

B. cold injuries

Injuries due to cold are more frequent and urgent in military than in civil life. Intense vasoconstriction due to local action of cold and reflex vasoconstriction stimulation is reinforced by passage of cold blood through the vasomotor center. Vasoconstriction provokes tissue anoxia. Ice crystal formation in the blood vessels does not usually occur, but when it does, necrosis ensues.

1. frostnip.

Is a painful area when vasoconstriction is evident but ice crystal formation has not occurred. Signs and symptoms of frostnip resolve with rewarming and permanent tissue damage does not occur.

2. frostbite (congelatio)

When soft parts are frozen and locally deprived of blood supply. Frostbite is associated with varying degrees of irreversible tissue damage in exposed areas of the fingers, toes, nose, ears, cheeks that occurs as a consequence of ischemia caused vasoconstriction and structural injury to cells caused by ice formation. The frozen part becomes pale and waxy but there is scarcely any pain or discomfort. Various degrees of tissue destruction similar to those caused by burns are encountered. These are erythema, edema, vesicles and bullae, superficial gangrene, and injury to muscles, tendons, periosteum and nerves. Freeze –thaw cycles are particularly injurious.

Frostbite is graded as:-

1. first degree—superficial when partial.
2. second degree—full-thickness dermal injury is present.
3. third degree—deep, when subcutaneous involvement is present.
4. fourth degree—bone, muscles, and tendon involvement are present, permanent functional impairment of hands or feet may result.

Treatment

Early treatment of frostbite before swelling develops should consist of covering the part with clothing or with the warm hands or other surface to maintain a slightly warm temperature so that adequate blood circulation can be maintained. Frostbite should be treated with rapid local warming of frostbitten extremities by immersion in warm water (104° to 110°) to minimize tissue loss. It is important not to attempt to rewarm areas of frostbite in the field if there is any danger of freezing. Frostbitten areas should never be rubbed, as the frozen tissue is particularly susceptible to trauma. There is varying degrees of endarteritis obliterans of the surviving blood vessels. After swelling and hyperemia, have developed, the patient should kept in bed with the affected limb slightly flexed, elevated, and at rest. The use of anticoagulant to prevent thrombosis and gangrene. Penicillin or other antibiotic should be given as a prophylactic measure against infection. Recovery may take many months.

3. Chilblain (pernio)

Chilblain is a recurrent localized erythema and swelling by exposure to cold. Blistering and ulceration may develop in severe cases. This occurs chiefly on the hand, feet, ears and face especially in children.

4. Immersion foot (Trench foot).

Immersion foot results from prolonged exposure to cold without actual freezing. The term is derived from the standing of soldiers in cold trenches that may have water in them. The lack of circulation produces edema, paresthesias, and damage to the blood vessels. Gangrene may occur in severe cases.

Treatment.

Consists of removal from the causal environment, bed rest and restoration of the circulation. Other measures, such as those used in the treatment of frostbite, should be employed.

Prevention of cold injuries

1. educate employees.
2. provide heated shelters and regular rest periods to that workers can rewarm periodically.
3. use appropriate protective equipment, including the use of non-conducting surfaces, to prevent frostbite of hand, feet, and face.
4. provide an on-site means of warming hands, feet, and face to prevent frostbite.
5. wear enough protective clothing. A good method is to use three layers, an outer layer that breaks the wind and allows some ventilation (usually Goretex, or Nylon), a middle layer of wool, down, or synthetic pile that absorbs sweat and retains its insulating capacity when wet, and an inner layer of cotton or synthetic weave that allows ventilation and escape of moisture.
6. avoid using ethanol to keep warm and other mind-altering drugs that impair judgment and coordination. Smoking leads to vasoconstriction and theoretically increases the risk of dermal injury due to cold exposure. Encourage adequate nutrition.
7. prevent dermal injury secondary to drying of the skin by frequent application of protective emollients and use of wind breaking clothing.
8. closely observe employees for evidence of impairment or alteration of consciousness.