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Estlander Flap for Reconstruction of a Lower Lip Defect Following Excision of a Squamous Cell Carcinoma

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Abstract: **Original Research**

Reconstruction of lower lip defects presents a major surgical challenge due to the anatomical and functional complexity of this region. We report the case of a patient with a squamous cell carcinoma of the right oral commissure, managed by oncological excision followed by reconstruction using an Estlander flap. Although described more than a century ago, this technique remains a reliable option for lateral third lower lip defects, thanks to its simplicity, robust vascularization, and favorable functional and aesthetic outcomes. In our case, a secondary commissuroplasty using the Préaux technique corrected postoperative microstomia and optimized oral opening. Postoperative outcomes were uneventful, with satisfactory restoration of labial occlusion, phonation, oral continence, and lip sensitivity. This case illustrates the value of the Estlander flap as an effective and reproducible solution for extensive tumor-related lower lip defects.

Keywords: Squamous cell carcinoma, Lower lip, Reconstruction, Estlander flap, Commissuroplasty.

I. INTRODUCTION

The lips play an essential role in facial aesthetics and functions such as alimentation and speech. Conditions such as cancer, trauma, infections, and congenital anomalies are the main causes of lip substance loss requiring reconstruction. Such procedures are often complex due to the intricate anatomy of the lips, composed of three distinct layers (skin, mucosa, and muscle), and the variety of available flap options. The rich vascular network of the lips makes local flap reconstruction feasible for medium to large defects with a low risk of necrosis.

The Estlander flap is a full-thickness lip-substitution flap, in which a portion of the uninvolved lip (either upper or lower) is rotated across the oral aperture to reconstruct the defect.

Despite being described over a century ago, it is still used today due to its reliability, effectiveness, safety, hemostasis, and satisfactory functional and aesthetic outcomes. The aim of this work is to report a case of surgical reconstruction of the right lateral third of the lower lip and right oral commissure using an Estlander flap.

II. Case Report

A 56-year-old male patient with a history of chronic active smoking (40 pack-years) and depression treated with Sertraline 50 mg/day and Olanzapine 10 mg/day for one year presented with a squamous cell carcinoma of the right oral commissure extending to the lower lip. The lesion, measuring 3 × 2 cm, had been progressing for approximately one year.

Oncological resection was performed with 1 cm margins, and all teeth were extracted. Cutaneo-mucosal closure was done with Vicryl 3/0.

The excision created a substance loss involving the right oral commissure and the lateral third of the lower lip. Once histopathological confirmation of clear surgical margins was obtained, the patient was scheduled for reconstruction.

Under general anesthesia, the patient was placed in the supine position in the operating room. The defect was outlined as a triangle, with the base on the upper red lip. The lateral limb began at the oral commissure, while the medial limb was offset from the commissure by the same length as the base, ending 1–2 mm short of the vermilion border to preserve the coronary artery pedicle. The apex of the triangle was placed in the nasolabial fold to conceal the future scar. The defect size was 5 × 4 cm.

A full-thickness incision was made using a No. 15 blade along the lateral and medial limbs, stopping 2 mm from the vermilion to protect the coronary artery pedicle within the upper lip. After confirming flap viability, it was rotated 180° on its pedicle (the upper lip vermilion) to cover the defect of the lower lip and right commissure.

Suturing was done in three layers, starting with the commissural point: mucosal, muscular (with braided 3/0 suture), and cutaneous (with 4/0 monofilament). Proper alignment of the red and white lip borders was ensured across all planes to prevent mismatch.

Donor site closure was also performed in three layers: muscular, subcutaneous, and cutaneous. A dressing and a nasogastric tube for feeding were placed to facilitate nutrition during healing.

Healing was achieved within 3 weeks, with removal of sutures and nasogastric tube. The immediate result was satisfactory, with restored lip occlusion, preserved phonation and sensation, and no salivary or food leakage. The cosmetic appearance was also deemed acceptable.

Postoperatively, the patient was followed as an outpatient to manage inflammatory scarring and promote scar maturation. After 6 months, the patient developed microstomia and was scheduled for secondary commissuroplasty using the Préaux technique.

Under general anesthesia, the patient was placed supine. A skin triangle was marked with its base medially and its apex at the neocommissure. Following excision of the triangle, careful dissection was performed to identify the orbicularis oris muscle and separate it from the underlying mucosa.

