

# **Injuries caused by heat, cold, electrical current, chemicals**

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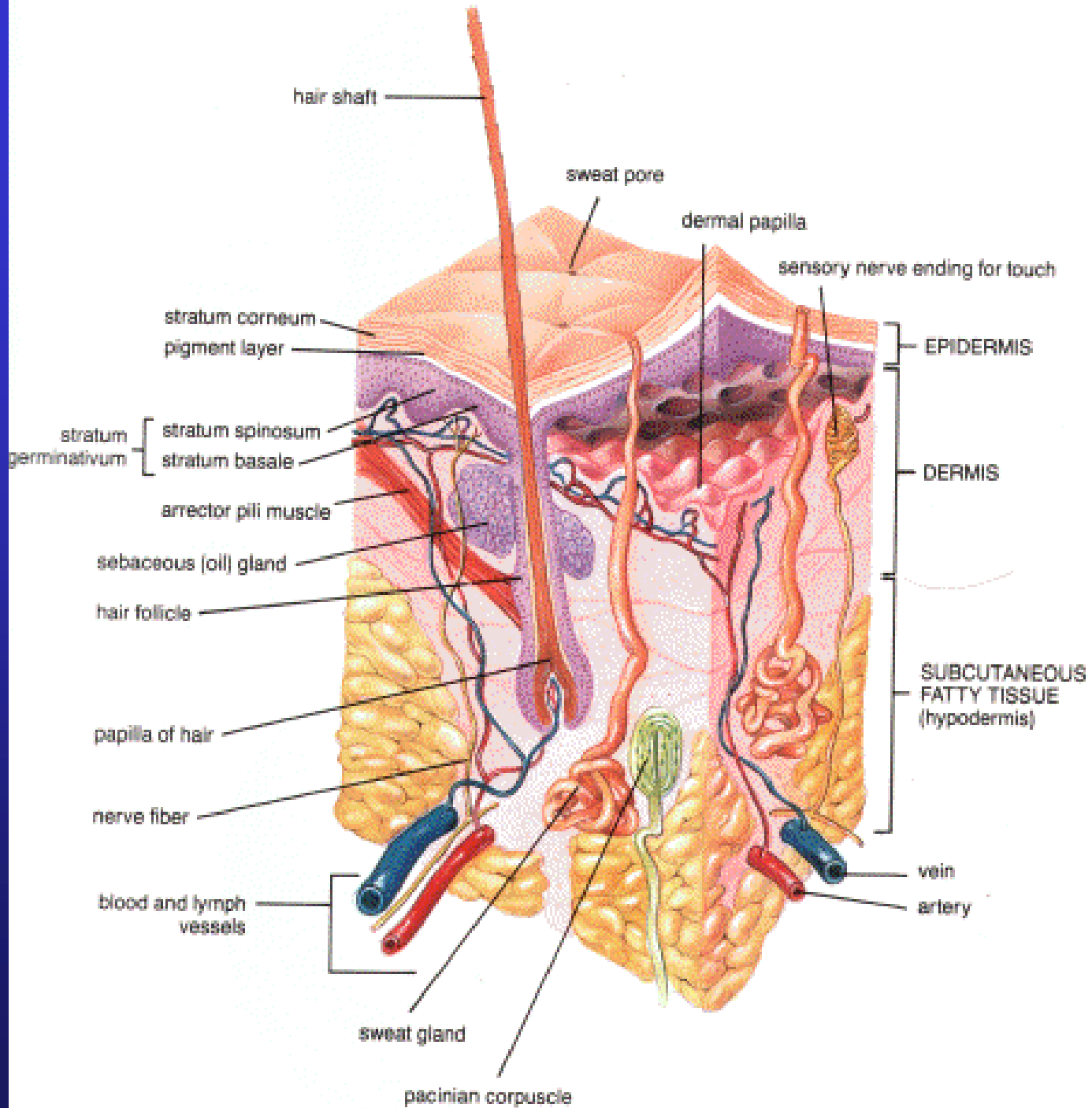
**Departement of Anaesthesiology  
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**Pain Management Centre**

