Management of Post–Electric Burn Microstomia by Free Radial Artery Forearm Flap in a 1-Year-Old Child

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Abstract

Management of post–electric burn microstomia is a challenging task, especially in children, as it causes difficulty in feeding and airway problems (secondary to nasal airway blockage). The recreated defect is often full thickness and requires full-thickness tissue for reconstruction. The free flap can provide adequate normal tissue for the restoration of functions and aesthesis of the perioral region. However, performing free flaps in children is equally demanding due to small-diameter vessel anastomosis and postoperative monitoring. We present a case of postburn microstomia that was managed by contracture release and reconstruction by free radial artery forearm flap in a 1-year-old child. Postoperatively, at 6 months of follow-up, the flap settled well and the child was able to open his mouth fully with good aesthetic outcome. The free flap can be considered a good and safe option for perioral contracture release and reconstruction for better functional and aesthetic outcomes.

Keywords

- postburn microstomia
- free flap in children
- post–electric burn perioral contracture

Introduction

Post–electric burn microstomia in children is not an uncommon condition, especially as unsupervised children tend to bite the electric wires at home with their teeth and as a result get electric burns. Most of the time such electric burns are deep and cause full-thickness loss of tissue. When such deep burns heal secondarily, they develop perioral burn contracture or microstomia.

Microstomia further causes difficulty in feeding, speech, respiratory difficulties (if nasal airway is also blocked simultaneously due to other causes), poor oral hygiene, and cosmetic concerns.

Management of such perioral contracture is difficult, especially in children due to failure of nonsurgical therapy, difficulty in intraoperative intubation, and requirement of full-thickness tissue for reconstruction, which is usually unavailable locally in case of burn around oral region.

Distant flaps like free flaps are one viable option, but performing it in children, especially in post–electric burn microstomia, can be a difficult task.

We describe a case of post–electric burn microstomia that was managed by contracture release and reconstruction by a free radial artery forearm flap in a 1-year-old child.

Case Report

A 1-year-old boy suffered electric contact burn while playing at home when he went near the refrigerator and bit the wire of the refrigerator. The patient was initially treated in a

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Fig. 1 Third-degree full-thickness burns of the upper and lower lips and the cheek region following electric burn.

Fig. 3 Healed burn wound with severe microstomia.

nearby hospital for 3 days where he was resuscitated and treated conservatively, and then referred to us for further management.

On initial presentation, the patient had third-degree burns over both lips on the left side including the left oral commissure with involvement of the left philtrum, left cheek, and chin with a necrotic patch (►**Fig. 1**). The patient also had a superficial second-degree burn wound over the left upper limb.

Fig. 2 Defect after debridement of eschar on the bedside and managed with dressing.

Initially, the patient's wound was managed conservatively with dressings. A deep eschar developed over the left angle of the mouth and in the lower lip, which was removed bedside during routine dressings (►**Fig. 2**). The wound eventually healed with conservative management and the patient was discharged. At the follow-up after 2 weeks, he developed severe microstomia with restricted mouth opening of only one finger width (►**Fig. 3**). He was readmitted and planned for microstomia correction by contracture release and reconstruction on a semi-emergency basis to improve feeding and airway blockage.

Difficult intubation was anticipated because of the restricted mouth opening, so a tracheostomy team was kept ready as a backup in case intubation fails. However, the patient was successfully intubated with a fiberoptic laryngoscope. Contracture involving the upper and lower lips was first released by making an incision horizontally, and all scar tissue was also excised. Since there was a full-thickness defect, for better aesthetic and functional outcome, a decision to reconstruct the upper and lower lips by radial artery forearm flap was made (►**Fig. 4**). A bilobed design of the flap was made: two lobes for the upper and lower lips and an area for the adjoining cheek and commissure. A suprafascial radial artery forearm flap was raised with the pedicle of the radial artery and venae commitments including the cephalic vein (►**Fig. 5**). The donor area was re-surfaced with a partial thickness skin graft.

The anastomosis was done between the radial artery and the recipient facial artery and venous anastomosis between the venae comitantes and the cephalic vein was anastomosed with the external jugular vein by nylon 10–0 sutures. Intraoperatively, there was vasospasm of the recipient vessels that was managed with warm saline and local xylocaine. Postoperatively, the flap was monitored in the intensive care

Fig. 4 Marking of free radial artery forearm flap.

unit (ICU) for 5 days and then shifted to the ward and discharged with follow-up advice and mouth-opening exercises. During the postoperative period at 2 months, the mouth opening was again reduced, so we decided to create commissure and debulking of the flap (►**Fig. 6**). The flap was incised horizontally along the aperture and the flap skin was sutured to the mucosa, creating a commissure, upper lip, and lower lip (►**Fig. 7**). Postoperatively, the flap settled well and with adequate mouth opening (►**Fig. 8**).

