

Chapter 71: Trauma: Soft Tissue Lacerations and Burns

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Lacerations

Penetrating wounds

Intraoral open wounds are often through-and-through lacerations from the skin. The first concern is to make sure a proper airway exists. The patient's airway, if adequate initially, should be observed because subsequent swelling of a floor of mouth, tongue, or pharyngeal wound can be obstructive. Proper mucosal wound cleaning and closure is important, as it is in other parts of the body: it helps to reduce secondary-intention scarring and undesirable retractions. The concept of leaving oral mucosal tests to heal spontaneously applies only to small, well-aligned wounds. Dirty wounds should be thoroughly cleaned, debrided, and closed loosely. This approximates the wounds edges properly and at the same time allows drainage, thereby preventing cellulitis or abscess.

Large mucosal defects can be covered with split-thickness skin grafts or with local mucosal rotation or transposition flaps. These flaps can be obtained from the tongue, floor of mouth, or buccal mucous membrane. Avoid tethering the tongue to the cheek by using transposition flaps as opposed to side-to-side approximation. When fractures are involved, a clean mucosal closure promotes healing and reduces infection. Although knife wounds, gunshots, and broken dentures happen, most open intraoral wounds are caused by auto accidents in peacetime. Gunshot wounds may leave oropharyngeal shrapnel in the surrounding soft tissue (Figs. 71-1 and 71-2), which should be carefully removed unless it consists of small particles that penetrate deeply into the tissues. Transoral removal of these trauma-induced soft tissue metallic fragments is often possible and desirable. Some require cutaneous incisions for removal (Fig. 71-3 to 71-7).

Animal bites involve the head and neck in 8% of cases; most of this 8% involve the lips and adjacent skin and soft tissue. In the USA dogs are responsible for nearly 90% of the bites. Over 600,000 animal bites are reported each year, and more than that go unreported. Lacerations and avulsion flaps are common. The wounds should be thoroughly cleaned, debrided, and closed primarily in layers. Puncture wounds do not need closure. Tetanus toxoid should be given if active immunization has not been kept current. If the patient has never been immunized, human tetanus hyperimmune globulin should be given. Rabies prophylaxis should be given to patients bitten by a rabid animal (either noted during observation or by brain tissue that demonstrates fluorescein antibodies) or by a biting animal that cannot be found. Broad-spectrum antibiotics may be used short term. However, animal or human bites limited to the head and neck do not require antibiotic prophylaxis. Because of possible legal ramifications photographs should be taken.

Nonpenetrating wounds

Blunt trauma to the oral cavity and pharyngeal soft tissue can cause significant swelling, leading to airway compromise. Severe blows often cause associated maxillary or mandibular fractures. The tongue, soft palate, and floor of mouth with their rich blood supply

are particularly prone to acute obstructive swelling. Airway maintenance is the first priority. Close examination and observation is required. Oral or nasal plastic airways can be used initially. However, if there is any question of impending obstruction, one should proceed with immediate endotracheal intubation. If massive swelling exists and causes unsuccessful intubation, an emergency tracheotomy should follow immediately. Swelling in this area often resolves rapidly, allowing for early extubation or decannulation. If edema persists, further treatment of residual scarring or stricture formation may be necessary. Open mucosal tears secondary to blunt injury are treated using the same principles as those used for penetrating wounds.

Burns

Electrical burns

There are two kinds of electrical burns: arc and contact. An electrical arc that directly approximates tissues causes heat of up to 3000°C. This produces immediate necrosis and coagulation of tissue. Contact burns occur at the sites where an electrical current enters and exits the body. This can be lethal if the current passes through the brain or heart. Electrical burns of the lips and oral cavity are usually of the arc type, but some indication exists that they are combination arc-and-contact burns. This burn most often occurs in small children biting electrical cords or putting their mouths against open outlets. The tissue damage is local, but it can penetrate deep into the muscle. Epidemiologic studies have shown that 1- or 2-year-old children are most often involved; nevertheless, all are susceptible from the time of crawling to the age of understanding the danger.

Oral cavity saliva allows the electrical circuit to be complete within the local area and causes the burning arc to char the tissue. If the victim is well grounded, the electricity from the cord traverse the body. A jolt of 110 V can cause a severe burn but is rarely fatal. Burns caused by 220 V are extremely dangerous and often fatal. Electrical-cord burns of the lips and oral cavity are usually third degree. Initially, the extent of the burn's destruction is not clear, and full demarcation remains unknown for 10 to 14 days.

The wound usually has a small, central ulceration with raised, indurated surrounding skin and subcutaneous tissue. The coagulation necrosis taking place cannot be controlled. A portion of the burned tissue sloughs, but the exact amount of loss is unpredictable. Therefore only obvious necrotic tissue should be removed as the wound is first cleaned. Then one should allow for possible further demarcation with careful observation, wound cleansing, and topical and systemic antibiotics as the wound-healing process begins.

