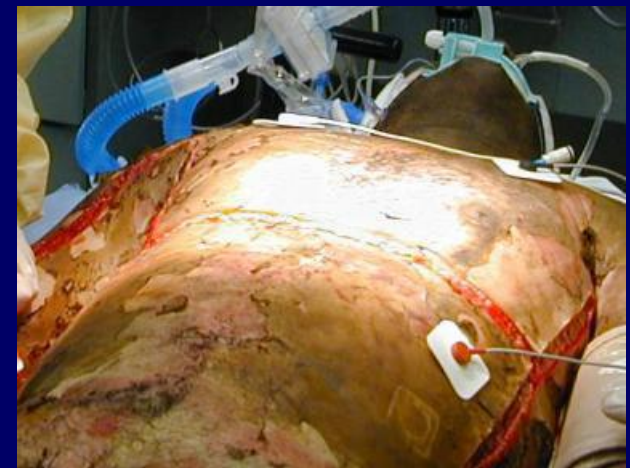
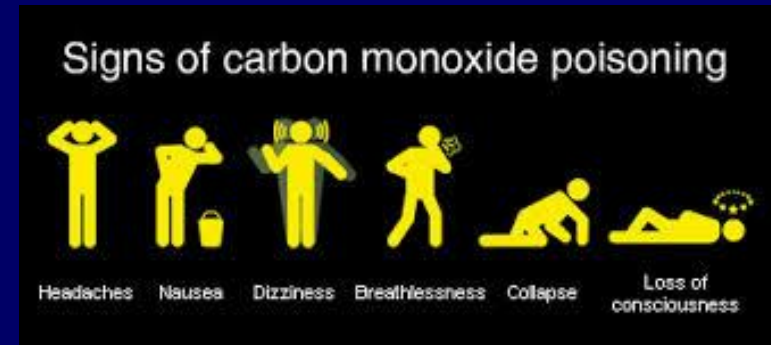
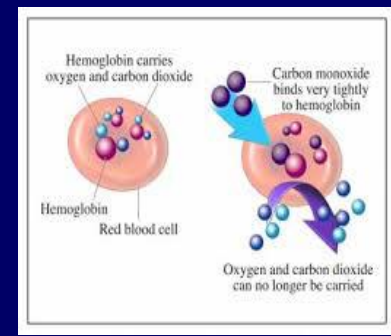


RESPIRATORY PROBLEMS

1. Carbon monoxide(CO) poisoning: CO gas is one of the product of combustion, it has an ability to bind to hemoglobin instead of Oxygen. Hemoglobin affinity for CO is 210 than that for Oxygen. The clinical manifestation include headache, disturb conscious level may presented as confusion or even comma with pink color spot on skin especially on neck & chest. Treatment is rapid removal from site of accident, high tension Oxygen & hyperparic Oxygen.

2. Circumferential chest burn: If the skin of the whole chest circumference involved by full thickness burn that result in loss of its elasticity & reduction in chest expansion during inspiration & tidal volume. The treatment is Escheratomy (Incision in the Escher) along the anterior axillary lines & subcostal margin.

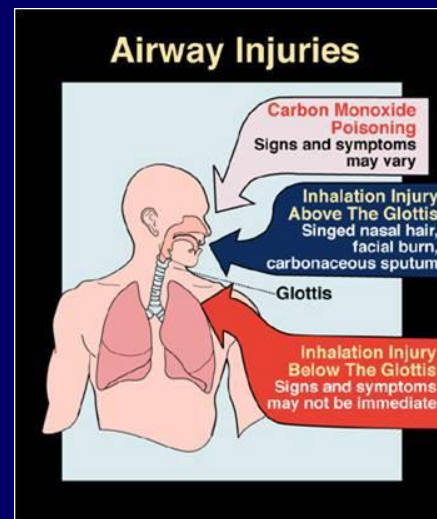


3. Burn face & neck.

4. Burn of upper respiratory tract.


The 3rd & 4th problems presented as upper airway obstruction by edema & secretion. The treatment is proper positioning of the patient as elevation of the head & chest, Oxygen, Steroids, and maintaining patent airway (this may need Intubation or even tracheostomy).

• **5. Inhalation injury (Adult Respiratory Distress Syndrome ARDS):** Inhalation of toxic gases & smokes may happen during burn accident especially when it occurs in a narrow closed poorly ventilated spaces. The product of combustion may include SO_2 , Nitrous oxide, Cyanides, and other derivatives of hydrocarbon materials. These toxic substances will cause damage of small bronchioles & alveoli that result in damage of alveolar-capillary membrane and disturbance in gas exchange and leak of fluid into the alveoli which result in pulmonary edema.



