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Functional and Aesthetic Restoration of Total Lower Lip Defects Using the Radial Forearm Free Flap

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Abstract:
Total lower lip reconstruction presents a significant surgical challenge due to the need to restore oral competence, dynamic mobility, and facial aesthetics. While local and regional flaps are often insufficient for extensive defects, free tissue transfer remains the gold standard. The radial forearm free flap (RFFF), owing to its thin, pliable, and well-vascularized tissue, is particularly suited for complex lip reconstructions.
We report the case of a 40-year-old male with a history of chronic smoking and previously treated squamous cell carcinoma of the lower lip. Following wide local excision, a through-and-through defect involving the entire lower lip and both oral commissures was reconstructed using a folded radial forearm free flap. The flap was harvested from the non-dominant forearm and inset to recreate both the mucosal and cutaneous lip surfaces. Microvascular anastomoses were performed to the facial and external jugular systems. Functional outcomes included restoration of oral competence, adequate mouth opening, and intelligible speech. Aesthetic results were rated as good to excellent, with minimal donor site morbidity.
Despite the increasing use of anterolateral thigh (ALT) flaps in oropharyngeal reconstruction, the RFFF remains superior in scenarios demanding fine tissue pliability and structural resilience. Its reliability in double-layered reconstructions and ability to contour complex three-dimensional structures make it particularly effective in total lip reconstruction. However, biological limitations such as lack of native muscle innervation and skin color mismatch persist.
The RFFF continues to represent a safe, effective, and versatile solution for total lower lip reconstruction, particularly in cases requiring pliable tissue and precise anatomical restoration. Long-term outcome studies incorporating patient-reported measures are essential to further refine reconstructive strategies and improve functional and aesthetic satisfaction.
Keywords: *lip reconstruction, radial forearm flap, folded*

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I. Introduction:

The reconstruction of total or near-total lip defects remains a major challenge in maxillofacial surgery, due to the need to restore both functional and aesthetic aspects. Functional lips are essential for proper speech, eating, and drinking, while also representing a key element of facial harmony.

Partial lip defects can often be managed using local flaps such as the Abbé, Karapandzic, or Johnson's stair-step techniques. These approaches allow for partial preservation of the orbicularis oris muscle, helping to maintain dynamic lip movement [1,2].

However, in cases of subtotal or total lip loss, local techniques are frequently insufficient. These larger defects often require free flap reconstruction to avoid excessive restriction of oral aperture and to ensure adequate tissue replacement [3].

The radial forearm free flap (RFF) has emerged as a preferred option for such reconstructions. Its thin, pliable tissue is particularly well-suited for recreating both the internal mucosal lining and external skin surface of the lip, especially when used as a folded flap. In this study, we present a series of cases that highlight the remarkable versatility of the RFF in three-dimensional lip reconstruction, detailing the key surgical steps and discussing the advantages and limitations of this approach [4].

II. Materials and Methods:

We present the case of a 40-year-old male patient with a history of chronic smoking, estimated at 7 pack-years. The patient was operated on one year prior for a well-differentiated squamous cell carcinoma of the lower lip. The tumor required a wide local excision, resulting in a full-thickness, through-and-through defect involving the entire lower lip, extending from one commissure to the other.

Given the size and complexity of the defect, reconstruction was performed using a radial forearm free flap (RFFF), chosen for its thin, pliable tissue and reliable vascular pedicle. The non-dominant forearm was selected as the donor site to minimize functional impairment. Prior to flap harvest, a modified Allen test was performed to ensure adequate ulnar artery perfusion and safe radial artery sacrifice.

The skin island measured approximately 10 × 8 cm, centered longitudinally over the course of the radial artery. Dissection was initiated on the ulnar margin of the flap and continued in a subfascial plane, carefully preserving the paratenon overlying the flexor tendons to optimize donor site healing.

The radial artery and its concomitant veins were dissected proximally to their origin to achieve sufficient pedicle length. The superficial cephalic vein was also preserved to provide an additional option for venous drainage. Once harvested, the flap was transferred to the facial defect and inset to recreate the lower lip's contour and oral sphincter function. Microvascular anastomoses were performed end-to-end:

- the radial artery to the facial artery,
- two accompanying veins to the facial vein and external jugular vein, respectively.

