

Reconstruction of the Lower Lip and Oral Commissure Using a Composite Radial Forearm Free Flap with Palmaris Longus Tendon Following Resection of Well-Differentiated Squamous Cell Carcinoma: A Case Report

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ABSTRACT

Well-Differentiated Squamous Cell Carcinoma (WDSCC) of the lower lip is managed by complete oncologic excision with safe margins, appropriate assessment of regional neck, and immediate reconstruction aimed at restoring oral competence, speech, swallowing, and facial symmetry. For extensive lower-lip defects involving the commissure, local flaps may be inadequate because they can cause microstomia or insufficient sphincter support. A 49-year-old male with a 20-year history of kharra/tobacco chewing presented with a painful ulceroproliferative lesion of the lower lip extending to the left oral commissure and gingivobuccal sulcus. Clinical examination showed a 4×3.3×2 cm lesion with restricted mouth opening and no palpable cervical lymphadenopathy. Incisional biopsy confirmed WDSCC. Contrast-enhanced computed tomography was used for locoregional assessment, after which wide local excision with left modified radical neck dissection type I and right supraomohyoid neck dissection levels I-III was performed. The ablative defect was reconstructed using a composite radial forearm free flap incorporating the palmaris longus tendon as a sling to recreate lower-lip support. Histopathology confirmed WDSCC with negative mucosal, skin, and deep margins, Depth Of Invasion (DOI) of 15 mm, positive skin involvement, no lymphovascular or Perineural Invasion (PNI), and 0/15 metastatic lymph nodes, corresponding to pT4aN0Mx. Postoperative recovery was uneventful. At six months of follow-up, the patient had a mouth opening of approximately 40 mm, with satisfactory restoration of oral competence and facial aesthetics. No evidence of recurrence was observed during the follow-up period. The case report provides further evidence in documenting single stage commissure and near total lower lip reconstruction using a tendon incorporated radial forearm flap in a nutritionally vulnerable, medically comorbid patient.

Keywords: Deglutition, Facial muscles, Microsurgery, Mouth rehabilitation, Operative, Surgical procedures, Treatment outcome

CASE REPORT

A 49-year-old male patient presented with a painful non-healing ulcer over the lower lip region of approximately two months' duration [Table/Fig-1,2]. The lesion began as a small peanut-sized growth and enlarged to an ulceroproliferative lesion measuring 4×3.3×2 cm on final clinicopathological assessment. Pain was dull, aching, intermittent, non-radiating and aggravated by mastication. Additional symptoms included burning sensation on consumption of hot/spicy foods, thick ropy saliva for 20 days, mild difficulty in mastication and restricted mouth opening. There was no appetite loss, weight loss, or significant voice change beyond mild alteration for one month. The patient had applied topical balm twice daily for 15 days without benefit.

The patient had a significant history of kharra/tobacco chewing 6-8 times daily for 20 years, which he had stopped approximately one year before presentation. He was hypertensive for the past 10 years and was taking telmisartan 40 mg once daily.

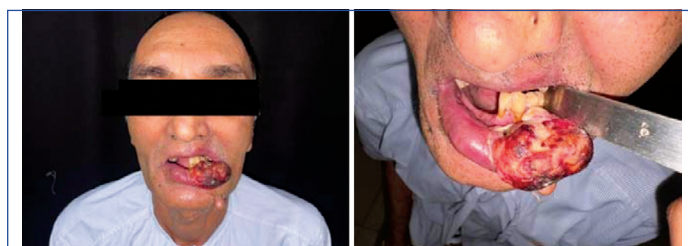
There was a history of left cerebral infarct with chronic ischemic changes, for which he was taking generic neurovascular/supportive medications, including donepezil twice daily, betahistine 16 mg twice daily, midodrine 2.5 mg twice daily, pantoprazole 40 mg once daily, and rosuvastatin/clopidogrel 10/75 mg once daily. He had no history of diabetes, tuberculosis, asthma, or bleeding disorders.

