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Lower Lip Reconstruction by Estlander Flap

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ABSTRACT

Introduction: Animal-induced trauma is an important public health concern. Trauma can range from simple to complex injuries, and can be present as perforations, avulsions, lacerations, or fractures. It has been found that dog bites are the most common among animal bites. In the patients having facial trauma, the lips are most commonly involved. Reconstruction of lower lip injuries is customised based on the size of defect. Small defects (less than 1/3rd) can be closed primarily. But for larger defects, local tissue flaps like Abbe-Estlander, Karapandzic, Webster-Bernard have to be done.

Methods: In this study, we hereby analyse the efficacy of the Estlander flap in patients with dog bites over lower lip. A 32-year-old male patient sustained injury to lower lip due to dog bite. One third of the total volume of the lower lip was involved. An Estlander flap was successfully done for the patient.

Results: Estlander flap provides adequate wound healing. Phonation is good, which results in patient satisfaction. Oral continence was present, there was no leakage of liquids or solid food. Absolute closure of the lips was achieved.

Conclusion: In cases of upper and lower lip reconstruction, the Estlander flap is a good local flap. It is used when the involved area is mostly upto one third of the total volume of lip. The aesthetic as well as functional objectives are successfully obtained using this flap..

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INTRODUCTION

Animal bite injuries result from both domestic and wild animals. Animal bite injuries predominantly affect males.[1] They are more common in children as compared to adults.[2] Dog bite injuries are most common among animal bites. As stated by National Centre for Disease Control (NCDC), India set forth 37,17,336 dog bite cases in 2024, an average of over 10,000 per day. The incidence of facial dog bite injuries continues to rise. In many developing nations like India, facial dog bites account for a substantial public health concern. Besides immediate trauma, patients are also at risk of infection, like rabies, and tetanus. Management of these injuries requires integrative work involving emergency physicians, plastic surgeons, infectious disease specialists, and rehabilitation teams. Timely and suitable treatment mitigates complications and also improves quality of life. Most bites in the head and neck region involve lips, nose, cheek[3] and present a unique reconstructive challenge because they usually involve a combination of tissue loss, contamination, and distortion of significant anatomical landmarks.

Lips have remarkable functionality, aesthetic, and social importance. The lower lip has an important role in maintaining oral competence, articulation

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of speech, mastication, swallowing, and facial expression. Also, the defects in the region of oral commissure are particularly complicated because they distort the continuity of the oral sphincter. Any misstep in satisfactorily reconstructing these structures can result in drooling, difficulty in speech, decreased oral intake, and obvious facial asymmetry. Even diminutive changes in the lips, that is, the appearance of the vermilion border, labial commissures, or Cupid's bow easily catch a person's sight and may result in significant psychological distress because the lips are central to the facial appearance and communication. Thus, any disproportion in the lips can have an ardent and firm effect on the patient's dignity and self-respect. This consequently affects the quality of life of the patient. The aim of lip reconstruction is both aesthetic and functional, which makes it one of the most demanding aspects of facial reconstruction. The goal of lip reconstruction is to maintain function, reconstitution of orbicularis oris muscle, three-layered closure, precise alignment of vermilion, preservation of adequate oral aperture, preservation of affinity between upper and lower lips and enhancement of aesthetics in repose and with animation.[5] Hence, reconstruction should be planned diligently to achieve optimal aesthetic and functional outcomes.

A wide range of lip reconstruction techniques can be used on the basis of defect size, location of tissue involvement, commissure involvement, patient age, tissue availability, and surgeon preference.[6] The essence of "replacing like with like" remains essential core in reconstructive surgery. Defects over lip involving less than one-third of the volume of lip can be closed primarily with acceptable results. But, larger defects, require local or regional flap reconstruction to restore both function as well as aesthetics. Also, quantum leap in reconstructive surgery has commenced use of microsurgical free tissue transfer and perforator-based flaps, local flaps remain the proposed option for moderate-sized lip defects. The advantage of local flap is that, they provide tissue that almost resembles the lost tissue in colour, texture, thickness, functional characteristics and takes less operative time. This concept can be demonstrated by employing adjoining lip tissue to reconstruct the defect. Flaps like Abbe Flap, Gillie's flap, Webster flap, Karapandzic flap can be used for full-thickness defects that imply over one-third of the total volume of the lip. The favoured procedure in lip defect with commissure involvement is the Abbe–Estlander flap.[7] First reported by Estlander for lateral lip defects in 1872, the use of Estlander flap to elevate skin, muscle and mucosa in the lip was made popular in 1898 by Dr. Abbe used it predominantly for medial lip defects.[8] The estlander flap is an axial pattern flap. It is also known as the lip-switch methodology. The width of the flap is usually one-half the width of the defect and is the same height as the defect. Employing this approach, defects that involve the commissure and as much as 50% of the lower, or upper lip can be satisfactorily reconstructed with an admissible function.[10] Even after greater than a century after its original account, the Estlander flap is still extensively used because of its simplicity, reliability, and reproducibility.

MATERIALS AND METHODS

A 32-year-old, male patient, with a wound sustained by dog bite encompassing one-third of the lower lip and the commissure. Presented after 2 days of injury, as shown in figure 1. The patient underwent vaccination and primary management and was referred to our centre for further management. More than one third of the full thickness of the right lower lip was affected, incorporating vermilion with extension to the commissure.

After taking valid consent, the patient was shifted to OT for antiseptic measures, where his painting and draping were done, and Estlander flap was marked. The width of the flap is usually one-half the width of the defect and is the same height as the defect. It was based on the superior right labial artery. Anaesthetic drug infiltration was done. Incision was given, and dissection was continued until full thickness of the flap was made. After that, the viability of the flap was verified. The flap was then rotated 180º, and mucosa, muscle and skin were sutured covering the defect. The donor site was closed primarily. The intraoperative photographs are given under figure 2.