**St. Ann's Teaching Hospital, Brno**

# Skin - anatomy

- **One of the largest organs, plays important roles in protecting the body against injury and infection.**
- **Major function of the skin is to help maintain body temperature (36-37 dg. C), 97-99 dg. F)**
- **Skin consists of two layers**
  - **Outer, epidermis, protected by oily substance (sebum) secreted from glands.**
  - **Lower, dermis, contains vessels, nerves, muscles, glands. Dermis registers sensations (heat, cold, pain)**



# Burns

- **In case of burns skin loose its barrier functions and as a result of damagein of soft veesels may leak tissue fluid (serum)**
- **This fluid either collects under epidermis and form blisters or leaks thorough injured skin.**

# Burns – according to severity

- 1st degree (epidermal):

Damageing of surface layer of the skin (epidermis),

Clinical symptom: local erythema

Duration of healing: several days

- 2nd degree (dermal):

Demageing of dermis

Clinical symptoms: Blister formation and erythema, sharp pain, loss of plasma, risk of infection

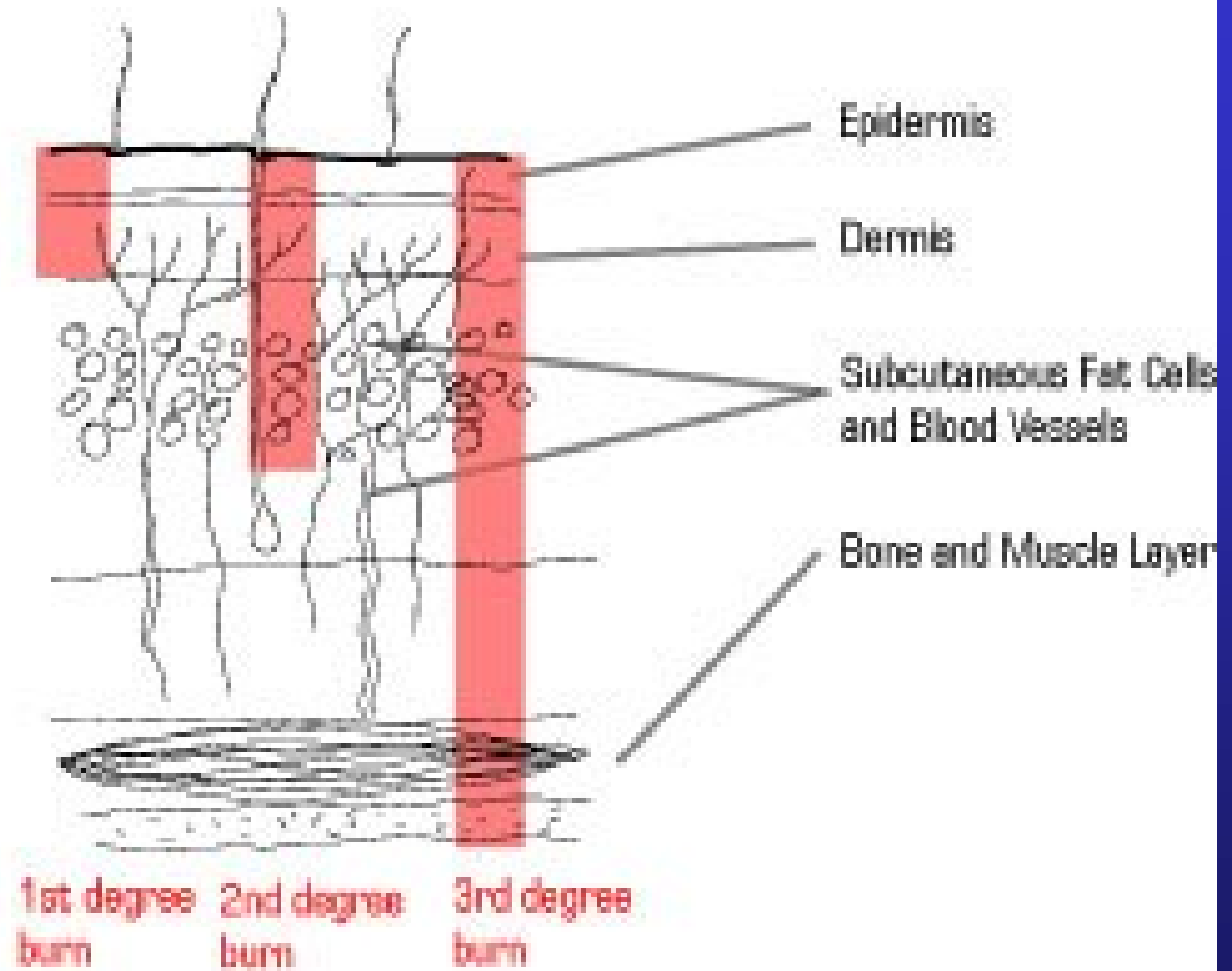
Duration of healing: several 2-3 weeks

- 3rd degree (subdermal)

