

# Functional Assessment: Speech and Swallowing Outcomes after Free Radial Forearm Reconstruction for Hemiglossectomy Defects

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## ABSTRACT

**Background:** To evaluate the speech and swallowing outcomes after free radial forearm reconstruction for hemiglossectomy defects.

**Patients and Methods:** The clinicopathologic data of 10 tongue carcinoma cases hospitalized from November 2015 to December 2018 in American International Institute of Medical Sciences, Udaipur (Raj.). There were 7 male patients and 3 female patients with age ranging from 40-65 years old. These patients underwent simultaneous hemiglossectomy and intraoral defects reconstruction with Forearm Radial Free flap. Mandible was not resected in any of the patients. All subjects were evaluated 3 months postoperatively.

**Results:** There was vascular crisis in 1 case, and secondary treatment was taken to rescue the flap. The donor sites were closed with grafted skin. In 3 cases, a partial grafted skin loss was observed and the donor sites healed after a long time under local wound care. 2 cases suffered from numbness in fingers to some degree.

**Conclusion:** When compared with primary closure of the post-excisional defect of the tongue, it is better to reconstruct the

defect with free radial forearm flap. The overall satisfaction of the patients in regards to function and cosmesis in tongue reconstruction was high when using free tissue transfer in the form of free radial forearm flap following wide local oncosurgical resection.

**Keywords:** Free Radial Forearm Flap, Hemiglossectomy, Reconstruction.

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## INTRODUCTION

Squamous cell carcinoma of tongue is a highly malignant condition and results in significant mortality and morbidity. However, early detection and treatment results in better outcome and prolongs survival. Tongue cancer is the most common intraoral malignancy. Most of them occur in the anterior two-thirds of the lateral border, followed by the base of the tongue and the tip of tongue. In most of these cases, hemiglossectomy and immediate surgical reconstruction of tongue defects are performed.<sup>1</sup> The morbidity following extensive resection of tongue results in severe speech and swallowing disturbances and life threatening aspiration that needs reconstruction. While carrying out the repair and reconstruction, it is necessary to rebuild the function and appearance of the tongue. It is also important to reduce the damage of the donor site in terms of both function and appearance.<sup>2,3</sup> Treatment includes radiation therapy or combined surgery and radiotherapy depending on the size of the tumor, the extent of tumor infiltration, and the surgeon's

preference.<sup>4-6</sup> It is the soft-tissue reconstruction of the oral cavity, and in particular the tongue, that is the most critical factor in achieving a successfully functional result. The tongue uniquely serves a multitude of varied functions, including articulation, mastication, deglutition, and taste. A number of recent studies have attempted to define a battery of functional tests to assess the rehabilitative outcome following surgery in the oral cancer patient.<sup>7,8</sup> After reconstructive surgery, the tongue should be evaluated as a single organ even though it serves different functions, and may have been reconstructed by different methods leaving surgical defects of different sizes. Although the mobile tongue and tongue base serve different purposes in speech and deglutition, they coordinate with each other, especially after surgery, and so should be evaluated together.

This study evaluated the speech and swallowing function outcomes in 10 patients with carcinoma of the tongue who underwent 25 to 100% full-thickness resection.

## PATIENTS AND METHODS

The study included 10 patients with tongue carcinoma (T2-T3) in the anterior two-third of the lateral tongue treated from November 2015 to December 2018 in American International Institute of Medical Sciences, Udaipur (Raj.).

There were 7 male patients and 3 female patients with age ranging from 40-65 years old. These patients underwent simultaneous hemiglossectomy and intraoral defects reconstruction with Forearm Radial Free flap. Mandible was not resected in any of the patients. All subjects were evaluated 3 months postoperatively. The vascular crisis, the speech, the swallowing function, and the donor site morbidity were evaluated. All patients gave their written informed consent.

**Surgical technique-** To harvest the FRF flap, firstly the dissection proceeded deep the antebrachial fascia, elevating the fascia with the flap. The distal end of radial artery and venae comitans were ligated and divided. Then, the flap could be raised from the distal aspect. As the dissection proceeded proximally, the pedicle traveled under the brachioradialis tendon and muscle. Care was taken to avoid injuring a dorsal branch of the radial nerve injury. The cephalic vein was taken with the flap. Finally, the defect left by the flap was repaired with grafted skin. Flap was anastomosed with neck vessels.

### Functional Evaluation

1. To evaluate swallowing function, the patient was made to sit erect and was given 100 ml of mineral water at room temperature (25 degrees Celsius) to drink as fast as possible. We calculated the number of times the patient swallowed, and the total time taken to drink the water. Thus the volume of each bolus, duration of deglutition per bolus, and the volume swallowed/second was calculated.

2. To evaluate speech, the patient's voices were recorded in the silent place and they were asked to sit erect with the microphone positioned 5cm from the mouth of each patient. Then, the recorded material was presented to speech therapist and was accessed.

