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From Resection To Reconstruction: Understanding Tongue Cancer – A Review

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Abstract:
In India, tongue cancer constitutes 30% of oral malignancies, with rising incidence among younger populations. Surgical resection remains the cornerstone of treatment, necessitating functional reconstruction to restore speech, swallowing, and airway protection. This review aims to review surgical resection options for tongue OSCC, and compare reconstructive options accordingly with an emphasis on the functional outcomes and technical considerations.

Key Word: *Glossectomy; Tongue Cancer; Reconstruction; Flaps*

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I. Introduction

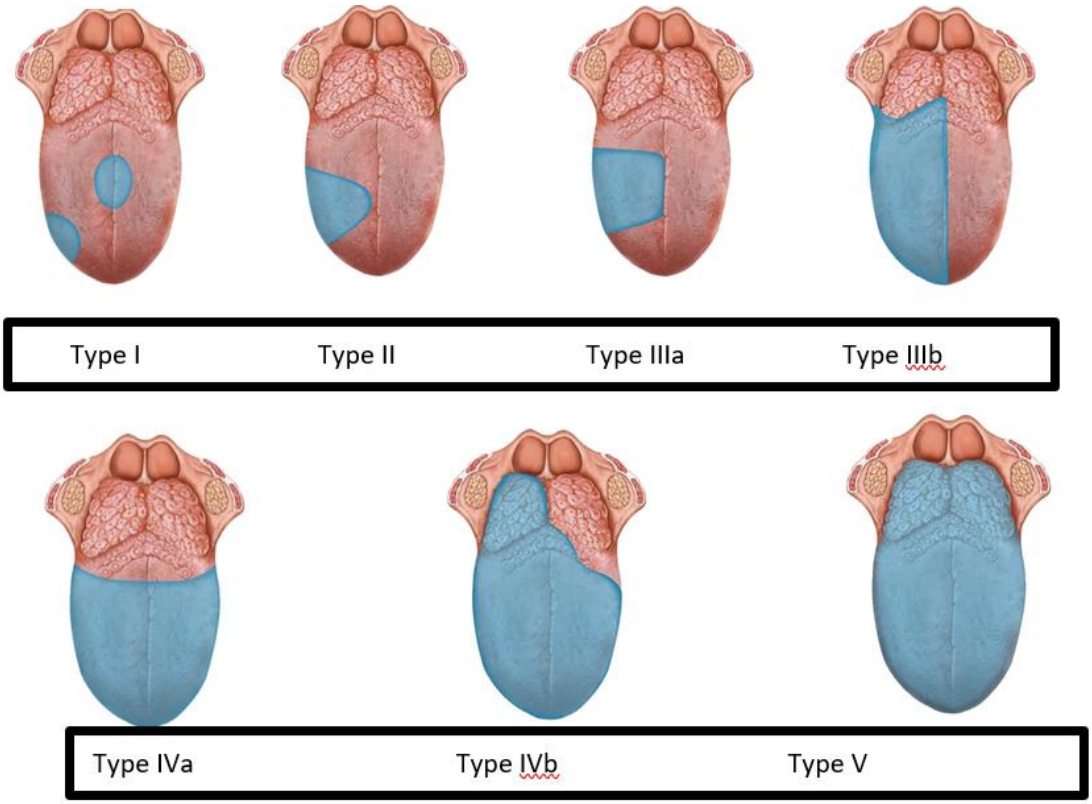
Oral squamous cell carcinoma (OSCC) is the sixth most common malignancy globally and constitutes nearly one-third of all the head and neck cancers[1]. The tongue, owing to its rich vascular and lymphatic supply, is one of the most frequent subsites affected by OSCC[2]. In India, OSCC represents 30–40% of all cancers of the oral cavity, with tongue cancer accounting for nearly 16–30% of oral malignancies[3]. The age-adjusted incidence rate (AAR) of tongue cancer in India is approximately 5–6 per 100,000 population annually, with rising incidence among younger age groups, particularly linked to tobacco and betel nut chewing[4–6].

The primary treatment for tongue SCC is surgical excision, often supplemented by neck dissection and adjuvant therapy when indicated[7]. The surgical objective is achieving oncologically safe margins while preserving or reconstructing tongue form and function to maintain speech, swallowing, and airway protection[8].

II. Surgical Resection Options [9,10]

Surgical approaches are determined by tumor size, location, and infiltration depth. Historically accepted surgical terms include:

- **Type I Glossectomy (Mucosectomy):** The mucosa and submucosa are included. Ideal for Precancerous, superficial suspicious lesions, limited to the epithelium.
- **Type II Glossectomy (Partial Glossectomy):** It includes the lesion and adjacent normal mucosa, submucosa, and the intrinsic muscles. Ideal for lesions infiltrating submucosa and superficially into intrinsic muscles, but not extrinsic muscles, or infiltration less than 10 mm deep.
- **Type III Glossectomy (IIIa – Hemiglossectomy):** It includes the mucosa, submucosa, and intrinsic and extrinsic muscles ipsilateral to the lesion. Ideal for lesions infiltrating the intrinsic and minimally extrinsic muscles or infiltration greater than 10 mm but confined within the ipsilateral tongue.
- **Type III Glossectomy (IIIb – Compartmental Hemiglossectomy):** It includes the mucosa, submucosa, intrinsic and extrinsic muscles ipsilateral to the lesion along with genioglossus, hyoglossus and styloglossus muscles, and the inferior portion of the palatoglossus muscle. Medially, the midline raphe is included in the resection.
- **Type IV Glossectomy (IVa – Subtotal Glossectomy):** Anterior subtotal glossectomy with preservation of both sides of the base of the tongue.
- **Type IV Glossectomy (IVb – Near Total Glossectomy):** Type IVa glossectomy with extension to the ipsilateral base of the tongue.
- **Type V Glossectomy (Total Glossectomy):** The specimen includes all of the mobile tongue and the base of the tongue transected at the level of the vallecula.