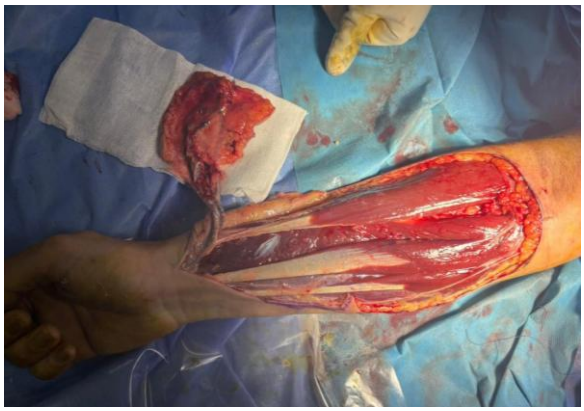

Figure 1. Intraoperative view showing harvest of a radial forearm free flap (RFFF). The flap is designed longitudinally over the radial artery axis. Adequate spacing is maintained at the distal margin to preserve sufficient length of the PLT for later anchoring during dynamic lip reconstruction.

To restore oral competence and dynamic function, the skin paddle was folded in a double-layered fashion to reconstruct both the intraoral and cutaneous surfaces of the lip. The flap was anchored laterally to the remaining orbicularis oris muscle stumps and commissures. A temporary feeding tube was placed, and the patient was kept under close postoperative monitoring in a specialized microsurgical unit.

Figure 2. Inset of the flap and reconstruction of the oral side. The vascular pedicle is anastomosed to the right common carotid artery and the external jugular vein, and the palmaris longus tendon (PLT) is attached to the left remaining orbicularis oris muscle and the right zygomatic major muscle ensuring tension of the lower lip.

The donor site was covered with a full-thickness skin graft harvested from the supraclavicular region and immobilized with a compressive dressing. Postoperative care included flap monitoring, antibiotic prophylaxis, and early physical therapy to maintain perioral mobility.

III. Results:

The single patient in this case study successfully underwent total lower lip reconstruction using a radial forearm free flap. The surgical procedure was well tolerated, with no intraoperative or immediate postoperative complications. The flap demonstrated complete survival, with no signs of partial necrosis, venous congestion, or arterial insufficiency during the postoperative period.

Figure 3. The flap remains viable 2 days post-operatively

Following discharge, the patient was able to return to his previous day-to-day activities without restrictions, indicating a swift functional recovery. Oral competence was effectively restored, allowing the patient to resume a normal diet without difficulty or drooling. Speech clarity returned to baseline, and no microstomia was observed, ensuring adequate oral aperture for both functional and hygienic purposes.

Figure 4. Appearance after 3 months follow-up. Folding of the RFF enables the reconstruction of the internal and external parts of the lower lip

Figure 5. The grafted donor site 3 months post-operatively

Clinical examination revealed good lip mobility and competence, with preserved mouth opening, facilitating maintenance of oral hygiene and reducing the risk of secondary complications such as candidiasis or dental caries. The patient expressed satisfaction with the aesthetic outcome, which was also judged by the surgical team to be good to excellent, demonstrating satisfactory symmetry, color match, and contour.

Importantly, donor site morbidity was minimal; the forearm donor area healed uneventfully without functional deficits or significant scarring, and the patient reported no pain or discomfort during follow-up.

While this positive outcome pertains to a single patient, it supports the reliability and effectiveness of the radial forearm flap for complex total lower lip reconstruction, balancing both functional restoration and aesthetic considerations.

IV. Discussion:

Total lower lip reconstruction continues to pose a significant challenge to reconstructive surgeons. The primary goals of reconstruction are to restore oral competence, enable intelligible speech and adequate oral intake, facilitate oral hygiene, and achieve an appearance as close to normal as possible [5,6]. Local flaps often fall short in meeting these objectives and frequently necessitate multiple revision procedures to improve function and aesthetics [7]. Similarly, regional flaps based on cervical skin may present vascular reliability issues, particularly in patients who have undergone prior neck dissection or radiation therapy.

At our institution, the anterolateral thigh (ALT) flap has progressively replaced the radial forearm flap (RFF) for several reconstructive indications, particularly in oropharyngeal reconstructions where increased soft tissue volume is necessary to restore bulk and contour. The ALT flap offers advantages such as a longer vascular pedicle, larger skin paddles, and reduced donor site morbidity, especially in non-obese patients.

However, despite these benefits, we continue to regard the RFF as superior in certain clinical scenarios, primarily due to its exceptional pliability and structural resilience. These characteristics are particularly valuable when the flap requires folding to reconstruct complex three-dimensional structures, such as the lip. The RFF's thin and supple nature allows for precise contouring without compromising blood flow.

