

Effect of position and severity on commissure constriction following electrical burns: review of 19 cases

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Abstract

Sixteen consecutive cases admitted to the Children's Hospital Medical Center of Akron for electrical burns to the mouth were evaluated as to age, sex, position of burn, and follow-up scarring. All cases that involved the commissure had resultant constriction and nine of these required surgery to relieve the constriction. Four additional cases are pictured to show a direct relationship between the initial injury extent and the subsequent commissure constriction.

Electrical burns to the mouth occur most commonly in children under the age of four.^{1,2} The most common cause appears to be sucking or gnawing on the end of a live extension cord. The saliva completes a circuit and results in an arc burn with skin temperatures reaching 2500°C. The extreme temperatures within subcutaneous tissue results in steam formation and an explosive phenomenon. The results can be scarring and constriction of the lips and commissures. Stages of healing for the full-thickness burn include inflammation, scar formation and separation, then epithelization and scar contracture. One aspect of oral electrical burns has not been studied systematically: the association of injury severity with morbidity.

Different cases have reported involvement in all areas of the lips. Commissure involvement has been reported as high as 83% in 35 cases² and as low as 48% in 43 cases.³ Plastic surgical and prosthetic treatment have been described to improve the esthetics following electrical burns.⁴ The present trend is to delay surgery until healing occurs, but this philosophy has evolved from one suggesting early surgery. Hyslop advocated the early debridement of electrical burns of the lips and corners of the mouth.⁵ He suggested treatment within 12 hours of the accident because the clear line of demarcation between the devitalized and normal tissue becomes indistinct after that. He contended this minimized surgical procedures and shortened healing time. Oeconomopou-

los described difficulty in determining the extent of damage to the tissue and a risk of severe hemorrhage immediately after the injury.⁶ Pitts et al. observed in 17 cases that almost all wounds were deeper than the outward initial appearance.² They assessed 17 cases seen within two weeks of the accident, six having early surgery. They observed constriction in all six cases having early surgery, debridement and primary reconstruction. They suggested that softening of the wound did not occur for nine months or longer. Thompson et al. evaluated 43 cases admitted to the hospital with electrical burns of the mouth and found no difference between cases of early or late operations.³ The consensus of clinical opinion is that early surgical intervention does not improve final results in the treatment of oral electrical burns.

There is agreement that an intraoral splint worn continuously for one year significantly can reduce constriction of the damaged commissure. Coleleugh and Ryan used an oral splint which seemed to minimize contracture following an electrical burn to the mouth.⁷ Wright reported that intraoral appliances offer a conservative approach as an alternative to surgery. He concurred that splinting minimized contraction and led to improved esthetic results.¹ Larson and Ryan reported that oral splints worn for a year would decrease the deformity and improve esthetics.^{8,9} Wood et al. suggested that plastic surgery was needed to correct the defect from an electrical burn when a special burn obturator was not used.⁴ They felt an obturator worn for a year could prevent or reduce the need for corrective surgery. Since the advantage of early surgical intervention has not been proven and since later surgical intervention is postponed until softening of the scar, it appears the intraoral splint is an excellent means of improving healing during this time period.

The purpose of this paper is to examine the relationship between the position and extent of untreated oral electrical burns and the resultant constriction. Then,

from the appearance of a fresh oral electrical burn, the dentist could predict the resulting defect and counsel the parents accordingly.

Methods and Materials

Two sets of cases are reported. In the first case set, records of 16 consecutive cases admitted to the Children's Hospital Medical Center of Akron between January 31, 1973, and June 1, 1980, were examined. A specific computer code was used for oral electrical burns. In this way all cases in the time period were retrieved. The cases were evaluated for age, sex, location of the burn, commissure involvement and resultant scarring or constriction of the commissure on follow-up. Splints were not used on any of these cases. The second case set consisted of four cases. One was from the initial set of 16 cases from the private practices of the authors. Photos immediately after the burn and several months later were assembled to show a spectrum for the injury and sequel.² Splints were not worn in any of the 19 cases.

Results

The cases admitted to the hospital showed a mean age of 18 months with all but two of the cases being between eight and 38 months of age (Table 1). Ten males and six females were affected. All the cases involved the lower lip; the upper lip also was involved in 88% of the cases. The commissure was involved in 63% of the cases. The follow-up records in hospital charts and telephone conversations with the parents revealed that all children with commissure involvement had some degree of con-

Table 1. Sixteen consecutive admissions for electrical burns of the mouth at The Children's Hospital Medical Center of Akron.

Age	Sex	Lip Involvement		Commissure Involvement	Constriction
		Upper	Lower		
8mo	f	yes	yes	yes	yes
10mo	m	no	yes	no	
11mo	m	yes	yes	yes	yes
12mo	m	yes	yes	yes	yes
16mo	m	yes	yes	yes	yes
16mo	f	yes	yes	no	
18mo	m	no	yes	no	
18mo	m	yes	yes	yes	yes
24mo	m	yes	yes	yes	yes
24mo	m	yes	yes	no	
26mo	m	yes	yes	yes	yes
31mo	f	yes	yes	yes	yes
36mo	m	yes	yes	yes	yes
6yr	f	yes	yes	no	
8yr	f	yes	yes	no	

striction. Eight of the 10 with commissure involvement have had surgery, one has surgery planned, and one did not require surgery. A spectrum of case photos shows there is a direct association between the appearance of the initial burn and the amount of contracture (Figure 1).