The patient was satisfied, and wound healing was adequate, vocalisation was also fine. Oral continence



Figure 1: Pre-operative photographs of patient showing lower lip defect due to dog bite.



Figure 2: Intra-operative photographs of patient showing raising and rotation of Estlander flap to cover the defect and final closure of wound.



Figure 3: Post-operative photographs of the patient.



Figure 4: Post-operative photograph of patient at 2-months follow-up.

was present. There was no leakage of liquids or solid food. Absolute closure of the lips was achieved. The post-operative photographs are given under figure 3 and 4 depicts photographs of patients at 2-months follow up.

DISCUSSION

Dog bite injuries are commonly associated with irregular wound edges, tissue avulsion, crush injury, and contamination which escalates the difficulty in reconstruction and entails careful assessment of tissue viability before final repair. Proper wound cleansing, debridement, and antibiotic prophylaxis play an important role in preventing infection and thus refining reconstructive outcomes.

The purpose of lip reconstruction is both aesthetic and functional. The goal of lip reconstruction is to maintain function, reconstitution of orbicularis oris muscle, three-layered closure, precise alignment of vermilion, preservation of affinity between upper and lower lips and enhancement of aesthetics in repose and with animation.[11] The aesthetic aim of lip reconstruction comprises reinstating labial symmetry and avoid poor scarring.[12] Lip function and oral competence are important for promising reconstruction.[13]

The vascularity of the lips is derived mainly from the superior and inferior labial arteries, forming a rich vascular arcade around the oral aperture. This robust vascular network is the basis of dependable vascularity of the estlander flap and promoted obvious postoperative healing with less risk of necrosis. Also, an important consideration in lip reconstruction is the re-establishment of dynamic muscular function. The estlander flap embodied Orbicularis oris muscle fibres within the transferred tissue, which enables preservation of sphincter function and promotes long-term oral competence.

Literature quotes that if the commissure is encompassed, then the Abbe-Estlander flap is an established procedure due to its outcomes in functionality.[14] The Karapandzic flap effectively preserves sensation and muscle continuity, but it can result in a higher degree of microstomia. The Bernard-Webster flap is useful for larger defects, but it requires more extensive tissue mobilisation and can modify facial contour. On the other hand, the Estlander flap offers an excellent balance between functional preservation and aesthetic restoration for moderate-sized commissure defects. Various studies have exhibited beneficial outcomes in terms of oral competence, phonation, mastication, and patient satisfaction. The flap is done in a single stage. These characteristics have contributed to its continued popularity despite the availability of newer reconstructive techniques.

The most commonly reported complications of Estlander flap include microstomia, waning of commissure, scar contracture, and mild asymmetry.[15] In order to minimise these complications, careful flap design, precise vermilion alignment, and meticulous surgical technique are essential. In selected cases, secondary commissuroplasty may be required to further refine the aesthetic result. Thus, the second operative intervention is common, and it must be accomplished at 12 weeks so as to enhance certain characteristics involving the result.[16] These disadvantages are usually outweighed by the functional and reconstructive benefits of the flap.

Zhai *et al.* employed the Abbe-Estlander flap for reconstitution of defects up to 50%, and it showed that this flap is a helpful substitute in large volume defects, owing to its vascularity.[17] Ali Ebrahimi *et al.* accustomed that the flap benefits in defects of up to 80% of the lip.[18] Alvarez NH *et al.* in their study on two clinical cases of wounds caused by dog bites where one third of the lip and the commissure were involved; concluded that due to the estlander flap's versatility, its blood flow, simple technique, and the possibility of performing it under local anaesthesia, it is still an ideal option for treating these type of defects.[10]

In our patients, it is shown that the Estlander flap is surpassing in equivalence to other procedures due to its vast margin of rotation, extensive vascularity, and the benefit that if done perfectly, it covers the defect with a single intervention.

Facial appearance is also closely associated with self-confidence, social interaction, and emotional well-being. Facial deformities can lead to anxiety, embarrassment, and social withdrawal. Successful reconstruction therefore surpasses beyond restoration of anatomy and function, contributing considerably to the patient's psychological recovery and overall quality of life. In our patients, restoration of facial symmetry and oral function resulted in a high degree of postoperative satisfaction.

Follow-up is essential in assessing the success of lip reconstruction. Evaluation should include oral competence, phonation, mastication, sensation, scar quality, commissural symmetry, and patient-reported satisfaction. Objective assessment should be combined with subjective feedback, which hence provides a comprehensive measure of reconstructive success. In our case, satisfactory wound healing, preserved oral competence, and acceptable aesthetic appearance were observed during follow-up, indicating a successful outcome.

CONCLUSION

Reconstruction of lower lip defects involving oral commissure is one of the most challenging aspects of facial reconstructive surgery. Successful treatment provides well-vascularised tissue, preserves muscle continuity, needs restoration of oral competence, speech, mastication, and facial aesthetics while minimising donor-site morbidity. Therefore, selection of a suitable reconstructive technique is important in determining long-term outcomes.

In cases of upper and lower lip reconstruction, the estlander flap is a good local flap. Estlander flap's versatility, easy surgical procedure, and feasibility of doing it using local anaesthesia, besides its lasting functional and aesthetic results, makes it an excellent choice for treating these types of defects. Its ability to reconstruct full-thickness defects while preserving oral competence has made it a cornerstone of commissure reconstruction.

The excellent postoperative outcome observed in our patient further supports its role as an effective reconstructive modality for dog bite injuries involving the lower lip and commissure. Careful planning, meticulous surgical technique, and adherence to sound reconstructive principles can help achieve predictable and satisfactory outcomes in similar cases.

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