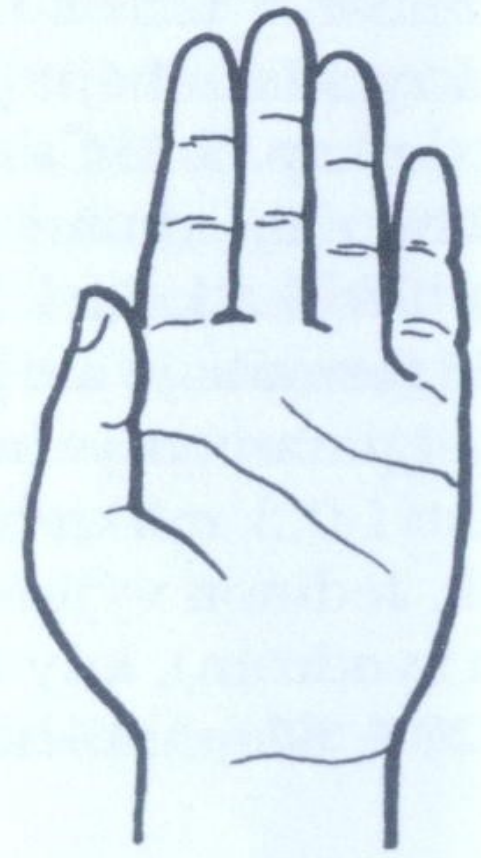
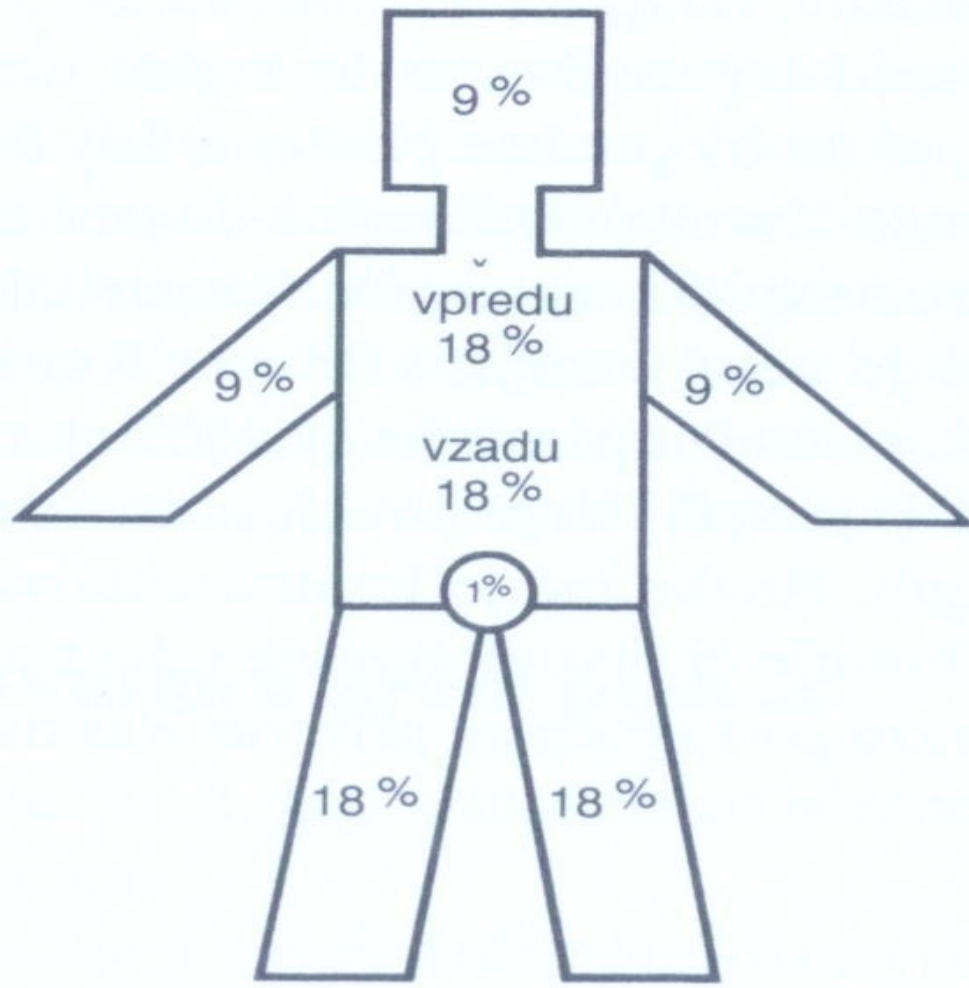
Demageing of the skin and deepar tissues (muscles, tendoms, fat..)