Clinical Examination

The patient was of moderate build but appeared undernourished, with a height of 170 cm and a weight of 48 kg (BMI, 16.61 kg/m²). Vital signs were within normal limits, with a pulse rate of 82 beats/min, blood pressure of 110/84 mmHg, and body temperature of 98°F. The low BMI was taken into consideration during perioperative optimisation, with appropriate nutritional planning and postoperative nasogastric feeding support.

There were no signs of pallor, icterus, cyanosis, clubbing, or oedema.

Extraoral examination showed gross facial asymmetry due to an ulceroproliferative lesion extending from the midline of the lower lip to the left oral commissure; the lesion was reddish-white, irregular,



[Table/Fig-1,2]: Preoperative extraoral and intraoral views showing an ulceroproliferative lesion involving the lower lip, left oral commissure and gingivobuccal sulcus (images from left to right).

indurated, fixed to the lower lip and tender on palpation. The final clinicopathological tumour size was 4×3.3×2 cm.

On intraoral examination, the same 4×3.3×2 cm ulceroproliferative lesion with everted edges and induration involved the vermillion and left gingivobuccal sulcus. Interincisal mouth opening was 25 mm, indicating restricted mouth opening/mild trismus rather than normal mouth opening. Teeth present were 13, 17, 23, 31-34, 37 and 38. No palpable cervical, axillary, or inguinal lymphadenopathy was detected.

The provisional diagnosis was carcinoma of the lower lip and left gingivobuccal sulcus, clinically staged as cT3N0M0. Final pathological staging was deferred pending definitive histopathological examination of the resected specimen.

Investigations and Surgical Management: Incisional biopsy taken from the representative edge of the lesion confirmed WDSCC, showing invasive squamous epithelial islands with keratinisation/keratin pearls and intercellular bridges.

Contrast-enhanced computed tomography of the head and neck was performed for locoregional staging and surgical planning. The imaging was interpreted as showing an enhancing lower-lip/left commissural soft-tissue lesion with extension toward the left gingivobuccal sulcus, without radiologically evident cervical nodal disease or mandibular cortical erosion in the available record; therefore, the lesion was considered resectable and suitable for primary ablative surgery with immediate reconstruction.

Wide local excision with 1 cm margins was performed. Although the neck was clinically N0, bilateral neck treatment was selected because the lesion involved the lower lip near the midline, extended to the oral commissure/gingivobuccal sulcus and represented advanced local disease requiring accurate regional staging and control. As documented in the operative and pathology records, a left modified radical neck dissection (Type I) and right supraomohyoid neck dissection (levels I-III) were performed, resulting in a near-total lower-lip defect [Table/Fig-3,4]. The excised specimen is shown in [Table/Fig-5,6].



[Table/Fig-3,4]: Post-excision defect showing near-total lower-lip loss after wide local excision (images from left to right).



[Table/Fig-5]: Gross excised specimen demonstrating the ulceroproliferative tumour mass.

After defect measurement, standard marking for a left radial forearm free flap was performed [Table/Fig-6]. A composite fasciocutaneous radial forearm free flap was harvested from the left forearm with the palmaris longus tendon included in the flap territory [Table/Fig-7,8]. The flap was inset to reconstruct the external skin cover, intraoral lining and left commissural component of the near-total lower-lip defect.