The healing of a burn injury includes significant scarring with contracture of all tissue involved and hypertrophy of the epithelial scar. Contraction of a healing wound is a well-known phenomenon, though not well understood. There have been many theories on burn contraction, with the most recent based on the observation of a significant increase in the number of myofibroblasts in a healing burn. These cells have fibrous and smooth muscle characteristics and are felt to be responsible for the shrinkage of tissue. This loss of surface area of burned skin is particularly a problem on the face, since it leads to alteration of normal facial contours. If the burn is adjacent to loosely attached skin, lips, or eyelids, the pulling, or scar contracture, leads to greater deformity. In more extensive burns the actual loss of

necrotic tissue and the pull of adjacent contracting burned dermis work together to add to the shrinkage and increase the deformity. Dental prosthodontists have made recent advances in severe lip and oral cavity burns with prosthetic appliances to maintain preinjury dimensions. They have been particularly helpful in preserving the oral commissura and reducing the potential for microstomia. In a circumferential entrance burn of the mouth, severe contraction to microstomia proceeds unabated without proper splinting. These mouth conformers are used like orthodontic retainers, with acrylic posts projecting anteriorly to hold the commissura in its anatomic position. Patient cooperation in wearing the apparatus has been a problem.

Hypertrophic scars are a known complication in all wounds in children. Parents should always be warned about their possible development. Hypertrophy is a common finding in burn wounds in patients of any age. Hypertrophy of burn scars occurs at the junction of the normal skin and the burned dermis or skin graft. Wounds with severe contracture may often become raised, red, fibrous scar bands as healing progresses. Such scar hypertrophy is thought to be a result of increased proliferation of fibroblasts. This proliferation is stimulated by several directions of pull in a healing burn, caused by contracture, replacement of lost tissue, and fibrous tissue tears occurring with movement. Electron microscopic sections have demonstrated disorganized collagen fibers rotating and mounding up tightly into a nodular pattern in the burn scar. In other scars the collagen remains loose and in a more linear pattern.

Treatment of electrical burns of the lips and mouth is controversial and the surgeon must exercise surgical and medical judgment with each case. There are still two distinctly different approaches. Some suggest the strictly conservative method of observation and allowing the burn to heal by secondary intention. This course includes cleansing and systemic and topical antibiotics but no surgical intervention. This avoidance of aggressive debridement and sacrifice of potentially viable tissue preserves the most skin, subcutaneous tissue, and muscle. It is emphasized that the exact extent of the burn is difficult to judge early. Also, since this age group tends to suffer from scar hypertrophy, an early procedure may increase the hypertrophic scarring. One should consider extending the observation period beyond the time of complete epithelialization of the wound to a time after the induration has cleared and the scars have softened (Fig. 71-8).

Others feel the course just described is not proper and propose surgical excision of the burn after clear demarcation shows. They suggest that early closure prevents infection, profound scarring, and wound distortion. The demarcation takes approximately 10 to 14 days. Local care is given as the wound is observed. The burn wound is then excised to viable tissue, and the repair is accomplished with local tongue or buccal flaps, free grafts, or primary closure.

In an attempt to combine both approaches it has been suggested that limited burns of this type can be treated conservatively with good results. The more severe burns involving the lips, corner of the mouth, vestibule, gingiva, or floor of mouth clearly do better with early debridement and surgical repair at about 2 weeks compared to healing by secondary intention alone. For cases in which there is significant loss of tissue, reconstructive procedures are required; these are discussed in the section on neoplasms of this area in Chapter 25. Steroid (triamcinolone) injections can be used to soften and diminish hypertrophic scars, but they should be used with caution, since overzealous injection can lead to tissue atrophy with subsequent deformity.

As discussed earlier, oral splints to prevent microstomia are very important in severe burns. Dental consultation helps further, since the deciduous teeth can often be damaged or lost in these injuries. Fortunately, permanent teeth are rarely involved or damaged.

Capping or covering the female ends of a live extension cord to reduce these types of injury substantially cannot be overemphasized.

Thermal burns

Thermal burns to this region can be fatal because a mucosal inflammatory response causes a slowly occlusive edema to develop over a 6- to 72-hour period. This can cause complete upper airway obstruction. An inhalation exposure can lead to three types of damage: carbon monoxide poisoning, smoke poisoning, and thermal burn. The first two types involve the lower respiratory tract with hypoxemia, bronchospasm, and bronchorrhea and are generally managed by the pulmonary team in the burn unit. The otolaryngologist-head and neck surgeon plays an important role in the diagnosis, observation, and management of the thermal injury to the upper respiratory tract. Thermal burns essentially affect only the upper airway, since extreme temperatures (1000°F) are rarely carried to the lower tract. The heat is readily dissipated in the mucous membranes of the nasopharynx, oropharynx, and hypopharynx because air is a poor thermal conductor. Burns from explosions or flames near the airway require regular, careful viewing of the pharynx. Thermal burns of the oral cavity, pharynx, and larynx can cause edema that may progress to severe airway compromise.