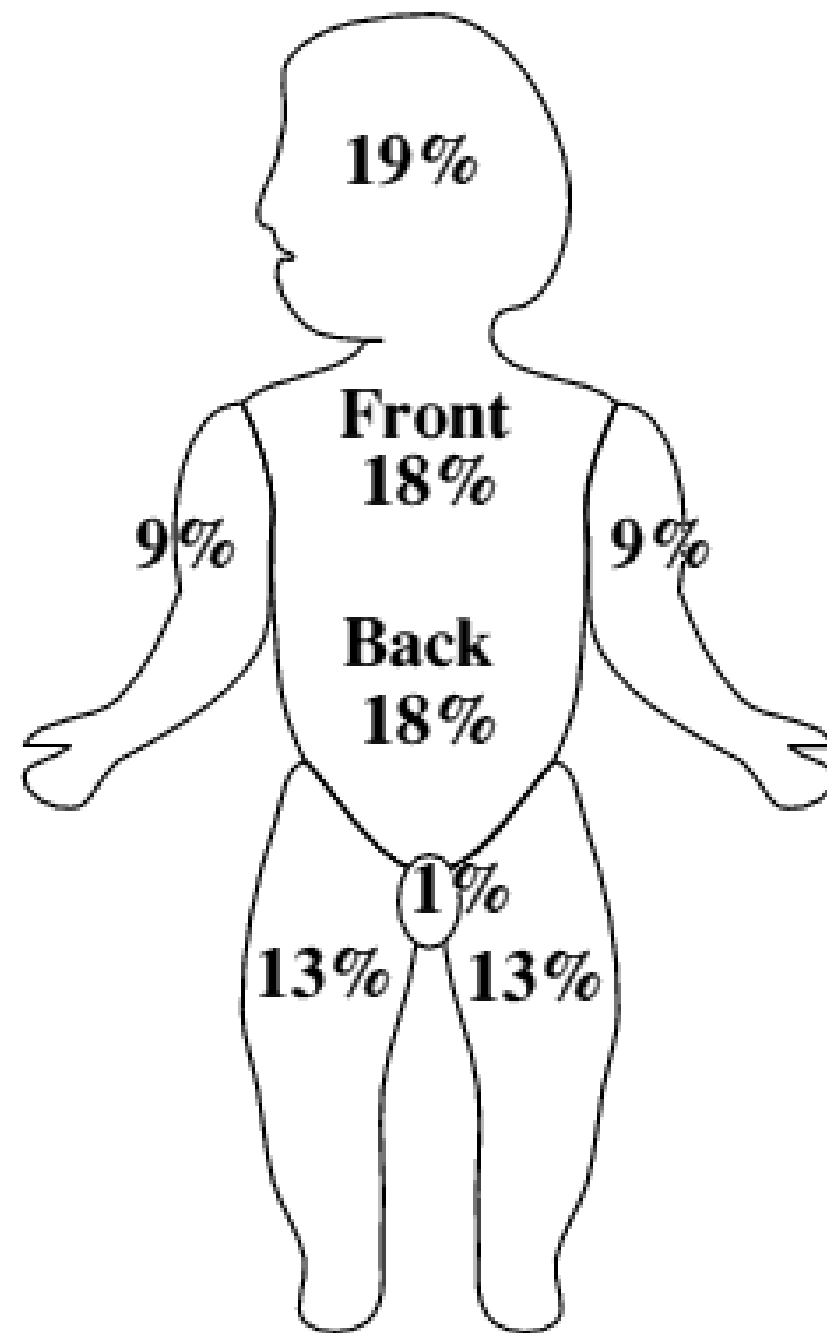
Clinical symptoms: Eschars, destruction of skin and subcutis, loss of pain sensation, skin may look waxy, pale and charred

