

Thermal, electrical and chemical injuries

Burn injuries are made by heat – fire, hot liquids, contact with hot solids or electrical current . No one is immune from thermal injury, though demographic analysis shows four high- risk groups to be predominant victims of severe burn injuries. They include the very young, the very old, the very unlucky and the very careless.

Many burns are caused by hot liquid scalds. Fifty percent of these occur in children : the most common site of injury is the kitchen. The second most common site of scald injury in the home is in the bathroom, primarily caused by hot tap water . Most adult scaldburns are caused by automobile radiator injuries;

In residential fires , heating unit failure is the principal cause. Smoke detectors and home fire extinguishers can significantly increase warning time in residential fires and decrease the chance of death in the event of fire. Ignition of clothes is often a determinant of burn wound severity.

Initial triage and management

Thermally injured patients , like other trauma victims, should be evaluated systematically. The first priority is maintenance of a patient airway, effective ventilation and support of the systemic circulation. Endotracheal intubation should be performed liberally on the patients who have suffered severe burns or where there is any question of an inhalation injury or an upper airway burn.

We must take care to associated trauma like closed head injury, pneumothorax and other thoracic trauma, spinal injuries, intraabdominal injuries, pelvic and long bones injuries and significant blood loss.

The patient should be completely undressed and all body surfaces examined. Expedient radiologic examinations of the cervical spine, pelvis and chest will also aid in the evaluations of possible trauma. Regardless of the extent of the injury , or whether the patient is to be transferred to a specialized burn care unit , two areas must be managed definitively prior to transfer: maintenance of adequate ventilation and, if indicated, release of the constrictive scar.

Burn center referral criteria

The American Burn Association has identified the following injuries as those usually requiring a referral to a burn center . patients with these burns should be treated in a specialised burn facility after initial assessment and treatment at the emergency department : second and third degree burns over ten percent body surface area BSA in patients under ten years old and over 50, second and thierd degree burns in patients with involving the face, hands, feet, genitalia, perineum and major burns, third degree burns over 5% BSA in any age group, elevctrical burns, circumferential burns, burn injuries in patients with preexisting medical injuries or with other associated injuries.

Burn depth categories

The first degree is superficial – is caused by sun , flash flame, UV, the skin is erythematous , is very painfull,dry , no blisters, no oedema.

The second (partial thickness) degree – is caused by contact with hot liquids, or solids, flash flame to clothing, direct flame, chemical injury , the surface appearance is moist blebs, blisters, the color is mottled white to pink , cherry red and very painfull.

The second full thickness degree – is caused by contact with hot liquids, or solids, flame, chemical, electrical injuries , the skin is dry with leathery eschar until debridment, charred vessels, visible under eschar, the color is mixed white, waxy, pearly, or dark, there is little or no pain, hair puls out easily.

The third degree involves the underlying structures is made by prolonged contact with flame or electrical , looks same as the second deep degree, possibly with exposed bone, muscle or tendon .

The prognostic

Is calculated after the ABSI score or Beaux index

The ABSI score follows the BSA and burn depth, the age and sex.

$IP = \% \text{ BSA} \times \text{degree of burn}$

How to calculate BSA?

Usually we follow “ the nine rule “ : we consider that upper limbs are 9% BS, antherior thorax posterior thorax are 18% BS, lower limb is 18% BS, the head and neck is 9 % BS, the perineum is 1 % . Or we can use the patients palm which is considered 1% of BS.

Treatment principles for outpatient burn management

The entire magnitude of patient's injury should be determined; the patient should be examined without clothing; Photographs are helpful to follow the progress of the wounds and for medicolegal purposes. Wounds should be copiously lavaged with room temperature saline solution and then gently washed with mild soap and a wash cloth. Substantial pain relief can be obtained by application of cold towels to the burned area ; these should not be left in place for no longer than 15-20 min in larger surface area burns to prevent the development of hypothermia. Treatment of blisters is controversial. Intact blisters with uncontaminated blister fluid provide a biological dressing over a partial thickness burn wound. It is generally agreed that blisters that have ruptured or appear about to rupture should be debrided. Any blister that interferes with the function of movement should be debrided.