The muscle was divided sagittally into medial and lateral bundles. The medial bundle (destined for the upper lip) was sectioned at its inferior end; the lateral bundle (for the lower lip) at its superior end. Both bundles were sutured together using 3/0 Vicryl and anchored to the skin using a bolster at the neocommissure.

The mucosa was incised in a horizontal T-shape to create three mucosal flaps, which were sutured with 4/0 Vicryl to the cutaneous plane to reconstruct the red lip. Thorough irrigation with saline was performed, followed by placement of a fatty dressing.

Postoperative outcomes were simple, with good wound healing. Adequate oral opening was restored, with good oral continence allowing normal feeding and phonation, while preserving lip sensitivity and achieving a satisfactory aesthetic appearance.

Fig 1: A) Preoperative appearance of the squamous cell carcinoma involving the oral commissure and extending to the lips; B) Postoperative appearance after tumor excision and cutaneo-mucosal suturing; C) Appearance after complete healing

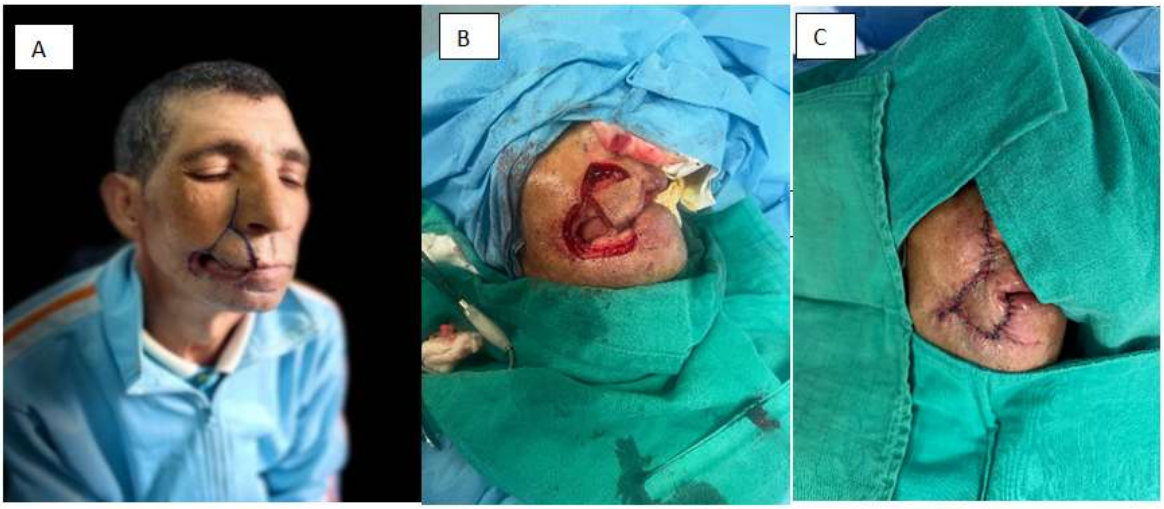

Fig 2: A) Preoperative view showing the design of the Estlander flap; B) Intraoperative view after elevation and 180° rotation of the flap; C) Appearance after flap placement and suturing