# Burns



# Extension of burns









# Severity of burns – adults (age, degree, extension)

- **Slight**

2nd degree up to 10%, 3rd degree up to 2%

- **Medium**

2nd degree up to 20% of body surface, 3rd degree up to 5% of body surface –referred surgical department

- **Severe**

2nd degree over 20% of body surface, 3rd degree over 5% of body surface –referred to specialised clinic

# Sever burns - children

- **Children under 2 years – 2nd degree over 5% of body surface**
- **Children 2-8 years – 2nd degree over 10% of body surface**
- **3rd degree burns are severe in children regardless their extent**

**These all types of burns are sever**

**Sever burns are have to be reffered to the specialised clinic!!!!!!**

# **The List of hospital with specialised Burns Department**

- **Teaching Hospital Brno Bohunice**
- **Teaching Hospital Královské Vinohrady**
- **Teaching Hospital Ostrava**

# Minor burns – first aid

- **Flood the injured part with cold water for at least 10 minutes to stop the burning and relieve the pain.**
- **Gently remove any jewelery, watches, belts or constricting clothing.**
- **Cover the burned area with sterile dressing**

## **Notice:**

- **Dont break blister, do not apply adhesive dressings, do not apply butter, oils, fats...**



# Severe burns – First Aid

- **Help the person lay down, if possible, try to prevent the burned area from coming into contact with the ground.**
- **Flood the burns with plenty of cold liquid (10 minutes at least). Gently remove any jewelery, watches, belts or constricting clothing.**
- **Cover burns with sterile dressing**
- **Record details of the injuries, monitor vital signs.**
- **Call for medical help**

# Heat stroke

- **Causes:**

Heatstroke happens in hot and usually wet environment, during intense physical effort and lack of liquids, in hot and poorly ventilated rooms

- **Symptoms:**

Feeling of heat, thirst, weakness, nausea, emesis, disorientation, loss of consciousness. Skin is dry, hot, red face. Respiration and pulse getting faster, in final stage get slower



# First Aid

- Put the afflicted to cool place, fresh air, shade.
- Lower body temperature – cold wrap, shower, bath, immerse to water (25° C)
- Serve by spoonfulls cold liquids with salt and vitamin C, cold black coffee, tea
- In case of unconsciousness – stabilised position
- Cardiac and respiration arrest –  
Cardiopulmocerebral resuscitation

# Sunstroke

- **Cause:**

Direct exposure to sunbeams

- **Symptoms**

1st to 2nd degree burns, headache, buzzing in ears, nausea, emesis, body temperature around 40° C, possible cramps. Respiration and pulse getting faster.

# First Aid

- Remove the afflicted from sunlit place
- The is conscious – semi-sitting position, cold compress on forehead, neck and limbs, serve cold liquids
- The afflicted is unconscious – same procedure as in case of heatstroke

# Hypothermia

- **Symptoms**

Feeling of cold, fatigue, sleepiness, apathy, disorientation, hallucinations, unconsciousness with restrained respiration

- **First Aid**

- Carry to leeward, dry and warm place, remove wet clothes.
- The afflicted is conscious – active and passive limb movements, pressure massages, bath 37 – 40° C. Serve hot drinks. **NO alcohol!**
- The afflicted is unconscious – ensure clear airways, put warm compress on chest and neck, wrap in blankets. Call ambulance.