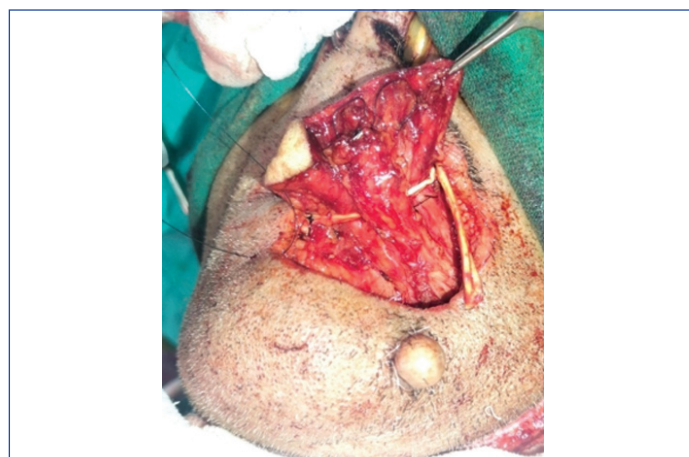


[Table/Fig-6,7]: Preoperative marking of the left radial forearm flap and harvested composite flap (images from left to right).



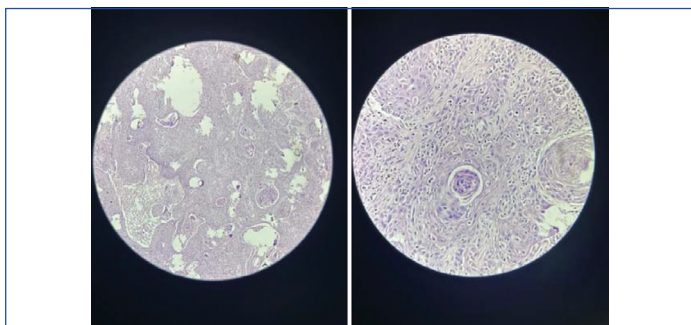
[Table/Fig-8]: Harvested palmaris longus tendon within the radial forearm flap.

The palmaris longus tendon was used as a lower-lip suspension sling and was anchored to the residual perioral/orbicularis-oris-modiolo soft tissue to recreate lip seal and resist postoperative ptosis [Table/Fig-9]. Microvascular anastomosis was performed to the facial vascular system. The available operative record documented facial-vessel anastomosis and tendon-based lip seal, but did not provide a patient-specific ischemia time or separately itemised venous drainage details; therefore, these details were reported as unavailable rather than inferred.



[Table/Fig-9]: Immediate flap inset and microvascular reconstruction.

Definitive histopathology showed a single ulcerative tumour measuring 4×3.3×2 cm within a 6.2×4×2 cm resected specimen. Sections showed WDSCC with invasive squamous nests, keratin pearls and intercellular bridges. All mucosal, skin and deep/base margins were negative: anterior mucosal margin 1.5 cm, posterior mucosal margin 1.0 cm, inferior mucosal margin 0.5 cm, anterior skin margin 2.5 cm, posterior skin margin 1.5 cm, inferior skin margin 1.3 cm, and base negative. Tumour DOI was 15 mm, gross tumour thickness/depth was 2 cm, pattern of invasion was three, Worst Pattern of Invasion (WPOI) was four, lymphocytic response score was two, Lymphovascular Invasion (LVI) was absent, PNI was absent, and skin involvement was positive. Fifteen lymph nodes were identified and all were negative for metastasis (0/15); extranodal extension was therefore not applicable. Final pathological staging according to the AJCC 8th edition was pT4aN0Mx, corresponding to Stage IVA, rather than the initial clinical stage of cT3N0M0 [Table/Fig-10].



[Table/Fig-10]: Stained photomicrographs showing invasive nests of squamous cell carcinoma with keratinisation and keratin pearl formation (H&E, ×100).

Postoperative Course and Follow-up

The procedure was uneventful. Flap monitoring was performed in the intensive care unit and the flap remained viable. Flap monitoring was mostly done clinically based on flap colouring, temperature, capillary return and pin prick bleedings, which remains one of the gold standard method for flap monitoring. The other methods used were Doppler ultrasound. These were important in detecting flap viability and patency. Clinical evaluation coupled with pin prick and Doppler monitoring has helped for postoperative flap monitoring. Nasogastric feeding was used initially (visible early postoperatively, [Table/Fig-11]), followed by gradual resumption of oral intake after intraoral healing. Given pT4a staging, 15 mm DOI and WPOI 4, postoperative referral for adjuvant radiotherapy/oncology opinion was recommended, along with structured surveillance, tobacco cessation counselling and nutritional rehabilitation. At 6-month follow-up, mouth opening was approximately 40 mm, oral competence was restored, drooling and recurrence were absent, and aesthetics were satisfactory [Table/Fig-12].



