The Karapandzic Flap in Lower Lip Reconstruction

Saikrishna Degala · Sujith Kumar Shetty ·
Monalisha

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Abstract Human bite injuries are both deceptive and challenging in their presentation and management. They are particularly notorious due to the polymicrobial nature of human saliva inoculated in the wound and the risk they pose for transmission of infectious diseases. Early treatment, appropriate prophylaxis and surgical evaluation are the key to achieving desired treatment outcomes. Here we present a case report of human lip bite with significant tissue loss that required reconstruction. The reconstructive techniques are usually varied but the ultimate objectives of treatment are to achieve healing, function, and aesthetics. Through this article, we have tried to focus on the diagnostic features, reconstructive procedure as well as other recommended treatment options for human lip bites based on the current available evidence.

Keywords Human lip bite · Lip reconstruction · Karapandzic flap

Introduction

A human bite can often be as dangerous as or more dangerous than animal bites because of the types of bacteria and viruses contained in the human saliva. It is not only the potential for infection but these wounds may result in gross disfigurement resulting in psychosocial complications. Other life threatening complications following human bites are tetanus [1], necrotizing fasciitis [2], transmission of diseases like HIV [3], herpes simplex virus, hepatitis B [4],

hepatitis C [5] and syphilis [6]. In a study of 388 patients with human bites, more than half of the patients (50.3 %) presented with bites on the hands or fingers, 23.5 % on an extremity and 17.8 % on the head or neck region. Studies have found that human bites are more common among males. Human traumatic lip injuries, although uncommon, present major challenges in terms of reconstructive options and the outcome of surgical management. Since the lips have such centrally important aesthetic and functional roles, successful maintenance of these roles after reconstruction is of utmost importance. Prophylactic antibiotic treatment and primary closure of bite wounds remain areas of controversy. The rate of infection secondary to human bites is estimated to be about 10 % [7]. Opinions tilt towards the fact that primary surgical repair is the treatment of choice for most clinically uninfected facial bite wounds, whereas delayed closure should be reserved for certain high risk or already infected wounds.

Iregbulem states: ‘Human bites of the lip are potentially heavily contaminated, and we believe there is no place for primary closure of such a wound, even if possible and if the patient presents early’. Avulsive injuries of the lip with significant tissue loss represent the most difficult cases for definitive management and also require hospitalization and possibly specialized reconstructive options. The cosmetic effects of such losses are profound and may affect their social life also. Lip defects are classified by their depth and their size. Superficial defects involve the skin and vermillion, and leave the underlying muscles, nerves and arteries undisturbed. Deep/full thickness defects include the underlying muscles, primarily the orbicularis oris. The nerve and blood supply may also be affected if the defect is large. Full-thickness defects require meticulous attention to obtain a three-layer closure of mucosa, muscle, and skin. When analyzing a lip defect, most important assessment is

S. Degala (✉) · S. K. Shetty · Monalisha
Department of OMFS, JSS Dental College and Hospital, JSS
University, Mysore, Karnataka, India
e-mail: degalasaikrishna@gmail.com

the amount of vermillion left. The lip vermillion carries orbicularis muscle which is responsible for lip movement.

Decision Tree for Reconstruction of Avulsed Lip After Human Bite Depends on the Extent of Tissue Loss

We report the presentation and management of a patient with avulsion of 2/3rd of the lower lip and also highlight other modalities of reconstruction.

Case Report

A 27 year old male patient (Fig. 1a, b) reported to our hospital with a complaint of deformity of lower lip following an assault. Patient gave history of assault and human bite 6 h back by his neighbor following a heated argument. There was history of alcohol consumption by both the parties.

Initially patient had visited some local hospital for the needful where primary treatment was given and was referred to our hospital for definitive treatment. On examination avulsion of right 2/3rd of lower lip noted measuring about 5 × 2.5 cm. Defect extended from right commissure to crossing the midline up to left side philtral ridge of upper lip and inferiorly up to labio-mental crease.

As our standard protocol, tetanus toxoid was given to the patient and antibiotic amoxicillin-clavulanate and metronidazole started. Since human bite wounds have been found to be contaminated with a wide spectrum of bacteria, which include both aerobes and anaerobes, some of which are part of the normal oral flora and generally respond to penicillin [8]. All routine blood investigations were carried out. There were no abnormalities detected. Post exposure HIV prophylaxis is not routinely indicated after a human bite. It is to be started only when there is an exposure to a known HIV-infected source with a high viral load and the exposure involves significant blood transfer, a deep wound, entry into a blood vessel, etc. [9]. It may be prudent to obtain a baseline HIV serological test with a 6-month follow-up test [10]. If

possible, the assailant should be tested for HB surface antigen and HB envelope antigen. If positive, the patient should be given a single dose of HB immunoglobulin and an accelerated course of HB vaccine (doses at 0, 1 and 2 months), unless the patient is known to be immune.

Patient was taken under general anaesthesia for secondary repair of lip with karapandzic flap. It involved bilateral full thickness circum-oral advancement rotation [11, 12] of the flap. The key feature of this reconstruction technique is preserving the neural and vascular structures that are encountered in the plane of dissection, so that optimal oral competence and sensory functions are preserved.