# Frostbite

Mostly affects fingers, toes and limbs, ears, nose, cheeks

- **Symptoms**

1st degree: pale skin, purple marbleised, sharp stabbing pain

2nd degree: white to greyish skin, substantial soreness, blisters and swellings after warming

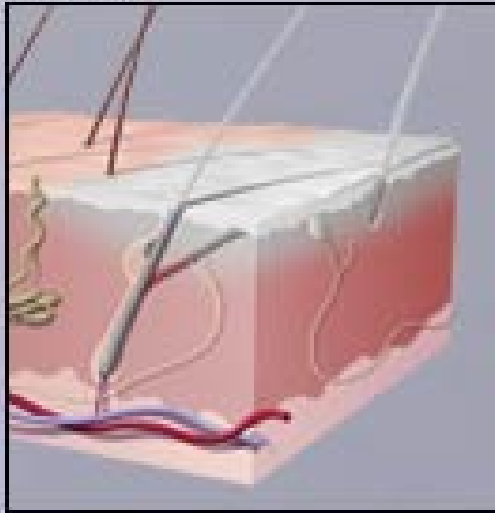
3rd degree: wax-like white and tough skin, insensitive centres, danger of tissue necrosis

# First Aid

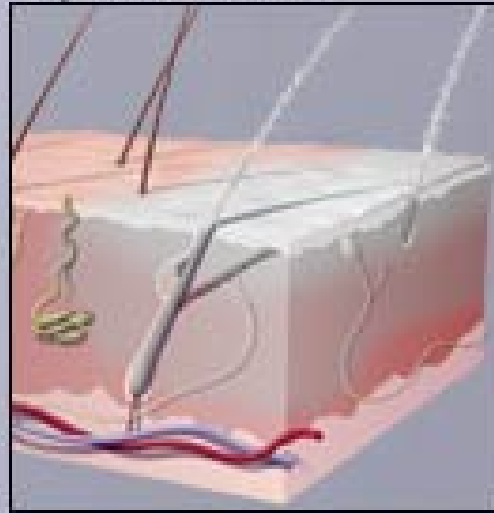
- DO NOT RUB frostbitten areas with snow or ice
- Carry the afflicted to warm place (25° C)
- Undress and remove shoes very carefully – danger of ripping off blisters and spreading infection
- Affected area without blisters can be immersed for 30 min to water 37° C hot.
- Treat secondary injuries (e.g. fractures)
- Serve tea with vitamin C
- Take antishock measures
- Call ambulance

# Frostbite

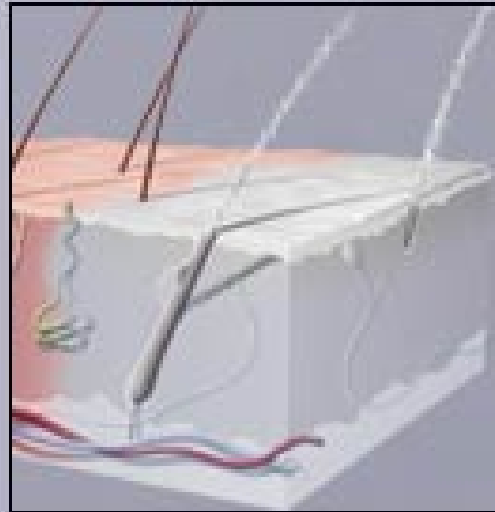
Frostnip



Superficial frostbite



Deep frostbite











# Chemical burns of cornea and conjunctivae

Rinse eye for 30 min with a lot of running water. Rinse direction is from the inner corner to outer corner. Apply antiseptic bandage to both eyes, take antishock measures, call ambulance.





# Chemical burns of skin and mucous membranes

- **Unknown agent**

Remove clothes by while flooding injuries. Rinse with running water, apply antiseptic bandage, call ambulance.

- **Acid burns**

Remove clothes and underwear stained with acid, rinse with running water (min 20), simultaneously prepare neutralising solution, apply antiseptic bandage moistened in the solution (alkaline soap or edible salt– 6 - 8%)

- **Alkali burns**

Remove clothes stained with caustic agent, rinse, apply antiseptic bandage with diluted acetic or citric acid

# Electrotrauma

- **Low voltage up to 1000 V**

Discontinue connection with conductor, monitor basic life functions, treat burns, treat other injuries, take antishock measures, transport

- **High voltage above 1000 V**

Ensure switching off the electricity by a specialist, keep safe distance 18 m, after disconnection current (by fire-fighters or other specialists) ensure basic life functions, treat burns, take antishock measures

- **Strike by lightning**

Similar procedure as in case of high voltage strike, only do not wait for linesman









**Thank you for your attention**

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