[Table/Fig-11]: Early postoperative frontal view with nasogastric tube and intraoral postoperative healing of the reconstructed lower lip.

DISCUSSION

Oral Squamous Cell Carcinoma (OSCC) constitutes around 90%-95% of oral cancers and is one of the most prevalent forms of cancer



[Table/Fig-12]: Six-month follow-up showing maintained lip contour, oral competence and intraoral healing.

in South Asia, especially India. It has been found to be associated significantly with tobacco use in different forms. Worldwide, a combination of tobacco and alcohol causes around 70%-80% of oral cavity squamous cell carcinomas, whereas in India, the most important cause is the use of smokeless tobacco [1].

The risk factors for lower lip squamous cell carcinoma include long-term smoking and tobacco use, Chronic Ultraviolet (UV) radiation exposure, particularly among individuals with occupational exposure, alcohol consumption, fair skin, advanced age, male sex, persistent actinic cheilitis, immunosuppression, and poor oral hygiene [2].

The pathological assessment of lower lip SCC is an important parameter in predicting the prognosis and deciding on appropriate treatment measures. Histopathological assessment of oral cavity squamous cell carcinoma should include tumour dimensions, Depth of Invasion (DOI), histological grade, Perineural Invasion (PNI), Lymphovascular Invasion (LVI), surgical margins, Worst Pattern of Invasion (WPOI), bone invasion, and regional lymph node involvement. Among these parameters, DOI is an important prognostic indicator and was incorporated into the AJCC TNM staging system in its 8th edition. The inclusion of DOI resulted in stage modification for a substantial proportion of oral cavity malignancies and has improved the prognostic stratification of these tumours. Higher DOI is related to high cervical metastatic rate as well as low survival rates. Likewise, the presence of PNI, LVI, margin positivity, extranodal extension, and poorly differentiated histological subtype indicates aggressiveness of the disease and the need for additional therapies. Histopathological examination revealed Well-Differentiated Squamous Cell Carcinoma (WDSCC) with a Depth of Invasion (DOI) of 15 mm and a tumour size of 4×3.3×2 cm. All surgical margins were free of tumour. Fifteen lymph nodes were identified, none of which showed metastatic involvement. The Worst Pattern of Invasion (WPOI) was classified as Grade 4. Lymphovascular Invasion (LVI) and perineural invasion (PNI) were absent, while skin involvement was present. Based on these findings, the pathological stage was pT4aN0Mx, corresponding to Stage IVA [3].

Bilateral neck dissection may be performed in case of squamous cell carcinoma of lower lip if it reaches the midline due to bilateral lymphatic drainage. Further justification of bilateral neck dissection includes such adverse features as advanced T stage, deeper invasion, and clinical involvement of cervical lymph nodes. The contralateral side of the neck is a common and potentially preventable site of recurrence in tumours of the oral cavity. The multivariate model obtained discriminates patients with low and high-risk (more than 20%) of contralateral metastasis. The application of this mathematical model can be useful for the indication of contralateral neck dissections [4].

The metastatic involvement of cervical lymph nodes by OSCC usually occurs according to a predictable pattern of first-level node metastasis followed by spread to contiguous levels of nodes. It is stressed in the paper that lesions if involving the midline, have an increased likelihood of exhibiting contralateral nodal metastasis, thus justifying the need for bilateral neck dissection in certain cases [5]. Large defects of

the lower lip after the excision of squamous cell carcinoma of the mouth pose various reconstructive difficulties as far as functional and cosmetic considerations are concerned. These include Maintaining the ability to retain oral competence to avoid drooling, Maintaining the functions of speech and swallowing by recreating the orbicularis oris sphincter action, Avoidance of microstomia, which affects eating, cleaning of the mouth, and prosthetic replacement, Restoring the cosmetic appearance of the lips by reconstructing the vermillion, commissures, and contours of the lower face [6].