Diagnosis begins as always with a careful history, which may elicit information on voice change or hoarseness, stridor, burn even in enclosed area, and sputum containing the burn products. This history, however, is not always elicited if the patient is seen soon after the insult. Initial diagnosis of the full extent of injury can be difficult because these symptoms may take several hours to develop.

Several findings may be found on physical examination. Superficial burns about the mouth, face, and neck may be noted first. Singed nasal hair, mucosal erythema, edema, blisters, carbonaceous sputum, shortness of breath, or dysphonia may be observed. Indirect laryngoscopy can be helpful in following these patients in the first 2 or 3 critical days. This can immediately provide information about the extent of the upper airway involvement and can help predict in a timely fashion whether the patient is going to require airway management with intubation. A mirror examination repeated regularly as part of the patient's observation allows differentiation of further progression. The airway can close slowly without shortness of breath; if not observed closely, the patient can abruptly become obstructed. If an indirect examination is difficult, the flexible fiberoptic laryngoscope is easy to use and gives excellent visualization of the entire area including the upper tracheal wall. Depending on the severity of the case, this close observation is needed for a minimum of 24 hours and possibly for more than 72 hours before the need for intubation is determined.

Management, as has just been emphasized, begins with thorough repeated observations. If the airway is narrowing, the treatment of choice is clearly nasotracheal or endotracheal intubation with a soft-cuffed, synthetic, essentially inert tube. Initially a tracheotomy is to be avoided to prevent further infection. The endotracheal tubes can be left in place for several days without damage to the larynx. Care should be taken to immobilize the tube, especially

if the patient is on a ventilator. A regular jerking motion of the tube can cause laryngeal or tracheal mucosal injury. If the tube is going to be needed for a prolonged period, then a tracheotomy tube is strongly considered. The risk of infection is less after 2 or 3 weeks, and the tracheostomy is more comfortable for the patient.

Mucosal burns can be cleaned and antibiotic ointment applied. Mucosal burns are usually superficial and heal well with good oral hygiene. Gargling a solution that contains one-third water, one-third hydrogen peroxide, and one-third antiseptic mouth wash cleanses the mouth and prevents bacteria-laden debris from collecting. The head of the bed is elevated to try to prevent swelling. Moisturized air (or oxygen, if needed, to maintain adequate arterial levels) via a cool mist should be used. Steroid therapy has not been shown to be helpful for inhalation or thermal burns. If lungs are involved, ongoing pulmonary care is an integral part of the treatment of these injuries.

Chemical burns

The discussion of chemical burns pertains more significantly to the esophagus. However, the entrance of the chemicals that cause the burn injury is through the oral cavity and pharynx. These burns are produced primarily by the ingestion of alkalines, caustics, acids, or corrosives. Household chlorine bleaches (chlorox-sodium hypochlorite) have not produced clinically significant esophageal burns in their usual concentrations (5.2%).

Although lip and oral cavity burns produce the symptoms of drooling, pain, and inability to swallow, the esophagus is the diagnostic and therapeutic concern. Information on the toxic effects of the specific poison ingested and its potential to burn can be obtained by calling one of the Poison Control Centers located in all major metropolitan areas. These centers are usually more helpful than reference texts because they keep an up-to-date listing of all new products. Although alkali burns penetrate more deeply than acid burns, both can cause severe injury, resulting in stricture.

Within the first 24 hours of detecting a history of ingestion, an esophagoscopy should be performed. This is recommended regardless of the presence of oral burns. If a circumferential burn of the esophagus is noted, the scope is not passed through it for fear of perforation. The patient is started on broad-spectrum antibiotics and steroid therapy for 6 weeks. Oral feeding is begun after 3 days if no evidence of perforation or mediastinitis is noted. A barium swallow examination is performed at 2 to 3 weeks and again at 6 weeks. If stricture formation is noted, then a dilatation program is begun. In most cases management is accomplished with mercury-filled dilators passed from above. However, for severe, elongated caustic esophageal strictures, the retrograde method is safer and more effective. This requires a gastrostomy, and the dilator is pulled from the stomach to the mouth.

The mouth burns are simply treated with local care, including cleansing, mouthwash, and application of topical antibiotic ointment to the lips. On the initial examination care should be taken to remove any pieces of the caustic agent remaining in the child's mouth to prevent further burns. These burns are most often seen in small children secondary to accidental ingestion. Occasionally, mentally disturbed adults are victims. Homes with small children should either get rid of toxic chemicals (such as drain cleaners) or keep them locked up.