Discussion

The results of these cases are interpreted to support the observation that an oral electrical burn involving the

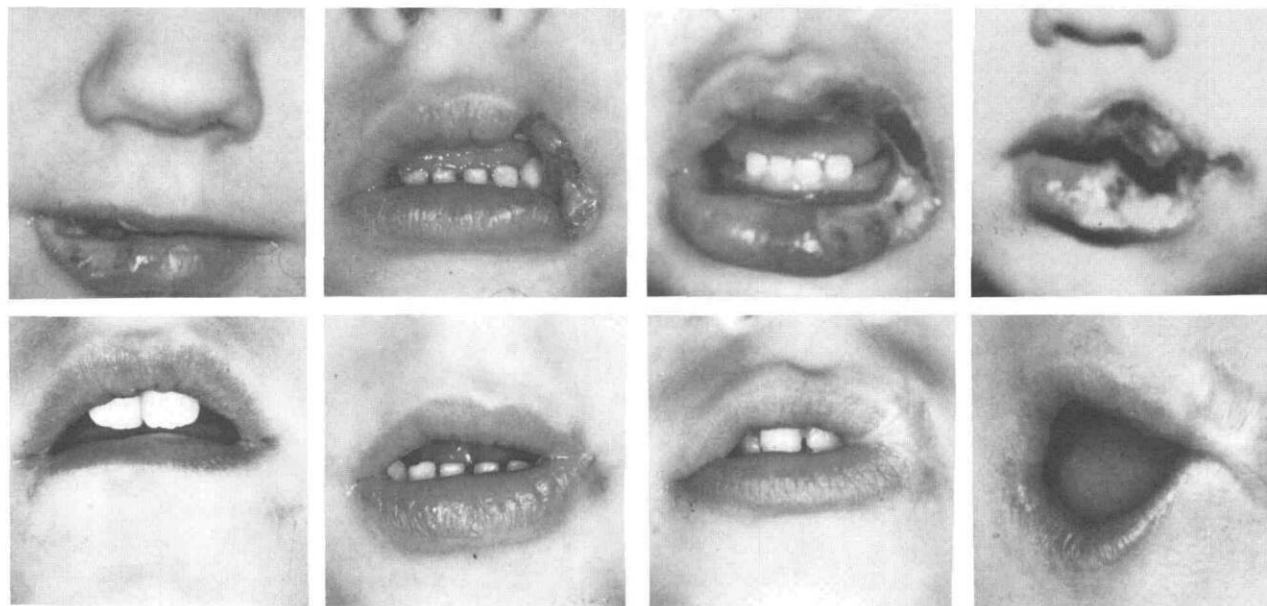


Figure 1. The spectrum of photographs above show four cases. The top row shows oral burns at admittance, and the bottom row shows the same individuals after the untreated burn has closed. The case at left is least severe and the cases increase in severity to the right.

commissure will result in a reduction in size of the oral opening. Commissure involvement in 63% of cases reported here falls between the rates previously reported.^{2,3} The ages for oral electrical burns found here support previous suggestions that infants and toddlers are the highest risk group. The prevalence of male involvement is statistically significant (using the Z test for proportions, the tendency for males to be involved is $Z = 2.89$; $p < 0.01$). The total of three studies shows 61 males and 33 females involved. This information is potentially important in counseling parents. From examples of untreated burns, there appears to be a direct association between the size of injury and the amount of constriction.

The photo spectrum of sequela for untreated burns in Figure 1 may be useful in counseling parents about treatment. A parent could be shown a series of pictures such as this to show the probable outcome without appliance therapy. The authors use this in their private practices to emphasize the need for immediate attention.

Conclusion

Most electrical burns in children involve the commissure of the mouth. Males are more frequently affected than females. With commissure involvement, constriction will occur in direct relationship to the extent of the

injury. The series of photos shown in Figure 1 may be of use in counseling parents.

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Quotable Quote

Walking a tightrope between seeming to endorse the defined diets and condemning them outright as unproved in controlled studies, the consensus panel concluded that parents and physicians who believe in the diets may want to give them a try. But the panel made it clear that there is no firm evidence that the diets work. Claims that the diets produce dramatic effects simply did not hold up in well designed clinical trials. Nonetheless, the panel did not want to dismiss the anecdotal evidence and testimonials that the diets work.

When, after hearing the results of research on defined diets and hyperactivity, the panel recommended that it wouldn't hurt to try the diets if parents believe in them, the audience had mixed reactions. Feingold applauded the consensus statement. Feingold Association president Hersey said she was "a little disappointed that the panel suggested trying other modalities. We would prefer that physicians first consider the diet before they resort to drugs."

Mailman, on the other hand, thought the panel was too much in favor of the diets. "Let's acknowledge the fact that there is no scientific evidence that diets can help the vast majority of people. However reprehensible giving drugs to children might seem, the stimulant drugs work in many children," he said.