III. Reconstruction Strategies

Reconstruction following glossectomy aims to restore:
1. Adequate bulk for bolus propulsion and articulation.
2. Mobility for effective speech and swallowing.
3. Airway protection and aspiration prevention.

Common reconstructive approaches include[12–15]:
- **Primary closure** – Suitable for small, superficial defects (<20–30% of tongue volume).
- **Secondary intention healing (raw surface left open)** – Preferred for small resections when mucosal approximation is not feasible, yielding surprisingly good functional outcomes.
- **Local flaps –** Examples include buccinator myomucosal flaps , submental flaps or facial artery myomucosal flaps, appropriate for small-to-moderate defects .
- **Regional flaps** – Pedicled options such as the pectoralis major myocutaneous flap for larger or composite defects.
- **Free flaps** – Microvascular free tissue transfer (e.g., radial forearm free flap [RFFF], anterolateral thigh [ALT]) for large or complex three-dimensional defects .

IV. Evidence-Based Comparison Of Reconstruction Options

Defect / Reconstruction Compared	Summary of Findings (Speech & Swallowing)	Authors (Year)
Small defects (<20–30%) Primary closure / Secondary intention vs Free flap	Non-flap approaches (primary closure or secondary healing) had superior speech intelligibility and faster swallowing recovery; free flaps bulkier and reduced articulation when defect <30%.	Lam & Samman (2013)[12]; Cortina et al. (2023)[2]
Small-to-moderate defects (≤40–50%) Primary closure vs Secondary intention vs Flap	Secondary intention showed best speech intelligibility (83% at 6 months), primary closure best swallowing (83%), flaps performed worst in both.	Indian cohort (2022)[13]
Primary closure vs Free flap after hemiglossectomy	Primary closure yielded better speech articulation while free flaps improved bolus volume and ingestion rate due to increased bulk.	Su et al. (2002)[20]
Submental artery island flap vs RFFF (moderate defects)	Comparable swallowing function; submental flap allowed earlier oral feeding, shorter hospital stay, and lower cost compared to RFFF.	Paydarfar et al. (2011)[21]
Pedicled (PMMC/Submental) vs Free	Functional outcomes similar in speech/swallow; free	Silva Filho et al. (2023)[22]

flaps overall	flaps superior for swallowing in large defects >70 cm²; pedicled flaps associated with shorter operative time and lower cost.	
Moderate defects (T2–T3) Local/Regional flaps vs Free flaps (RFFF/ALT)	Free flaps superior in long-term swallowing and speech; local flaps caused tethering and reduced mobility.	Systematic review (2025)[14]
Subtotal–Total glossectomy RFFF vs ALT flaps	RFFF favored early speech (thin pliable tissue), ALT better for swallowing (bulk, less donor-site morbidity). Long-term outcomes similar.	de Vicente et al. (2008)[11]
Near-total/total glossectomy: PMMC vs RFFF vs ALT	RFFF had better speech intelligibility, ALT had acceptable swallowing and lower morbidity, while PMMC inferior in both functional and survival outcomes.	Prospective cohort (2022)[23]
Meta-analysis: Free vs Locoregional flaps	Free flaps achieved higher long-term swallowing success (~77%), better QoL, and lower recurrence; locoregional flaps had faster recovery but higher donor morbidity.	Habal et al. (2025)[24]

SURGICAL PRO TIPS

1. **Do not rotate the tongue tip during closure** – Rotation disrupts normal orientation, impairs articulation (especially tip-driven consonants), and hinders adaptation to prosthetics[16].

2. **Resect intrinsic muscles aggressively for deep margins** – SCC often infiltrates intrinsic muscle fibers deeper than mucosal spread; aggressive intrinsic muscle excision improves oncologic safety (*author's experience*).

3. **Overestimate flap bulk by 10–15%** – Compensates for expected postoperative atrophy, preserving long-term tongue volume[17].

4. **Quilting sutures** – Use quilting sutures in the deep muscle layer after resection as it helps in obliterating dead space between intrinsic muscles and flap / remaining native tissue , prevents hematoma / seroma formation , enhances revascularization , might act as ligatures for open vessel endings thus preventing post-op bleeding (*author's experience*).

5. **Temporary tongue-tip anchoring** – Suturing tongue tip to alveolus temporarily can reduce early postoperative airway obstruction risk[18].

V. Conclusion

Tongue reconstruction following oncologic resection demands individualized planning based on defect size, depth, and patient needs. Evidence supports primary closure or secondary intention for small defects and free flap reconstruction for larger, functionally significant resections. Functional outcomes correlate with preserved mobility and adequate bulk. Technical considerations, including tongue tip orientation and intrinsic muscle margin clearance, further optimize the results.

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