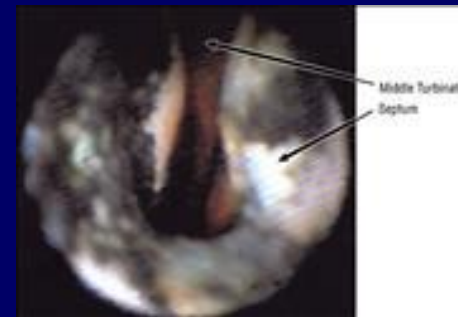
Treatment

- Airway with c-spine immobilization
- For facial burn, singed nasal hair, soot in mouth-
- Early intubation
- 100% O_2
- COHgb level



The diagnosis is usually by suspicion as the history of the accident in a narrow closed poorly ventilated space, dyspnoea, productive with soot; on examination there is burn of face, neck & upper airway, soot on the nasal opening, burn nasal hair, soot is seen in the upper airways by direct laryngoscopy. Clinically, it is usually manifested during the 3rd-5th post burn day, the patient get dyspnoea, tachypnoea, hypoxia, hypercapnoea, rhonchi, wheezes, crepitation, disturb conscious level, and respiratory failure. On Chest X-ray there is signs of pulmonary edema. The mortality is very high & it is 50% in the best centers treatment includes; elevation of the head & chest, high tension humidified Oxygen, bronchodilators, systemic antibiotics, steroids, and even Intubation.

6. Pneumonia.



Figures 3a and 3b: Bronchial injury from inhalation burn from house fire. A) Post-burn day #1 B) Post-burn day #4

BURN WOUND INFECTIONS

Usually occur after the 5th post burn day.

The burn patient is more liable for infection because of break-down of the mechanical barrier(skin), Malnutrition, hypoproteinemia, anemia, long period of hospitalization, cross infection.

Source of infection either endogenous from inside the body, usually Gram positive like Streptococci and Staphylococci Or exogenous from external environment(medical &nursing staff or from other patient), usually Gram negative like Pseudomonas & Proteus.

Burn Wound Infections

- First week - cellulitis from Gram positive organisms (Strep/Staph)
- After 7 - 10 days - invasive infections of the wound; Gram negative organisms, especially *Pseudomonas*
- Fungal infections are becoming more common. Candida may cause a superficial infection and additional skin loss; *Aspergillus* commonly results in a deep, invasive infection with 20 - 40% mortality rate.

Diagnosis: 1. Local symptoms & signs as pain, redness & swelling at wound margin, Change in color of Escher, bad odor, pus discharge, earlier Escher separation, dusky color granulation tissue, septic spot on non burn skin.

**2. systemic;
fever(Temperature>39C),
tachycardia, poor appetite, nausea,
vomiting, ileus, diarrhea, disturb
level of consciousness.**

**3. Laboratory Leucocytosis, high
ESR, positive bacteriological test
as wound swab & wound biopsy.**



Prevention : by correction of nutritional state, anemia, and hydration state; systemic prophylactic antibiotics in the first 5 days; proper wound care & local antibiotic; isolation of patient.

Treatment: Systemic antibiotic according to the culture & sensitivity result, supportive measures as correction of anemia & nutritional state, proper wound care and local antibiotic.

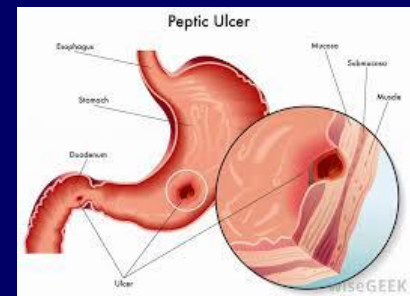


Gastrointestinal problems

The shock (hypovolemia) state & stress of burn result in poor circulation & increase in vagal to the Gastrointestinal tract, as a result there will be poor absorption and decreases motility. Clinical manifestations are thirst, nausea, vomiting, acidity, Hematemesis, malena, ileus, & constipation or diarrhea.

The prevention of GIT problems include; adequate fluid replacement, avoiding non-steroid anti-inflammatory analgesia, use of antacid & H2- blockers like Cimetidine.

Treatment include the same lines in the prevention in addition to stop of oral feeding(temporarily) & blood transfusion in case of GIT bleeding.



Nutrition. The burn patient get increment in his Basal metabolic rate by about 135%(from 2000 kcal reach up to 4500 Kcal) & in protein requirement(from 42gm/day up to 180 gm/day), so there is a need for proper feeding. This include: Nothing by mouth & i.v. fluid till shock state is relieved, start small amounts of water then increase it gradually, fluid diet, then feeding with high calorie & protein diet as frequent small meals.

Anemia; due to loss of RBCs as a result of burn accident(the PCV decreases by about 40%), as result of hypermetabolic state blood loss during wound care & surgical sessions, so there is a need frequent checking of PCV & hemoglobin level, and Frequent blood transfusions especially in extensive burns.



