. This may take 30 minutes or more. Such management is best achieved under hospital conditions where infection-control and adequate pain-relief can be provided.

- If tissue has spontaneously thawed by time of presentation (as is often the case) the 40-42°C water bath is not required, but affected tissue can be cleaned and bathed at a more comfortable temperature (30-35°C). Rewarming can be very painful.
- Elevate the affected part.
- DO NOT use radiant heat to rewarm the part.
- DO NOT break blisters.
- NEVER thaw a part if there is any likelihood of it being refrozen. Thawing and refreezing results in far more tissue damage than leaving the tissue frozen for even several hours.

NON-FREEZING COLD INJURY

Prolonged exposure of limbs to low temperatures above freezing may lead to “trench foot” or “immersion foot”. When first seen, the injured part is pale, anaesthetic, pulseless and immobile, but not frozen. The pathophysiology is not fully understood. Although there is no formation of ice crystals in the tissue, the cold temperature alone appears to cause damage to nerves and to the lining of small blood vessels, leading to occlusion and stasis of blood flow.

Management of Non-Freezing Cold Injury

The treatment of Non-Freezing Cold Injury is still controversial, as no single treatment method has been demonstrated to result in better tissue survivability than other treatments.

- Dry the foot well. Keep the body warm but the foot cool.
- Do not let the victim walk on affected feet. Rather they should lie down with the feet elevated.
- DO NOT use radiant heat to rewarm the part.

Useful References:

1. Burr R. Trench Foot. *J Wild Med* 1993;4:348-352.
2. Francis TJR, Golden FStC. Non-freezing cold injury: the pathogenesis. *J Roy Nav Med Serv* 1985;71;3-8.
3. Granberg PO. Cold Injury. In: Chant AD, D’Sa AA, eds. *Emergency Vascular Practice*. London: Arnold, 1997:119-134.
4. McCauley RL, Smith DJ, Robson MC, Heggors JP. Frostbite and other cold-induced injuries. In Auerbach PS, ed. *Wilderness Medicine*, 3rd ed. St Louis: Mosby, 1995:129-145.
5. Mills WJ. Summary of the treatment of the cold injured patient-frostbite. 1993;Vol 35.1:61-66.
6. Riddell DI. A practical guide to local cold injuries. *J Roy Nav Med Serv* 1986;72:20-25.
7. Swedish National Board of Health and Welfare. Hypothermia - Cold-induced injuries. Stockholm: 1997: 1-110.

FURTHER READING

ARC Guideline 9.3.3 Hypothermia: First Aid and Management