BULLETIN OF STOMATOLOGY AND MAXILLOFACIAL SURGERY
Volume 21, Issue 12

DOI:10.58240/1829006X-2025.21.12-449

REVIEW ARTICLE

RECONSTRUCTION OF ORAL CAVITY DEFECTS AFTER MALIGNANCY RESECTION: A NARRATIVE REVIEW

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Received: 02.12.2025; **Accepted:** 25.12. 2025; **Published:** 30.12.2025

Abstract

Malignancies of the oral cavity represent a significant global health burden, with squamous cell carcinoma accounting for the majority of cases. Surgical resection remains the cornerstone of curative treatment; however, removal of malignant lesions often results in complex defects involving bone, soft tissue, mucosa, muscle, and neurovascular structures. These defects can profoundly affect speech, swallowing, mastication, aesthetics, and quality of life. Consequently, reconstruction of oral cavity defects following oncologic resection is a critical component of comprehensive head and neck cancer management.

This review provides a detailed overview of oral cavity anatomy relevant to reconstructive surgery, classification of post-resection defects, and current reconstructive techniques ranging from primary closure and local flaps to regional and microvascular free tissue transfer. Emphasis is placed on flap selection based on defect size, location, and functional requirements. Outcomes related to flap survival, functional rehabilitation, aesthetic restoration, and complication rates are discussed. Advances in microvascular surgery have significantly expanded reconstructive options, enabling restoration of complex composite defects with improved functional outcomes. However, reconstruction must be individualized, considering patient comorbidities, tumor stage, adjuvant therapy requirements, and institutional expertise. Multidisciplinary collaboration between oncologic surgeons, reconstructive surgeons, speech therapists, and rehabilitation specialists is essential to optimize outcomes.

Understanding the anatomical foundations, surgical options, and outcome measures is vital for achieving optimal reconstruction following oral cancer resection. This review synthesizes current evidence to guide reconstructive decision-making and highlights future directions in oral cavity reconstruction.

Keywords: Oral cavity cancer; Reconstruction; Free flaps; Head and neck surgery; Oral anatomy; Oncologic reconstruction; Functional outcomes

1.INTRODUCTION

Cancers of the oral cavity constitute a significant subset of head and neck malignancies worldwide[1]. Squamous cell carcinoma remains the predominant histological subtype and frequently necessitates wide local excision to achieve clear oncologic margins. Advanced lesions often require composite resections involving mucosa, muscle, bone, and adjacent soft tissues. Although surgical extirpation is essential for disease control, it commonly produces substantial functional and aesthetic deficits.

Resection of structures such as the tongue, floor of mouth, buccal mucosa, palate, and mandible can severely impair articulation, bolus formation and propulsion, mastication, airway protection, and facial

symmetry. These deficits profoundly affect nutrition, communication, and psychosocial well-being. Accordingly, reconstruction represents a fundamental component of oncologic management rather than a purely cosmetic adjunct[2].

Historically, reconstruction relied on primary closure and regional pedicled flaps, which were suitable for limited defects but inadequate for complex composite resections. The advent of microvascular free tissue transfer transformed reconstructive practice by enabling simultaneous restoration of soft tissue and osseous components with superior functional outcomes and acceptable morbidity[3,4,5].

2. Anatomical and Functional Considerations

The oral tongue plays a pivotal role in articulation and swallowing. Postoperative functional recovery is closely associated with preserved tongue mobility and reconstructed volume [6]. Pliable, thin tissue is required to facilitate dynamic movement following subtotal or total glossectomy.

The floor of mouth contains critical neurovascular structures, including the lingual nerve and submandibular duct. Reconstruction must maintain tongue mobility and prevent tethering or contracture. Similarly, palatal and buccal mucosal defects demand careful lining restoration to preserve resonance and mastication.

Segmental mandibulectomy presents additional reconstructive challenges. Disruption of mandibular continuity compromises occlusion, mastication, speech intelligibility, and lower facial contour. The classification system proposed by Brown et al.[7] provides a structured framework for reconstructive planning based on defect location and extent. Structural restoration is essential for long-term functional and dental rehabilitation.

