

Epidemiology :

In united states there are 2-3 million thermal injuries every year .One hundred thousand of these patients require hospital admission .No one is immune from thermal injury ,though demographic analysis shows four high risk groups to be the predominant victims ,they include very young ,very old ,very unlucky and very careless .Many burns are caused by hot liquid scalds.50% of these occur in children .

Classical description of burn wound and surrounding tissue :

1.Zone of coagulation (non viable tissue) 2.Zone of stasis . 3.Zone of hyperemia

Estimation of the size and extent of burn wound (rule of nine) :

Head and neck :9% ,each upper limb :9% ,each lower limb :18% ,ant. Trunk:18%

Post. Trunk :18% ,genitalia :1%

Estimation of burn depth :

- 1.Superficial (1st degree):limited to epidermal layer (sun burn) with erythema and mild edema
- 2.Partial thickness (second degree)(dermal burn):very painful ,cherry red with blister .
- 3.Full thickness (third degree)extent to subcutaneous tissue little or no pain .dry leathery eschar charred vessels visible under eschar ,mixed white ,waxy ,pearly ,dark ,charred .
- 4.Fourth degree :involve underlying structures(bone ,muscle..) same features of 3rd degree burn

Notes :1-1st degree burn not included in quantitating extend and size of burn

2-On initial evaluation estimation of burn depth is less significant than its extend .

Management :systemic evaluation :1.maintenance of patent airway .2.effective ventilation

3.support of systemic circulation .4.diagnosis and treatment of concomitant life threatening injuries ,like pneumothorax ,thoracic and abdominal injuries ,pelvic and long bones fracture

Indications for admission to burn unit :

1-2nd and 3rd degree burn more than 10% from total body surface area(TBSA) in patients less than 10 or more than 50 years old .

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2-2nd and 3rd degree burn more than 20% from (TBSA) in other groups .

3-2nd and 3rd degree burn in functional and cosmetic area (face, hands, feet, genitalia ..)

4-3rd degree more than 5% in any age group .5-Electrical burn .

6-Chemical injuries with serious threat functional and cosmetic area .7-Inhalational injury .

8-Circumferential burn .9-Burn injury in patient with preexisting medical disorder .

10-Burn with concomitant trauma(fractures.....)

Inhalational injury :

20% to 80% of burn mortality now result from pulmonary pathology ,which is primarily due to inhalation injury .

Pathogenesis :1-Carbon monoxide inhalation 2-Direct thermal injury to the upper aerodigestive tract.3-Inhalation of product of combustion which is most significant in the lower respiratory tract and in severe cases may develop increase capillary permeability leads to adult respiratory distress syndrome(60%-70%) and secondary infection begin to supervene at 72 hr post burn .

Diagnosis :history of closed space burn ,singed nasal hair ,facial or oropharngal burn ,expectoration of carbonaceous sputum ,strider ...

Investigations :1-carboxyhaemoglobin level more than 10% are significant ,level more than 50% associated with death .

2-Bronchoscopy :vocal cord edema ,sloughing or edema of tracheal mucosa .

3-Xenon ventilation/ perfusion scanning :sensitive in lower respiratory injury.

4-Pulmonary function test :sensitive in lower respiratory injury also .

Treatment :

1-Early intubation 2-In co poisoning ...give 100% oxygen .

3-Clearing airway by treated bronchoscopy .4-Adequate ventilatory support .

5-Documented infection should be aggressively treated with appropriate antibiotic (using antistaph.and G negative organisms)

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Note :corticosteroid is contraindicated in inhalational injury .

Escharotomy :A life threatening or limb threaten problems in the chest and extremities can be produced by circumferential burn and leathery eschar .Limitation of chest wall excursion can be observed easily ,if restricted ,escharotomy should be performed bilaterally in the anti axillary lines using scalpel or electrocautary to incise the full length and depth of the eschar .Extremity escharotomies are performed in the mid lateral line and in the finger also .thenar and hypothenar compartment involved in severe burn ,eschar and even fascia over these compartment should be incised .

Indications :1-Doppler negative. 2-no or little bleeding by pricking finger with needle or heavy black bleeding (venous congestion).3-O₂ saturation less than 95%.

Note :with severe deep thermal burn escharotomy combine with fasciatomy

Further management :

1-After securing large bore intravenous line samples taken for Hb ,urea ,electrolytes, blood cross matching ,blood gas and blood analysis for co and cyanide in unconscious patient

2-Nasogastric tube for burn over 20-25% because of paralytic ilius .

3-Intravenous analgesics and sedatives .4-Asses tetanous immunization status

4-Antiacid to prevent curling ulcer (gastric and duodenal ulcer) may result in acute haematemesis.

