



Oral commissure burns in children



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Pediatric oral commissure burns present a therapeutic and reconstructive challenge. Although these injuries are fairly common in young children, there exists some controversy on the appropriate timing and nature of the repair that should be performed. Some authors advocate early surgical intervention, whereas others advocate a far more conservative approach that uses prolonged splinting techniques in the hope of avoiding the need for reconstructive surgery. In the event that reconstructive surgery becomes necessary, there exists a wide range of reconstructive techniques that are described in the literature, from simple excision and skin grafting to complex local flap reconstruction using adjacent or distant tissue. In this article, we present an overview of the nature of pediatric oral commissure burns, identify special concerns in pediatric burn patient, discuss the potential role for oral commissure splinting, and finally review a number of different surgical reconstructive techniques that have been proposed in the literature.

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Introduction and epidemiology

The number of burn injuries in the United States is estimated to be between 500,000 and 2 million per year.¹⁻³ Up to 400,000 children are treated annually for burn injuries in the United States, and burns are the third most common cause of death among children aged 0-14 years.^{4,5} It is important to keep in mind the possibility of nonaccidental injury in these cases, as up to 20% of pediatric burn admissions involve child abuse or neglect, particularly those cases involving scalding injuries.^{3,6,7} It is noteworthy that boys are more commonly involved in burn cases than girls are, in some studies in a ratio as high as 2:1, and that children diagnosed with attention-deficit hyperactivity disorder also are at a higher risk.^{3,8,9}

Specifically, electrical burns tend to occur mostly in children aged between 0 and 4 years and tend to

disproportionately involve the lips, mouth, or tongue.¹⁰ In a series of all pediatric patients presenting with electrical burns, the mouth was the most common site of injury, nearly all patients were younger than 4 years (93%), and most patients were younger than 2 years at the time of injury (65%).¹⁰ The most common mechanism of injury involves children biting into an electrical cord, touching the male ends of a live but improperly connected cord, or sucking on the female end of an extension cord that is plugged into the wall.¹¹

There are 2 mechanisms of injury that are frequently described in relation to electrical burns: the arc burn and the contact burn.^{10,11} A contact burn, which is less common around the mouth, typically requires 2 points of contact, such that the current flows from the electrical source, pass through a part of the body, and exit through the ground via the path of least resistance. An arc burn, which is the most common type of injury around the mouth, results from the electrolyte-rich saliva completing a circuit between 2 conductive wires, which initiates an arc or a flash, and this has been reported to generate temperatures as high as 3,000°C.

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The low electrical resistance of the mucous membranes makes them particularly susceptible to severe injury via this mechanism. The most common site of involvement in the mouth is the oral commissure and the upper and lower lips adjacent to the commissure.¹¹ Although these injuries are rare, involvement of the oral commissure is common, and knowledge of the proper treatment is important to achieve acceptable functional and cosmetic outcomes.

Special concerns in pediatric burn patients

Caring for pediatric patients with facial burns requires a comprehensive and multidisciplinary approach to management, and the American College of Surgeons therefore recommends that all patients with facial burns be triaged to American Burn Association–certified burn centers.¹² When initially assessing pediatric facial burn patients, it is important to keep in mind the ABCs—airway, breathing, and circulation. Evaluation should be done for any physical evidence of airway burns, which can include charring of the mouth or lips, singeing of nasal hairs or eyebrows, dark and carbon-stained mucus, wheezing, changes in voice, difficulty in breathing, or coughing. In such cases, definitive airway management in the form of endotracheal intubation may be advisable given the possibility for airway edema that can develop in a delayed fashion after the injury. Particularly in children, it is important to keep in mind circulatory support. Major burn injuries are typically accompanied by massive fluid loss, and although children may initially compensate quite well for this, there exists a greater potential for precipitous and rapid circulatory collapse than what exists in adults. The Parkland formula and the palmar method allow for quick calculation of the amount of resuscitation fluid that is estimated to be required over the first 24 hours after injury. Verification of tetanus prophylaxis should be performed, and booster vaccinations can be administered if indicated.

Management of facial burns in pediatric patients is an area particularly fraught with psychological, developmental, functional, and esthetic concerns. The facial form contains various complex concave and convex surfaces arranged in juxtaposition, structures that are lacking in internal support, and multiple dynamic subunits that are responsible for sight, speech, and oral consumption. Therefore, treatment of these injuries requires a comprehensive, multidisciplinary approach that attends to the preservation of function and esthetics while also considering the psychological and developmental concerns unique to the pediatric population.

Oral commissure burns

There have been several classification systems put forth to describe the degree of tissue damage in pediatric patients with oral commissure burns; however, none has gained widespread acceptance. One schema created by Ortiz-Monasterio

and Factor classified injuries according to the percentage involvement of the upper or the lower lip; however, a more recent classification system proposed by Al-Qattan et al⁸ organizes oral commissure burns according to depth and extent of the injury.¹³

On initial presentation, burn injuries to the oral commissure typically appear gray to white with evidence of charring. The wounds are frequently painless and bloodless because of the nature of a high-temperature thermal injury. The lower lip and oral commissure are involved more frequently than the upper lip is, and patients may present initially with poor salivary control. Importantly, it is very difficult to assess the true margins of injury at initial presentation, and the actual area of involvement may be more than initially believed.

As the burn injury evolves, the patient begins to develop a rim of erythema and edema in the surrounding tissue, and after the first 24 hours, an obvious margin indicating the area of tissue necrosis usually forms because of thrombosis of the blood vessels in the affected area. Eschar and coagulative necrosis develop as the wound heals, with eventual slough of the eschar in 1–4 weeks. The developing scar has a tendency to contract as the soft tissue remodels over time. Although bleeding at initial presentation is uncommon, there appears to be a delayed risk of bleeding from the labial artery that can occur between 1 and 2 weeks following the injury in up to 25% of cases.¹⁴

When treating facial burns, some authors outlined what they consider to be the 5 reconstructive goals of treatment: an undistracted, “normal” look at conversational distance; facial balance and symmetry; distinct esthetic units fused by inconspicuous scars; a doughy skin texture appropriate for corrective makeup; and a dynamic facial expression.¹⁵ Although this pertains to all facial burns and is not specific to oral commissure burns per se, it does provide us with some important considerations to keep in mind when treating these injuries.

Treatment of oral commissure burns

The timing and the appropriate treatment for burn injuries to the oral commissure, lips, and tongue continues to be controversial. A wide variety of treatment strategies and surgical techniques performed at varying intervals from the time of injury have been studied and proposed without the development of any widespread consensus. In general and to more easily discuss the available treatment options, we can categorize interventions based on the time point at which they are performed: early intervention, which occurs within a few days of the injury; intermediate intervention, which occurs at the time that necrosis can be distinguished from normal tissue (typically 1–4 weeks); and delayed intervention, where repair is begun after all the tissues have healed (after several months).¹¹ The choice of treatment strategy can vary depending on the length of time elapsed since the burn injury, the degree and extent of the injury, and the individual surgeon's preferences.¹¹

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