3. Evolution of Reconstructive Techniques

Small mucosal defects may be addressed with primary closure or split-thickness skin grafting; however, scar contracture and limited functional restoration restrict their use to early-stage lesions [8].

The pectoralis major myocutaneous flap represented a major advancement before the widespread adoption of microvascular techniques. Although reliable and technically less demanding, its bulk and donor-site morbidity may impair speech and swallowing outcomes. It remains valuable in salvage situations or when free tissue transfer is contraindicated [9].

4. Microvascular Free Tissue Transfer

Microvascular reconstruction is currently regarded as the gold standard for large or composite oral cavity defects. Contemporary high-volume series report flap survival rates exceeding 90–95% [7,10]. These techniques allow precise restoration of both lining and structural components.

The radial forearm free flap, first described for intraoral reconstruction by Soutar et al.[11], remains a workhorse flap due to its thin, pliable characteristics that facilitate articulation and swallowing. Functional assessments demonstrate superior outcomes compared with regional flaps [4].

The anterolateral thigh (ALT) flap offers versatility and variable soft tissue bulk. Wei et al. reported excellent reliability in a landmark series of 672 cases[12]. It is particularly suited for larger defects requiring substantial tissue replacement.

Mandibular reconstruction was revolutionized by Hidalgo's description of the fibula osteocutaneous flap[13]. This technique provides adequate bone stock, allows osseointegrated implant placement, and restores mandibular continuity with favorable aesthetic and functional outcomes[9,14].

5. Functional Outcomes and Quality of Life

Restoration of intelligible speech and safe swallowing remains the primary determinant of reconstructive success. Microvascular free flaps demonstrate superior functional outcomes compared with regional techniques[15].

Health-related quality-of-life (HRQoL) studies highlight the substantial psychosocial burden of oral cancer. Rogers et al. demonstrated strong associations between functional impairment and diminished quality-of-life scores[16].

Long-term follow-up confirms sustained benefits of microvascular reconstruction [17].

Importantly, free flap reconstruction does not compromise oncologic safety. Patel et al. showed that microvascular reconstruction may facilitate more aggressive tumor resection without adversely affecting survival[18].

6. Complications and Risk Factors

Despite high success rates, complications including flap failure, fistula formation, infection, and donor-site morbidity remain clinically significant. Smoking, prior radiotherapy, and systemic comorbidities have been identified as predictors of adverse outcomes[15].

Liao et al. further emphasized advanced tumor stage and vascular compromise as risk factors for flap failure[10]. Careful patient selection and meticulous technique are therefore critical.

7. Multidisciplinary Rehabilitation

Reconstruction extends beyond surgical repair. Early involvement of speech and swallowing therapists, dietitians, and psychosocial support teams significantly enhances recovery. Shaw et al. demonstrated that effective mandibular reconstruction and rehabilitation strongly influence long-term quality of life[19]. A coordinated multidisciplinary approach is essential to optimize outcomes.

8. Future Directions

Technological advances including virtual surgical planning, computer-assisted design, and three-dimensional modeling are improving reconstructive precision. These digital workflows enhance accuracy, reduce operative time, and improve aesthetic symmetry. Emerging regenerative strategies and tissue engineering approaches may further refine reconstruction in the future [7].

CONCLUSION

Reconstruction of oral cavity defects following malignancy resection is a complex yet indispensable component of comprehensive oncologic care. Current evidence strongly supports microvascular free tissue transfer as the preferred modality for large and composite defects. Individualized planning, guided by defect classification and patient-specific factors, combined with multidisciplinary rehabilitation, remains central to optimizing long-term functional and quality-of-life outcomes.

DECLARATIONS

Conflict of Interest

The authors declare no conflict of interest.

Funding

No external funding was received for this study.

Ethical Approval

Not applicable (Narrative review).

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