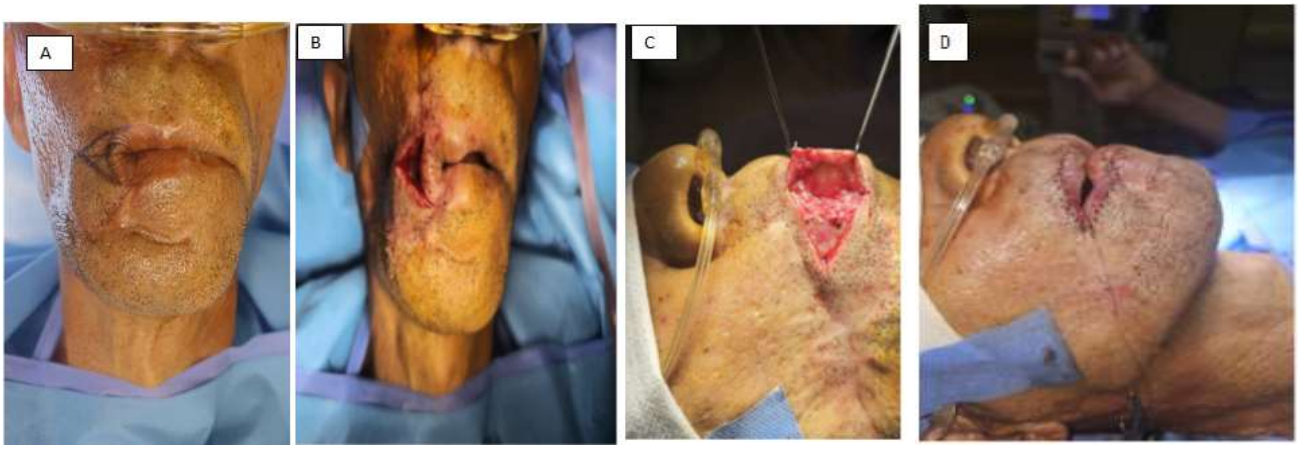

Fig 3: A) Intraoperative view of the triangular marking for commissuroplasty using the Préaux technique; B) Intraoperative view after excision of the triangular skin flap; C) View after dissection of the mucosal flap; D) View after positioning and suturing of the mucosal flap

Fig 4: A) Final result after complete healing with the mouth closed; B) Final result after complete healing with the mouth open

III. DISCUSSION

Reconstruction of the lower lip following surgical excision of squamous cell carcinoma can be particularly challenging, especially when addressing large surgical defects. Reconstruction must adhere to functional, morphological, and aesthetic principles.

Functionally, the goal is to restore a musculo-mucosal sphincter and preserve lip sensitivity. Restoration of labial amplitude must be achieved in all planes [1]:

- **Vertically**, to ensure salivary continence by re-establishing adequate white lip height and proper lip closure for feeding and phonation.
- **Horizontally**, by positioning the commissures symmetrically relative to the mid-sagittal plane.

Morphologically, the lip is a unique structure composed of three distinct layers and a free mucosal border. Lip tissues should be used primarily for lip reconstruction—repairing lip with lip.

Aesthetically, to preserve balanced interlabial proportions, the flap width should be equal to half the defect width, and the flap height should match the defect height [1–4]. Although various techniques exist to reconstruct defects involving one-third to two-thirds of the lower lip, no single method is considered the gold standard.

In our case, we opted for reconstruction using the **Estlander flap**, where part of the uninvolved lip is incised and transposed to create a new vermilion on the opposite lip [3, 4]. Despite being described more than 150 years ago, the Estlander technique remains reliable and safe, offering consistently satisfactory functional and aesthetic results in lip reconstruction.

Its disadvantages are minor and include possible commissural asymmetry and a rounded appearance of the reconstructed neocommissure. This can be improved by **secondary commissuroplasty** [2].

In our case, a slight asymmetry was observed, but the final outcome was judged satisfactory given that the lesion involved more than one-third of the lower lip. Functional outcomes were excellent, with restoration of alimentation, phonation, and lip sensation—enabling rapid return to normal activity and minimal complication rates.

Generally, one of the Estlander flap's most significant advantages is its **high degree**

of aesthetic camouflage, with a scar that becomes barely perceptible over time.

Other lip reconstruction techniques, such as secondary healing and skin grafting, tend to contract, carry a higher risk of distortion, take longer to heal, present poor color matching, and often result in major scarring.

Moreover, **skin grafts** are usually reserved for high-risk lesions or when flap reconstruction is not readily feasible [5, 6].

Unlike **Abbe** or **Karapandzic flaps**, which are better suited for defects of the central, paramedian, or complete lower lip, and often yield less satisfactory outcomes than ours, the Estlander flap remains more appropriate for lateral lip defects.

Clinicians must make every effort to preserve both **function and aesthetics** when selecting a reconstructive approach for lower lip defects. The **Estlander flap** is a cornerstone technique in lip reconstruction, yielding excellent results with minimal morbidity when performed by experienced hands.

CONCLUSION

The **Estlander flap** is a local rotation flap that enabled us to reconstruct the defect resulting from the excision of a squamous cell carcinoma of the lower lip and right commissure.

The results were highly satisfactory both functionally and aesthetically, making this flap a **technique of choice** for the reconstruction of lateral lower lip defects. However, **it should be complemented with a commissuroplasty** to optimize oral aperture and symmetry.

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