Wound care

By; daily wash with warm, isotonic, sterile, non-toxic solution like water or normal saline & bland soap, to remove separated dead tissue & tissue debris, clean the wound, & get rid of large number of micro-organisms, use of local antibacterial agent that could penetrate the Escher like 1% Silver sulfadiazine cream, 1% Mefenide cream, and 0.5% Silver nitrate solution.

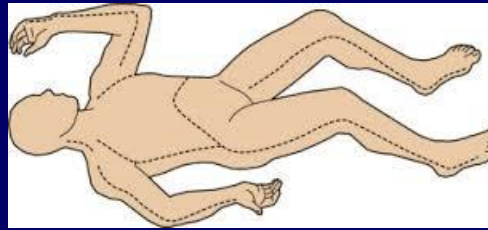
Blister of 2nd degree thermal burn should be left intact because it contain sterile fluid. Indications for blister removal include; already ruptured blisters, blisters contain pus or blood or turbid color fluid, and large blisters that interfere with functions.



Escheratomy: incision of Escher, is indicated for circumferential burn of limb with compartment syndrome and circumferential burn of chest with respiratory embracement.

Open method means leave the burn wound open without dressing under humid environment (cage). The advantages are less accumulation of discharge, no pain on removal of dressing as in closed method, and not coasty, but it may be associated with dryness of wound & pain.

Closed method mean dressing of burn wound after cleaning. The advantages are; the wound is not liable for dryness, less pain, the wound is always under humid environment, but it is painful on removal, may result accumulation of pus, and it is coasty.



Escherectomy (Excision of Escher) & wound excision under anesthesia may be needed for cleaning & preparation for skin grafting of deep(full thickness) burn wounds.

Early excision & Immediate grafting of the burn wound is the method of treatment used for deep (2nd)dermal & 3rd degree burn.



Rehabilitation: include proper positioning of the burn patient as elevation of the head of the bed to relieve respiratory embroachment, elevation of burn limbs to reduce edema, proper position of flexor surfaces to prevent contracture, continuous change of position of the patient to prevent pressure ulcers, & encourage the patient to move all joints to prevent stiffness.

Psychology: The patient may have psychological problems, psychiatric diseases or social problems that led him to suicidal attempts Or may get psychiatric problems as a result of burn like depression, nightmares. So there is a need for psychiatric treatment which best provided by psychiatrist.



Cold injuries: exposure of the tissues to extremely low temperature result in partial or full thickness damage. This exposure may be industrial as in accidental spills of liquid nitrogen or similar substances or environmental as in injuries of very cold weather. Frost bite is due prolonged exposure to cold and there is often an element of ischaemic damage(due to associated vasoconstriction). Treatment is gradual warming of the affected area for the wound is same for thermal burn.



Chemical injuries: Numerous chemicals (like strong acids & alkali) in industrial and domestic situations can cause burns. Tissue damage depends on the strength and quantity of the agent and duration of contact. Pathologically there is local coagulation of proteins and necrosis of tissues with possible systemic effects (like toxic effect of phenol on liver, kidney, and body tissues). The treatment includes; dilution with running water initially then continue with same treatment as that for thermal burns (here the blisters should excised as it may contain chemicals).



Electric burns: The passage of current through the tissues causes heating that results in cellular damage. Heating depends on resistance of tissue, duration of contact, square of the current. The bone has the highest resistance while the least resistant tissues are nerves and blood vessels. Bone can therefore become very hot and cause secondary damage to tissues near to the bone like muscles. The muscle damage result in compartment syndrome locally, and delivery of myoglobin to the circulation result in acute tubular necrosis (acute renal failure) in kidneys.



There are two types of electric injuries;

1. **1. Low (tension)voltage(<1000 volts)injuries as from domestic supply 220volts. This is associated with local tissue damage, the common sites are fingers and lips especially in children. It may cause cardiac arrest.**
2. **High(tension)voltage(>1000volts)injuries cause damage by**
 - **i - flash from an arc may cause a cutaneous burn and ignite clothing.**
 - ii- high-voltage current transmission will result in cutaneous entrance and exit wounds and deep damage. It may result in coma or convulsion attack, respiratory muscles paralysis, or cardiac arrest according to the axis of the current between entrance and exit.**



Treatment ;

1. Cardiopulmonary resuscitation, ECG monitoring and intensive care for 1st 24hours.

2. Intravenous fluid; the amount of fluid given should ensure urine output of 100ml/hr in adult & 2ml/kg/hr in children to prevent renal failure.

3. Other lines of treatment as systemic antibiotic, analgesia, tetanus prophylaxis, ----etc.

L 4. Local wound care as fasciotomy in case of compartment syndrome, cleaning, local antibiotics, wound excision, amputation, reconstructions.