## RESULTS

Ten patients with tongue carcinoma underwent simultaneous reconstruction after hemiglossectomy. All the patients underwent hemiglossectomy reconstruction with forearm radial free flap. There was vascular crisis in 1 case, and secondary treatment was taken to rescue the flap. The donor sites were closed with grafted skin. In 3 cases, a partial grafted skin loss was observed and the donor sites healed after a long time under local wound care. 2 cases suffered from numbness in fingers to some degree. Finally it was seen that forearm radial free flap reconstruction in partial glossectomy of anterior two-third tongue proves to have a better functional assessment including speech and swallowing when compared to primary closure.

## DISCUSSION

Squamous cell carcinoma of tongue typically affects men in sixth to eighth decades having a strong association with alcohol and tobacco abuse over years. Less than 4% of these lesions have been reported in patients younger than 40 years. Retrospective analysis suggested that the disease runs a more aggressive course in under 40 age group. Metastatic spread of SCC of the

tongue is facilitated by its rich lymphatic network and tends to increase with the size of the primary tumour.<sup>9</sup> Approximately, 50% of tongue cancers present with neck node involvement. In order to achieve a good therapeutic control of the disease, a wide local excision and neck dissection are to be done as a primary procedure. This oncosurgical resection results in a large three dimensional defect of the tongue and floor of the oral cavity that impairs speech, swallowing and imposes risk of aspiration. It is therefore prudent to reconstruct the defect with a well vascularised tissue for a good functional substitution.

The free radial forearm flap is a workhorse flap in tongue reconstruction. Its lack of extra bulk, long vascular pedicle, good calibre of the vessels, pliability and minimal donor site morbidity are among its main advantages; the flap harvest is relatively easy and good calibre of the vessels is suitable for anastomosis with a high success rate. The free radial forearm flap, therefore, offers the best choice for reconstruction of tongue following oncosurgical resection.

In our study, vascular crisis occurred in one patient postoperatively and the flap underwent complete necrosis on postoperative day 5; postoperative hematoma was found in one patient within first 24 hours of reconstruction; we immediately went for re-exploration, removed the blood clots and checked for anastomotic leakage or any active source of bleeding; but couldn't detect any fresh bleeding point and the flap survived. Thus, our flap survival rate was approximately 90%. Song et al.<sup>10</sup> reported a flap survival rate greater than 90%; Kruse et al.<sup>11</sup> reported that the success rate of free radial forearm flap was more than 95%; Shibahara et al.<sup>12</sup> reported a total success rate of 100%. It emphasizes the reliability of free radial forearm flap for reconstruction of head and neck defect. Free radial forearm flap, also known as 'Chinese' flap, is a versatile fasciocutaneous flap was first described by Yang and colleagues in 1981, who used it to treat postburn neck contracture.<sup>13</sup> Soutar proposed the use of free radial forearm flap for reconstruction of oral cavity in 1983 and thereafter the flap became the most utilized technique for intraoral reconstruction.<sup>14</sup> Cheng first used this flap for tongue reconstruction.<sup>15</sup>

Many surgeons compared the postoperative swallowing functions of patients who underwent reconstruction of tongue with free radial forearm flap with patients who underwent primary closure of post excisional defect and concluded that the flap added bulk, thus improved pharyngeal clearance and deglutition. Patients with primary closure were unable to lift the tongue tip, had poor tongue to palate contact during initiation of swallowing and premature spilling of bolus into the pharynx. Some surgeons retrospectively compared the postoperative speech and swallowing in patients who underwent hemiglossectomy for carcinoma of anterior tongue. Immediate reconstruction was done with free radial forearm flap in 50% patients and other 50% were reconstructed with free anterolateral thigh flap. The functional outcome with both flaps were adequate and the two groups did not differ significantly for either speech or swallowing.

In this study, we used free radial forearm flap in a series of 10 patients with squamous cell carcinoma of tongue following oncosurgical resection with satisfactory aesthetic and functional outcome with regards to speech and swallowing with minimal donor site morbidity.(Fig 1-6)



Fig 1: Hemiglossectomy



Fig 2: Harvested left forearm radial free flap



Fig 3: Forearm Radial free flap



Fig 4: Anastomosed FRF with neck vessels



Fig 5: Postoperative third day



Fig 6: Postoperative 3 months follow up

## CONCLUSION

Although microvascular reconstruction is a lengthy procedure and requires utmost surgical skill and expertise, the post-excisional morbidity is reduced to a great extent while maintaining the function of the important organ like tongue. When compared with primary closure of the post-excisional defect of the tongue, it is better to reconstruct the defect with free radial forearm flap. The overall satisfaction of the patients in regards to function and cosmesis in tongue reconstruction was high when using free tissue transfer in the form of free radial forearm flap following wide local oncosurgical resection.

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