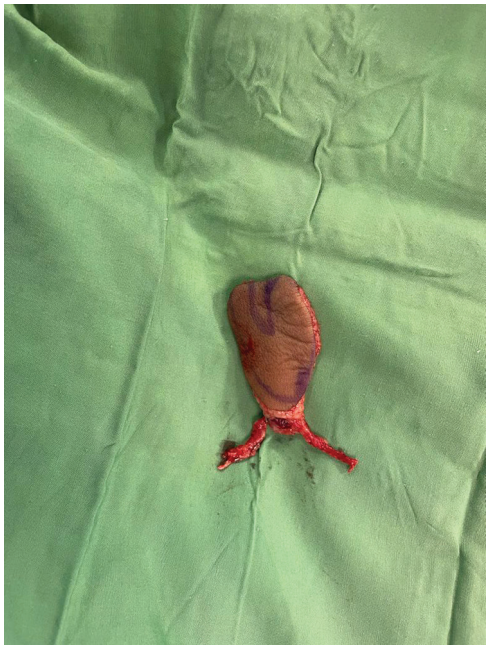

Fig. 5 Free flap harvested with pedicle.

Fig. 6 Well-settled flap with reduced mouth opening.

Fig. 7 Flap revision and commissuroplasty.

Fig. 8 Well-settled flap and adequate mouth opening.

Discussion

Post–electric burn of the perioral region especially in children is a difficult problem both during the acute phase and after the healing phase. Electric burn, which is usually a deep third-degree burn, often causes damage to the labial artery and charring of full-thickness tissue. However, most of the time, such burns heal with conservative management due to good vascularity of the face. Burn wound healed with secondary intention leads to microstomia, which is more difficult to manage.

Due to reduced mouth opening, feeding is affected and there is risk of airway obstruction (if nasal airway is compromised simultaneously due to other causes); therefore, correction of microstomia is required on a priority basis.

Various authors have described local tissue as flap options for reconstruction like a mucosal flap, vermillion flap, and commissuroplasty to manage microstomia.[1] Jaminet et al successfully managed severe microstomia caused by ingestion of caustic acid in an 8-month-old infant using bilateral commissuroplasty and rhomboid buccal mucosa flaps.[2] Branch and David also described managing microstomia in a 10-week-old infant using multiple Z-plasty and bilateral mucosal flaps.[3] Although local tissue is a viable option, it is either unavailable or severely scarred.

Sadiq et al described the role of free flap reconstruction in pediatric oral burn cases by using anterolateral thigh (ALT) flaps at 5 years of age.[4] They also described microstomia in a 3-year-old boy treated by splinting and Z-plasty, which further requires release of re-contracture and reconstruction by radial artery forearm flap.

To the best of our knowledge, ours is the first-ever reported free flap reconstruction in a 1-year-old child with post–electric burn microstomia, which is a novel and viable option.

Microsurgery in the pediatric population is challenging because of technical difficulties in the anastomosis of the small vessels. Small vessel diameter, greater chances of vasospasm, and difficult postoperative care are the major challenges for reconstructive surgeons in pediatric patients. However, in the era of microsurgery, free flap reconstruction for various defects in children has been reported with an equal success rate compared to adults.

Ohmori et al first described the use of a free groin flap in a 3-month-old child and concluded that there is no minimum age for free flap transfer.[5] Germann et al used a latissimus dorsi musculocutaneous (LD) free flap for reconstruction of the dorsum of the foot in a 15-week-old infant.[6] Fried et al used an LD myocutaneous flap in a 6-month-old infant for reconstruction of temporal defects after teratoma resection.[7] Later on, various authors reported and observed the use of free flap in small children to be possible and safe.[8] Yazar et al analyzed the safety and reliability of microsurgical free tissue transfer in pediatric head and neck reconstruction in 72 cases and found a success rate of 98.6%, which is comparable to various studies in adults.[9]

Vessel anastomosis in pediatric patients is challenging, but due to improved microsurgical skills and the use of microscope, it has the same patency as in adults. In our patient, mouth opening has improved 6 months after the second surgery, and he is able to eat normally. The lip seal is maintained because of the preservation of the orbicularis oris muscle of the opposite side, and a static sling by the palmaris tendon can be hitched in the future if required.

Conclusion

Severe post–electric burn microstomia can be effectively managed by free flap even in smaller children. It is an effective and safe option that gives good aesthetics and good function of the perioral region.

Note

The manuscript, figures, tables, and data are not published previously and are not under consideration for publication elsewhere. Informed consent was obtained from all individual participants (parents) included in the study for publishing their cases and photographs.

This paper has not been presented in any conferences or meetings.

Author Contribution

R.K.M. was responsible for conception of the work, acquisition and analysis of data, and drafting of the manuscript. S.C. was responsible for acquisition and analysis of data and drafting and editing manuscript.

Conflict of Interest
None declared.

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