Fluid management :pathophysiology

The pathophysiology of post burn fluid shift is not yet fully understood .An increase in micro vascular fluid flux is seen in both burned and unburned tissue as a result of major thermal injury. In burn tissue there is a transient decrease in blood flow followed by arteriolar vasodilatation resulting in edema .The rate and amount of edema formed depends on the degree of thermal injury and fluid resuscitation .In a large wound ,edema is usually maximal at 18 to 24 hrs post burn .Circulating volume loss in thermal injury has explained by impaired microvascular integrity .In burned tissue ,microscopic endothelial cell gaps are evident for days or weeks in patent microvascular .However ,major fluid loss stops well before these endothelial cell gaps closed .Release of vasoactive substance (leukotrienes ,prostaglandin ,free oxygen radicals and histamine)also contribute to the loss of microvascular integrity .Increased osmotic pressure in burned tissue also contribute to fluid loss into burn tissue .Edema also occurs in unburned tissue ,this has classically been attributed to generalized increase in microvascular

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permeability with thermal injury in excess of 25% to 30% (TBSA). The reason for this potentially large volume shift remain unclear .It may be due to systemic action of mediators released locally or to other ,unknown factors.

Parkland formula :that is used to calculate fluid in burn patient in the 1st 24 hr .

Parkland formula =4 ml x kg body weight x % of burn up to 50%

Half of this volume given in 1st 8 hrs ,the rest in the next 16 hr using isotonic crystalloid such as ringer solution or normal saline . 5%dextrose should be given in children at the 1stday to prevent hypoglycemia because of low collagen storage in paediatric.

In the 2nd day change crystalloid to 5% glucose water and adjust based on urine output and give albumin at =0.3 to 1 cc x kg (weight) x% of burn /16 =cc 5% albumin /hr ,don't vary based on urine output .

In the 3rd day change to maintenance I.V. fluid or begin oral intake .

Protein infusion generate an inward oncotic force that counteracts the outward hydrostatic force in the capillaries .Without protein ,massive interstitial edema occur .Protein usually started at 8-12 hr after injury using crystalloid in 1st 8 hr .Albumin is the most oncotically active of the protein and is associated with no disease transmission .Fresh frozen plasma contain the entire osmotic load of plasma in addition to all clotting factors but disease transmission has made less attractive choice .protein infusion is preferable in elderly patient and in patient more than 50% burn surface area and patient with significant inhalational injury which has been shown to decrease edema in burned tissue but does attenuate non burn tissue edema and it maintains blood volume better than crystalloid alone .

Prophylactic antibiotic :no role of systemic antibiotics in the 1st days postburn , we give only local antibiotics as a prophylactic.

Topical antibiotics application will :

1-delay colonization of the wound. 2-Keep the wound bacterial density lower than would otherwise occur .3-keep the wound flora more homogenous .

Silver sulfadiazine :broad spectrum antibiotic ,apply every 12-24hr used with or without dressing ,after its application can form pseudoeschar lead to confusing of inexperienced

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examiner attempting to determine wound depth .Leukopenia is not infrequently seen after 2-3 days of treatment usually resolves without discontinue the drug .

Mafenide :broad spectrum applied every 12 hr, it has best eschar and cartilage penetration so it used in burn of ear and nose .Can lead to acid-base abnormalities causing hyperchromic metabolic acidosis when applied to more than 20% of surface area ,so limited apply to small size area.

Recongnition and management of infection :

Because of immunecompramisid state of these patients as well as to long lasting hyper - metabolism ,they don't exhibit the usual clinical parameters of infection ,the burn wound may change in appearance with development of sepsis ,it may exhibit softening of the eschar ,surrounding cellulitis ,purulent material or once healthy granulation tissue begin to deteriorate .Careful serial clinical and laboratory monitoring is the most sensitive method of diagnosing sepsis before disastrous haemodynamic instability occur .

Clinically :unexplained hypotension ,tachycardia ,tachypnea ,new onset ilius ,spiking fever ,altered mental status ,hypothermia ,decrease urine output .

Laboratory tests :hypoxia ,thrombocytopenia ,hypo. or hyperglycemia ,twice weekly eschar biopsy ,wound colonization more than 100000/gram .Swabs taking from endotracheal tube ,bladder catheter chest tube .(urinary and respiratory tracts are the most sites of primary infection in burn patient .

Management of clinically septic patient :

1.Support of cardiopulmonary and G.I. system. 2.adequete fluid must be given to maintain intravascular volume and urine output .3.Antibiotics according to cultures (some combination to cover staph.aureus and G negative rods .4.Systemic amphotericin B in candida fungal infection .5.Consideration should be given to eschar debridement .

Physiotherapy :Respiratory excersizes .Musculoskeletal care and mobilization of joints in their full range ,usually during dressing .Splinting :neck and elbow (extension) ,Hand and fingers in functional position (extension of wrist ,flexion of MPJ and extension of IPJ ,ankle joint ,hip and mouth.