After skin preparation and thorough debridement of wound, surgical site was infiltrated with lignocaine and adrenaline in concentration of 1:80,000. The releasing incisions of this orbicularis oris musculocutaneous flap was placed around the periphery of the anatomic lip unit taking care to be masked within the labio-mental and melolabial creases. The incision was deepened through skin and subcutaneous tissues, after which blunt dissection was used in a radial fashion. Careful dissection was carried out preserving branches of the facial vessels, facial nerve and sensory supply. Lateral margins of orbicularis muscle were detached from its attachment to gain adequate mobility (Figs 2, 3).

Buccal mucosa was rolled out and mucosal incisions in the vestibule were given only adjacent to the margins of the defect to create the vermillion and enable closure. The wound was then closed in layers, taking care to obtain a good muscular apposition (Figs 4, 5).

Discussion

Reconstruction of large-scale lip defect requires dynamic repair with remaining lip tissue to provide superior results in terms of esthetic and function. When planning reconstruction of lower lip, several major points should be taken into consideration, as suggested by Fujimori [13] and Nakajima et al. [14]:

1. The flaps used should preferably be local flaps including innervated muscle.
2. All suture lines should be in natural facial creases.
3. The flaps should be large enough to contain whole elements of lip tissue.
4. The newly reconstructed lip should not produce microstomia.

Management ranges from simple primary closure of the wound, reconstruction with local or distant flap and free tissue transfer in case of massive defects. However, distant

Fig. 1 Pre operative photos showing avulsion of right 2/3rd of the lower lip

Fig. 2 Intraoperative photo showing circumoral incision in radial fashion

Fig. 4 Post operative 1 week

Fig. 3 Intraoperative photo showing detachment of lateral margin of the orbicularis muscle

Fig. 5 Post operative 6 months

flaps have no muscular element and thus provide no sphincteric control.

A prospective cohort study by Chen et al. [15] demonstrated that primary closure of bite wounds is associated

with higher rates of infection (6 %) as compared with other sutured wounds in the same institution. Illustrated the reconstruction of a lip with an upper arm flap. Dieffenbach [16] was the first to describe local flaps for the same purpose. Since then there have been many different techniques described for reconstruction of large lower lip defects with

distant or local flaps. Bakamjian [17] described the use of the tongue flap as a source of tissue in major lip reconstructions. Mchug described reconstruction of large lip defects even whole of the lower lip using neurovascular island flap from each side providing good sensation and muscular function with water tight sphincter [18]. Rayner [19] described the method of resurfacing whole lip with sensate musculo-mucosal flaps taken from the cheeks. The return of sensation is of particular benefit. Johanson et al. [20] described the step ladder technique for lower lip reconstruction by advancing lip tissue opposite to site of defect. For the reconstruction of defects of the lateral parts of the lower lip the Abbe or Estlander cross-lip transposition flap may alternatively be employed depending on involvement of the commissure [21]. The Abbe flap, is outlined on the upper lip to be half the size of the defect as measured along the vermilion. In this way both lips will be shortened by equal amounts thereby carrying the risk of microstomia.

As suggested by Fujimori and Nakajima et al., reconstruction of 70–80 % of lip should be mainly carried out by redistribution of remaining lip tissue to retain the function and larger defects requires the use of additional tissue. For defects larger than approximately 60 % but less than approximately 80 % of the lip, one can use cheek tissues advanced medially in the form of a Bernard modification of the Webster procedure, or one can use innervated lip flaps from the remaining lip tissue, also known as Karapandzic flaps. Gate flaps, described by Fujimori [13] deliver similar amounts of tissue but do not provide innervations of the reconstructed lip.

Distant flap (such as flaps from the scalp and forehead, the submandibular, deltopectoral, and pectoralis major flap) and free tissue transfer is required for lip reconstruction when the total remaining lip stock is insufficient to make a circular stoma and the local flaps are inadequate. Usually, these defects involve adjacent cheek, chin, and/or mandible. The most frequently used free flap is the radial artery forearm free flap, with palmaris tendon suspension for lower lip loss [22]. The flap can be innervated by anastomosing a branch of the lateral antebrachial cutaneous nerve to the transected end of the inferior alveolar nerve; however, the usefulness of this maneuver is debatable because thin flaps such as the radial forearm flap often spontaneously regain some sensation without any nerve coaptation [23].

In our present case, there was avulsion of 2/3rd of lower lip which was repaired using karapandzic flap. Speech, facial expressions, and oral competence were unaffected and the new stoma was sufficient to allow a normal diet. This flap was first described by Von Bruns [24]. A complete lip is formed by rotating upper lip and perioral tissue down and around. The incisions are made through skin and muscle down to, but not through, mucosa. Karapandzic

modified the creation of the flap and described it as neurovascular myocutaneous flap [12]. The important difference being the preservation of blood vessels, an intact motor and sensory nerve supply. This technique avoids additional transection of the orbicularis oris muscle fibers, thereby minimizing denervation and atrophy of the sphincter and enhancing movement and sensation. A large variety of other techniques, e.g., Dieffenbach's flap and its refinement the McHugh sliding flap, Gillies fan flap (a variation on the Estlander flap) and its modification by McGregor have been described which can transfer tissue from the cheek into the lip [25, 26]. Currently, the preferred reconstruction method for subtotal lower lip defects is a free flap or—if this is not possible—local flaps.

Conclusion

Human bites are potentially dangerous for their propensity in causing infections at the site of bite injury as well as posing a potential risk for transmission of systemic diseases. Early treatment, appropriate prophylaxis and surgical evaluation are key to achieving desired treatment outcomes. The reconstructive approach to lip defects should make every attempt to preserve function and cosmesis with a minimum amount of morbidity.

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