



Cold Injury and its Management

What is cold injury?

Cold injury is a tissue trauma produced by exposure to freezing temperatures and even brief exposure to a severely cold and windy environment.

Cold Injuries

Generalised

- Hypothermia

Localised

- Non-freezing
 - Chilblains
 - Trench Foot
- Freezing
 - Frostnip
 - Frostbite

Incidence Of Cold Injuries Indian Army(2003)

<u>Cold Injury</u>	<u>Admission Rate</u>
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Frostbite	- 0.21%
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Chilblains	- 0.11%
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Hypothermia	- nil
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Trench foot-	nil
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(Based on Western Himalayan HA region
troops data)

Hypothermia

- ✓ Mild(cold stress)- 37-35°C
Pallor,Shivering,Complex motor function loss
- ✓ Moderate - 35-33 °C
Irrational behaviour,Intense shivering,
Fine motor coord loss
- ✓ Severe - >33 °C
No shivering,uncooperative,skin pale/ice cold,Decrease HR/RR,arrhythmias

Hypothermia- Treatment

- Mild/moderate- Re-warming, conserving/ replenishing body heat
- Severe- Prevention of ventricular fibrillation
- Prevention-Multiple loose layer, dry clothes, avoid direct exposure to wind/snow, exercise, warm calorific food & drink

Chilblains

- Non-freezing injury, abnormal reaction to cold
- Pallor, erythema, pressure sites
- Importance - prone to frostbite
- Treatment - Reassurance, Re-warming & drying

Frostbite



Symptoms and clinical features of

Frostbite.

- 1. Initial tingling and burning**
- 2. Limb feels heavy and numb**
- 3. Increase in pain and swelling**
- 4. Possible blistering**
- 5. Progressive reduction in sensation**
- 6. Gangrene, with increase in severity**

FACTORS AFFECTING OCCURRENCE OF COLD INJURY

1. *Environmental factors:*

- a) Severity of exposure to cold**
- b) Duration of exposure**
- c) Wind velocity**
- d) Moisture**
- e) Hypoxia (Lack of Oxygen)**

2. *Host factors:*

- a) Lack of Acclimatisation**
- b) Stagnation of circulation**
- c) Physical Inactivity**
- d) Nutrition**
- e) Dehydration**
- f) Local conditions eg. Injury, Infection, etc.**
- g) Alcohol consumption**

COMMONLY AFFECTED AREAS

- 1. Fingers**
- 2. Toes**
- 3. Ear lobes**
- 4. Nose**
- 5. Cheeks**
- 6. Chin**
- 7. Soles, heel**
- 8. Dorsal surface of foot**
- 9. Male genitalia**
- 10. Buttocks**

Patho Physiology

Phase of cooling

- Freezing of extracellular fluid
- Movement of fluid (intra to extracellular)
- Vasoconstriction
- Endothelial damage
- Sludging of RBC, platelets
- Freezing intracellular fluid
- Tissue damage & cell death

Patho Physiology

Phase of Re-warming

- Dilatation leads to leakage of fluid & proteins from damaged capillaries
- Edema
- Free radical generation leads to continued endothelial damage
- Microcirculatory failure due to microthrombi
- Prostaglandin & thromboxane (Inflammatory mediators)

CLINICAL CLASSIFICATION

Superficial- First Degree

- Erythema
- Edema
- Itching
- No blisters/
necrosis
- Recovers
completely



Superficial-Second Degree

- Vesicles With Clear Fluid



Second Degree(contd.)

- Eschar formation
2-3 weeks



Deep-Third Degree

- Violaceous haemorrhagic blisters



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Third Degree (Contd)

- Skin Necrosis
Blue grey
discolouration



Deep- Fourth Degree

- Minimal oedema
- Initially mottled, deep red/cyanotic



Fourth Degree (Contd)

- Eventually dry black mummified
- Loss of tissue



Site Of Lesion

(Our Experience)

N=80

<u>Site</u>	<u>No. Of Cases</u>	<u>Percent</u>
Upper Limb	56	71%
Lower Limb	18	23%
Both	07	8%
Face (Ear&nose)	05	6%

Treatment



Pre-hospital

- Prevent further cold injury
- Prevent mechanical trauma
- Avoid rubbing
- Restore general body warmth
- Analgesics
- Tetanus toxoid

Treatment

✓ Re-warming

- 37 – 41° c for about 30 mins/ till flushed
- Danger of burn injury
- Avoid freeze-thaw-freeze cycle
- Analgesics/sedatives

✓ Sterile loose dressings

✓ Prophylactic antibiotics

✓ Physiotherapy

Treatment -Contd

✓ Surgery

- Excision, escharotomy,
- Skin graft
- Amputation
- Reconstruction procedures

Treatment – Contd.

✓ Therapy

- Vasodilators (ketanserin, buflomedil)
- Haemodilution (lomodex)
- Platelet aggregation inhibitors (Aspirin)
- Prostacycline analogues (iloprost)
- Fibrinolytics (strepto / urokinase, r-tpa)
- Heparin
- Hyperbaric oxygen
- *Aloe vera*

Treatment in field situation

1. Treat systemic hypothermia, if any.
2. Rehydrate with warm fluids
3. High calories and protein diet.
4. Avoid further trauma
5. Avoid freezing-thaw-freeze
6. Avoid consequent frostbite
7. Reduce dislocation if any immediately
8. Treat fractures if any
9. Rewarm only if no chance of refreezing
10. Keep clean to prevent infection
11. Administer anti tetanus toxoid
12. Prohibit smoking.
13. Offer assurance and support.
14. No rubbing and dry heating. No thawing in the field. After thawing prevent freezing

Primary Prevention

✓ Health promotion

- Hygiene
- Nutrition
- Exercise
- Smoking

✓ Specific protection

- Shelter
- Clothing, boots & socks
- Foot hygiene
- Venous congestion

Secondary Prevention

- Early Diagnosis
- First Aid
- Prompt treatment : The following action should be taken as soon as a cold injury case is seen:
 - Stretcher case
 - Sheltered place
 - Oxygen should be given through BLB mask
 - All constricting clothing should be loosened and boots removed
 - The affected part should be kept at absolute rest
 - Gently cleaned and wrapped in sterile dressing
 - A booster dose of 0.5ml of tetanus toxoid.

Prevention - Contd.

- Buddy system
- Cold adaptation
- Rapid evacuation
- Limit tissue injury
- Re - exposure

Precautionary measures to prevent Cold Injury

1. Physical well being and adequate nutritious food.
 2. Limit the period of cold exposure.
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3. Take every effort to retain body warm with proper insulative clothing (multi-layers).
 4. To maintain hydration by taking hot tea, coffee etc.
 5. Heavy socks with well fitting boots and insulative gloves should be worn.
 6. Keep the body parts, especially the extremities dry and free from abrasions.
 7. Wet garments, socks, boots, gloves, etc., should be changed immediately and dried.
 8. Never touch metallic objects with bare hands in severe cold.
 9. Do not wet hands with kerosene or petrol.
 10. Boots and socks to be changed regularly. Feet to be washed often.
 11. Avoid use of alcohol and smoking.

Do's and Don't's on Recognition of Cold Injury

Do's

1. Remove tight shoes, socks etc.
2. Warm the injured parts.(Not by direct heat)
3. Cover the body with blankets.
4. Provide hot drinks and rest.
5. Cover blisters with dry dressing.
6. Treat as a stretcher patients.

Don't's

1. Don't massage or rub the parts.
2. Don't smoke or drink.