After blister debridement the wound should be covered with a moisture retaining nonadherent dressing. If the wound is contaminated should be used a topical antibacterial such as sulfadiazine or mafenide.

The BSA should be evaluated and after 48 hours. The changing of the dressing should be made at two days or daily under analgesia. All wounds treated in this fashion should be totally re-epithelialized in 2-3 weeks. If the wound is not healed, the original burn was probably deeper and it will require skin grafting or keratinocyte culture appliance.

Tetanus status of the patient should be ascertained and brought up to date.

Outpatients whose burns heal in less than three weeks should be advised that is probably no scarring will occur, though pigment changes are likely. These will fade with time, but there may be a permanent change in pigmentation , different from the surrounded nonburned skin. With healing in less than three weeks , true hypertrophic scarring is rare. Burned skin , after healing, remains highly susceptible to sunburn for a period of 1-2 years. Patients should be cautioned about excessive sun exposure for several years after they are burned.

The team approach to burn care that has become to successful in the in_patient setting can be duplicated in the management of out-patient burns. For example , a good hand therapist can be invaluable in preventing secondary deformities that may result from inflammation , edema, pain and immobility in relatively minor hand burns . Likewise, psychologists and social workers can be of great benefit in helping the patient adjust to his injury and return to his pre-injury status. A multidisciplinary burn clinic with all these team members present is the most effective method of delivery of such care.

Diagnosis

Diagnosis begins with clinical suspicion. A flame burn occurring in a close space is likely to cause significant inhalation injury. Singed nasal hairs, facial or oropharyngeal burns and expectoration of carbonaceous sputum are occasionally seen. Signs of upper respiratory obstruction – such as crowding, stridor or air hunger – usually signify an injury to the hypopharynx/ larynx and mandate immediate intubation. An idea of lower respiratory tract inhalation injury can also be obtained using the fiberoptic bronchoscope.

The wound assessment

Is done in a burn unit. The room should be heated to minimize heat loss. Adequate analgesia is very important. Constant monitoring of vital signs is mandatory. Blisters and loose skin is debrided. If indicated, this is a convenient time to perform escharotomies. After debridement of loose skin and gentle washing of the wounds, the topical agent of choice is applied. Dressing is completed expeditiously, monitoring patient core temperature throughout and using bulky absorbent dressings to control exudate from these wounds. Special beds, such as Clinitron air beds or Flexicare bed are very useful in treating burns of the back or other dependent areas. Dressing must not be constricting; distal extremities must be available for neurovascular monitoring.

Wound surveillance

We make quantitative eschar cultures – is a good means to monitor the wound's resistant flora and to anticipate the potential offending organisms in invasive sepsis.

Operative therapy

Several important points should be kept in mind. First, small burns that will eventually heal should be able to be excised with 0% operative mortality. This implies that early excision requires an experienced surgeon. Inadequate excision and skin grafting will lead to skin graft loss, adding the size of the donor site to the total wound area. This may necessitate another operation. Second, non-life-threatening burns in patients with other medical problems should not be excised until the associated problems are under control so the operation is associated with no mortality and minimal morbidity. Third, hand and foot burns will cause less disability if excision is performed shortly after admission. Fourth, large superficial burns with scattered small deep components are best treated nonoperatively until the shallow areas have healed. Fifth, significant problems with pain management may become indication for early excision.

We can perform tangential excision for the third degree burns in 10% BSA and cover with skin grafts prelevated from the anterior surface of lower limbs or abdomen.

Normally, a second degree burn is healed after three weeks. If is deeper or infected the healing is prolonged and in some cases will necessitate skin grafting.

Rehabilitation

It is important to begin rehabilitating efforts as soon as possible after injury. General rehabilitative goals are to limit or prevent loss of motion, prevent or minimize anatomic deformity, prevent loss of body weight (especially muscle mass) and return the patient to work and activity as early and completely as possible.

Reconstructive surgery in the burn patients

Reconstruction is difficult because of wide area of destroyed , scarred, or abnormal tissue compared to the patient who have had other types of trauma. In general, reconstruction of the burn patient is deferred until hypertrophic scars have matured. So we can use Z- plasty, tissue expanders, free tissue transfer local flaps, etc.