Medicine for Managers

Dr Paul Lambden BSc MB BS BDS FDSRCS MRCS LRCP DRCOG MHSM

Frostbite

There is a fine line between heroism and insanity. In 2000 Sir Ranulph Fiennes attempted a solo walk to the North Pole. The expedition failed and he suffered severe frostbite to the tips of all the fingers of his left hand. A surgeon insisted the dead fingertips be left for several months to allow remaining healthy tissue to regrow. Fiennes cut them off himself with a fretsaw!

Frostbite occurs when any body tissue is exposed to temperatures below freezing (32°F or 0°C). Any part of the body can be affected but classically it is the extremities of the body (fingers, toes and nose) that are most vulnerable.

It occurs simply because, at low temperatures, there is a deprivation of oxygen which can cause damage to or death of cells. The tissue cooling results in constriction (narrowing) of the blood vessels supplying the area as they attempt to conserve heat. This in turn results in slowing and stagnation of the blood and, if the cold environment is maintained over a long period, the tissues and the blood in the vessels freeze. Ice crystals form with the result that severe damage and destruction of tissues, blood vessels and red blood cells occurs. At this stage the damage is irreparable and the result is that gangrene develops in the affected area. Therefore the severity of the damage to any area will depend on the degree of the cold and the duration of the exposure.

The severity of the frostbite is described by a rather arbitrary classification; frostnip, superficial frostbite and deep frostbite. There is no clear distinction between each stage. The ability of the body to recover from exposure to cold will depend on whether the damage is reversible (such as during the frostnip stage) or irreversible (as with deep frostbite).

The initial changes (frostnip) result in pins and needles with throbbing and pain, followed by numbness in the affected area, associated with the skin becoming cold and white. The skin subsequently becomes hard and frozen. The affected area may also swell. If the exposure to cold continues the area continues to feel cold to touch and frozen and may appear blotchy or blue. As the low temperature persists other tissues will become affected, including muscles, tendons and nerves.

The extent of the damage will not be known until the affected area thaws out. If the damage is relatively mild, the result of the warming is that the skin turns red and blisters form. The changes are accompanied by pain (often severe) which is usually throbbing in nature. More severe damage results in the formation of dark red blood-blisters which go on to form thick black scabs which are, in fact, necrotic (dead) tissue. The longer and more extreme the exposure to low temperatures the more the tissue necrosis that occurs. Further management may involve surgery to remove the dead areas, resulting in the loss of digits or parts of limbs, parts of the face, etc.

Some people are more at risk of frostbite. Clearly mountaineers, winter sports enthusiasts and people stranded in extreme cold weather are very vulnerable. So are those people whose job may involve such hostile conditions, such as people in the military services and mountain rescue. Others include the homeless, the very young, the very old, people who have consumed a lot of alcohol (because it may not be apparent that the body is cooling), patients with Raynaud's phenomenon and those with circulatory disorders.

Frostbite must be treated quickly and efficiently. The key action is to move the patient to a warmer area to prevent further heat loss (or if impracticable to wrap them in warm blankets or other covering to try to warm them and to protect frostbitten areas) Medical assistance should be summoned immediately. Around one in eight people suffering from severe frostbite will also be suffering from hypothermia. Patients should be provided with dry clothing and given warm drinks. Frostbite is usually treated by placing the affected part(s) in a water-bath operating at about 40°C until the temperature is restored to normal. Damaged areas are then covered in simple non-adhesive dry dressings to prevent any friction to the affected area.

Patients with hypothermia (having core body temperature of below 95°F (or 35°C) will have general symptoms of shivering, lassitude, gasping respiration and a weak, thready pulse. In more severe cases, they may lapse into unconsciousness and may

die. Hypothermia, like frostbite, is a medical emergency requiring careful reheating. If they are heated too quickly, blood will be diverted to the skin at the expense of the core resulting in potential system failure. If they are heated to slowly, there may be increased damage. These days this is almost always managed in hospital.

With frostbite, prevention is better than cure (because there isn't one!) If it is not possible to avoid extreme cold then appropriate clothing is essential. The extremities in particular must be protected with thick insulated mittens (which are more effective than gloves, insulated boots and thick protection for ears, nose, lips, etc. Remember than several thin layers are more effective than one thick layer. If travelling by car in very cold areas ensure you have warm blankets, flasks of hot drink, spare dry clothes, etc. in case of breakdown. If caught in extreme cold, keep out of the wind (which adds to the chill), do not smoke (which narrows arteries) and do not drink alcohol (which increases heat loss). And don't forget some Kendal Mint Cake! Keep safe.

paullambden@compuserve.com