In contrast, the fasciocutaneous perforator-based ALT flap tends to be thicker and less flexible, which can lead to venous congestion when folded. This susceptibility poses a significant risk to flap viability, especially in reconstructions requiring intricate folding or double-layered designs. While techniques such as bi-paddled ALT flaps based on separate perforators have been developed to mitigate this risk, they necessitate meticulous planning and can increase operative complexity.

Therefore, although the ALT flap has become the preferred choice for volume-demanding reconstructions at our center, the radial forearm flap remains the flap of choice when pliability, reliable vascularity, and the ability to withstand folding are critical for optimal functional and aesthetic outcomes.

Several techniques involving suspension procedures have been proposed to address the limitations of traditional reconstructive methods. Among these, the approach originally described by Sakai et al. [8] and subsequently modified by others [6,7] has proven particularly effective in achieving functional outcomes in complex cases.

Based on our experience, total lower lip reconstruction using a tendino-fasciocutaneous radial forearm free flap represents a safe and reliable technique. This method consistently achieves the majority of the reconstructive goals, offering satisfactory functional and aesthetic results even in challenging clinical scenarios [9].

V. Conclusion:

Although the radial forearm flap is considered the gold standard for lip reconstruction, it often requires secondary revision procedures to improve both functional and aesthetic outcomes. As a primary reconstructive method, it does not consistently meet patient expectations. This underscores the need for a thorough follow-up study incorporating both a detailed patient questionnaire and objective clinical assessments, in order to evaluate long-term outcomes and guide future improvements in reconstructive techniques.

This comprehensive approach to lip reconstruction emphasizes defect-specific solutions, with free flaps playing an indispensable role in extensive defects while maintaining realistic expectations about functional and aesthetic outcomes.

References:

[1]. Schüller, M.; Gosau, M.; Müller, S.; Gerken, M.; Rohrmeier, C.; Legal, S.; Schreml, S.; Ettl, T. Long-term outcome and subjective quality of life after surgical treatment of lower lip cancer. *Clin. Oral. Investig.* 2015, *19*, 1093–1099.

[2]. Vanison, C.; Beckmann, N.; Smith, A. Recent advances in lip reconstruction. *Curr. Opin. Otolaryngol. Head. Neck Surg.* 2019, *27*, 219–226.

[3]. Fernandes, R.; Clemow, J. Outcomes of total or near-total lip reconstruction with microvascular tissue transfer. *J. Oral. Maxillofac. Surg. Off. J. Am. Assoc. Oral. Maxillofac. Surg.* 2012, *70*, 2899–2906.

[4]. Sadove, R.C.; Luce, E.A.; McGrath, P.C. Reconstruction of the Lower Lip and Chin with the Composite Radial Forearm—Palmaris Longus Free Flap. *Plast. Reconstr. Surg.* 1991, *88*, 209–214.

[5]. Sadove R. C., Luce E. A., and McGrath P. C., Reconstruction of the lower lip and chin with the composite radial forearm-palmaris longus free flap, *Plastic and Reconstructive Surgery*. (1991) 88, no. 2, 209–214, 2-s2.0-0026050746

[6]. Lee J.-W., Jang Y.-C., and Oh S.-J., Esthetic and functional reconstruction for burn deformities of the lower lip and chin with free radial forearm flap, *Annals of Plastic Surgery*. (2006) 56, no. 4, 384–386, 2-s2.0-33645396719, https://doi.org/10.1097/01.sap.0000200283.03650.e3.

[7]. Jeng S.-F., Kuo Y.-R., Wei F.-C., Su C.-Y., and Chien C.-Y., Total lower lip reconstruction with a composite radial forearm-palmaris longus tendon flap: a clinical series, *Plastic and Reconstructive Surgery*. (2004) 113, no. 1, 19–23, 2-s2.0-1242264469, https://doi.org/10.1097/01.PRS.0000090722.16689.9A.

[8]. Sakai S., Soeda S., Endo T., Ishii M., and Uchiumi E., A compound radial artery forearm flap for the reconstruction of lip and chin defect, *British Journal of Plastic Surgery*. (1989) 42, no. 3, 337–338, 2-s2.0-0024381983.

[9]. Seikaly, H.; Rieger, J.; Zalmanowitz, J.; Tang, J.L.; Alkahtani, K.; Ansari, K.; O'Connell, D.; Moysa, G.; Harris, J. Functional soft palate reconstruction: A comprehensive surgical approach. *Head. Neck*2008, *30*, 1615–1623.