Exceptional oral function is provided by palmaris longus tendon which forms a suspension system that ensures lip support and prevents drooling. Patients obtain satisfactory articulation and deglutition as well as oral continence from reconstructive surgery. The tendon sling offers sustained vertical support for the lip height and projection of the neolip. The flap with tenon can repair near-complete or complete lower lip defect, usually with chin defects following removal of a tumour. Excellent Functional and Aesthetic results almost all case series describe adequate appearance, good oral continence, speech that can be understood, and normal oral intake [7].

In the study by Silberstein E et al., studied 80-100% defects of the lower lip that were reconstructed through tendinofasciocutaneous radial forearm flaps [8]. All the flaps survived successfully without any instances of drooling among the subjects; the subjects' speech and diet returned to normal. There was also not a single instance of microstomia found among the subjects. In the study by Atiyeh B et al., reiterated the fact that oral competence is still the main target for any lower-lip reconstruction procedure [9]. To further enhance the procedure, they used the palmaris longus tendon with its blood vessels as a dynamic sling, which was important in ensuring that oral incompetence and saliva leakage were avoided post-reconstruction. Current research really backs using radial forearm-palmaris longus flaps for fixing big issues with the lower lip and mouth corners. According to Evin N and Selimoglu M this technique leads to full recovery of tissue and good mouth function after rebuilding the whole lower lip [10].

Even though it has been shown that a composite radial forearm free flap with palmaris longus tendon can be used for extensive lower-lip defects, there are many innovations of the current case study. Firstly, the defect occurred due to the presence of a WDSCC, which involved the lower-lip defect, the oral commissure, and the gingivobuccal sulcus, thus forming a complex three-dimensional defect that required the restoration of functionality of the oral sphincter and symmetry of the face. Such cases where the lower lip, the commissure, and the intraoral soft tissues were repaired using the described method are quite rare. Secondly, although the defect was extensive (>80% loss of the lower-lip tissue), good results were obtained. There was no difficulty of speaking or swallowing, an acceptable aesthetic appearance of the defect, and a mouth opening of 40 mm after six months postoperatively. Thirdly, this paper is indicative of the feasibility and reliability of microvascular reconstruction despite the presence of several comorbid conditions in the patient, such as hypertension

and previous stroke. Fourthly, the current case paper discusses the reconstruction following a carcinoma of the lower lip related to the habit of using smokeless tobacco. In this regard, this case paper makes another contribution to the contemporary literature, which is rather limited when addressing reconstruction of the lower lip squamous cell carcinoma linked to tobacco chewing. This particular case highlights the importance of using the composite radial forearm free flap with palmaris longus tendon for reconstructing the defect in one stage where not only external skin coverage, but also internal mucosal lining, commissural integrity, and oral competence are achieved.

CONCLUSION(S)

The composite radial forearm-palmaris longus free flap should be considered for large lower-lip defects involving the commissure when local flaps are likely to compromise mouth opening or oral competence. In this patient, the technique provided thin lining/cover, reliable vascularity and tendon-based suspension in a single stage. Final histopathology upgraded the disease to pT4aN0Mx because of 15 mm DOI and skin involvement, emphasising the value of complete pathologic staging. The case also highlights the need for perioperative planning in patients with undernutrition, hypertension and previous cerebrovascular disease. At six months, oral competence, mouth opening, aesthetics and disease control were satisfactory. Long-term surveillance, tobacco cessation, nutritional rehabilitation and oncology follow-up remain essential.

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