

Secondary Onlay Free Flap Reconstruction of Glossectomy Defects following Initial Successful Flap Restoration

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Abstract

Patients who undergo tongue reconstruction over time may develop gradual worsening of dysarthria and dysphagia secondary to flap atrophy. At our institution, these patients undergo a secondary flap onlay procedure for augmentation of the neotongue. We review a total of 11 patients with total glossectomy defect who underwent secondary tongue augmentation with secondary onlay free flap consisting of radial forearm free flap (n = 6) and rectus free flap (n = 5). There was improvement in swallowing in 7 of 11 patients. Five (45.4%) patients achieved gastric tube independence. Seven (63.6%) patients achieved a varying degree of oral intake. All patients achieved tracheostomy independence. Dysarthria was improved in all patients. There were no flap failures. Therefore, a secondary onlay flap technique is feasible and may improve dysphagia and dysarthria to achieve gastric tube and tracheostomy independence in total glossectomy patients with delayed tongue atrophy.

Keywords

total glossectomy, tongue cancer, tongue defect, oral cavity defect, oral cavity reconstruction, tongue reconstruction, dysphagia, double free flap, laryngeal preservation, oral function

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Patients who undergo tongue reconstruction show improved speech and swallow function with larger volumes of the neotongue.¹ Initial flap reconstruction may atrophy over time due to loss of muscle bulk from loss of neural supply, radiation-induced fibrosis, or generalized treatment-induced weight loss.² At our institution, we have approached this problem by providing volume to atrophic neotongue with a secondary augmentation using soft-tissue free flaps in an onlay fashion. We review our favorable results with this technique.

Patients and Methods

We performed a retrospective chart review of all patients who underwent total glossectomy with flap reconstruction with secondary flap augmentation between December 1997 and July 2012. Surgical indications were patients with dysphagia attributed to an inadequate oral phase of swallowing and dysarthria attributed to a significant decrease in neotongue tissue volume. Institutional Review Board (IRB) approval was obtained from the John Peter Smith IRB for the project.

Secondary onlay flap technique is performed by making a sagittally-oriented incision through the previously reconstructed neotongue, splitting the neotongue into 2 halves. The incision is carried to a depth of approximately 1 to 1.5 cm to accommodate the secondary onlay flap. Three-dimensional size and shape of the secondary onlay flap are determined. The potential donor sites are then examined to match the tissue bulk needed. If either radial forearm free flap (RFFF) or rectus abdominus muscle (VRAM) flaps are selected, recipient vessels are identified in the neck prior to flap harvest. Flap inset is performed prior to vessel anastomosis. All patients receive tracheostomy at the time of the surgery.

Results

A total of 11 patients underwent total glossectomy and primary flap reconstruction with subsequent onlay free flap technique between 1997 and 2012. Patient age ranged from 46 to 79 years, with a mean age of 68.9 years. All patients had initial advanced T stage tongue cancers (T3 or T4A). Diagnosis at the time of glossectomy was squamous cell carcinoma in 10 patients and mucoepidermoid carcinoma in

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1 patient. Initial reconstruction was performed with VRAM ($n = 4$), pedicled pectoralis major muscle flap ($n = 4$), and RFFF ($n = 3$). No patients showed evidence of recurrent disease at the time of the secondary onlay flap augmentation procedure. The secondary onlay flap augmentation was performed with RFFF ($n = 6$) and VRAM ($n = 5$). The mean follow-up was 4.1 years. The average time elapsed between primary flap reconstruction and secondary augmentation was 2.1 years. There were no flap failures.

Prior to augmentation, 5 of 11 patients (45.4%) were tracheostomy dependent secondary to aspiration risk. Following the secondary onlay augmentation, patients underwent modified barium swallow evaluation, and all patients were tracheostomy dependent.

Prior to augmentation, all 11 patients were gastric tube (GT) dependent and unable to tolerate any form of oral intake. After secondary onlay augmentation, 5 of 11 patients (45%) were able to achieve complete GT independence and subsequent removal.

With regard to speech therapy, all patients were referred for speech therapy postoperatively. Patients subjectively noted improvement significantly in speech understandability after augmentation procedures (see **Figures 1** and **2**).

Discussion

The importance of re-creating tongue bulk cannot be underestimated in reconstruction of total glossectomy defects. Patients who undergo reconstruction with larger-volume flaps show improvement in swallowing and speech outcomes. In addition, patients who undergo radiation with low body mass index or who undergo postoperative weight loss seem to do poorly in similar outcome measures.¹⁻⁴ These data lend support to the importance of maintaining adequate tongue tissue bulk. It is clear that over time, atrophy occurs, either as a result of scarring, muscle atrophy, or radiation-induced fibrosis. This atrophy has functional consequences of gradually decreased swallow function and speech

intelligibility over time. As such, patients with initial total or subtotal glossectomy defect reconstruction may do well for some time but may develop delayed-onset dysarthria and dysphagia.

Treatment methods such as maxillary, mandibular, or tongue prostheses have been used with some success.⁵ Fat injections into the neotongue have also been performed. Unfortunately, patients may not always be compliant with using prostheses, and injected fat may resorb over time. Our approach of placing a second onlay free flap circumvents these problems.

In total glossectomy patients with laryngeal preservation, reported rates of GT dependency range from 14% to 70%.³ Our surgical outcomes reveal notable improvement in dysphagia and dysarthria in most of our patients. Five of 11 (45.4%) patients were GT dependent preoperatively but were able to achieve complete GT independence without aspiration after surgery. An additional 2 patients were able to achieve occasional oral intake, although they were still GT dependent. Speech quality also improved in all 11 patients. Correspondingly, tracheostomy dependency was decreased after secondary onlay flap. All patients achieved successful decannulation status. This includes 5 patients previously unable to tolerate decannulation prior to the onlay procedure.

Conclusion

Augmentation with secondary onlay flap is a feasible way to restore tongue tissue bulk and improve dysphagia and dysphonia secondary to tongue atrophy. A notable number of patients achieved tracheostomy and GT independence and were able to tolerate oral intake. In properly selected patients and in institutions with extensive experience in free flap reconstruction, secondary onlay flap is a safe treatment option that can provide notable improvement in quality of life for total glossectomy patients who develop tongue volume loss after initial reconstruction.



Figure 1. Patient underwent total glossectomy with rectus abdominus muscle (VRAM) reconstruction with postoperative chemotherapy and radiotherapy. Onlay procedure with second VRAM flap with good improvement in neotongue volume.



Figure 2. Patient underwent previous subtotal glossectomy 9 years prior with rectus abdominus muscle reconstruction and postoperative radiotherapy. Patient underwent subsequent radial forearm free flap onlay with improvement in neotongue volume.

Author Contributions

Jordan Rihani, manuscript preparation; **Thomas Lee**, data acquisition and manuscript review; **Yadranko Ducic**, manuscript concept, design, review.

Disclosures

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