

Versatility of Forehead Flap in Maxillofacial/Nasal and Intraoral Defects: A Retrospective Analysis

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Abstract

Introduction: Difficulties to find the ideal donor site with perfect matching tissues have always made the reconstruction of facial complex defect a tough problem for surgeons. The main aim of reconstruction is to restore facial contour (esthetics) and function (mastication, deglutition, and speech).

Aim: The aim of the study was to analyze the versatility of forehead flap in maxillofacial/nasal and intraoral defects.

Materials and Methods: This retrospective study was conducted to analyze the versatility of forehead flap in maxillofacial/nasal and intraoral defects. A total of 25 consecutive patients, of either sex, who required soft tissue reconstruction of the maxillofacial region, including oral cavity and nasal defects due to tumor ablative surgery. Follow-up was done for up to 4 months – 1 year and on every follow-up visit, patients were questioned about the degree of satisfaction, with mouth opening, swallowing, and donor site esthetics. Cosmetic deformity judged subjectively.

Results: Of 25 patients, 17 patients were males, 12 patients were above 60 years. Maximum number of site of tumor involvement was noted in cheek 9 patients (36%) and in lower lip 5 patients (20%). About 44% patient had stage 2 tumors and 28% had stage 3 tumors. About 18 patient had adjuvant radiation, 1 patients had chemo RT, and 6 patients had no adjuvant treatment. About 16% of patients had a complication of altered forehead sensation.

Conclusion: Forehead flap is a reliable technique for the reconstruction of maxillofacial region defects. It is easy to rise and can provide coverage for wide defects as far as the para mandibular and submandibular regions. Moreover, it does not require patient repositioning.

Key words: Forehead flap, Orofacial, Reconstruction, Soft tissue defect

INTRODUCTION

Difficulties to find the ideal donor site with perfect matching tissues have always made the reconstruction of facial complex defect a tough problem for surgeons. The main aim of reconstruction is to restore facial contour (esthetics) and function (mastication, deglutition, and speech). Reconstruction of jaw and mouth defects represents a challenge to the surgeon.^[1-5] These options include healing

by secondary intention, primary closure, skin grafting, use of locoregional flaps (with or without tissue expansion), and free flap transfer. Recently, however, the reconstructive escalator or elevator approach has been advocated, because reconstruction should be individualized to each patient and not based on a rigid, stepwise approach.^[6]

The use of orofacial prostheses has also contributed significantly to the restoration of an acceptable functional and esthetic status for patients following soft tissue defects.^[7] Although each of these reconstructive options achieves different degrees of functional, esthetic, and psychological rehabilitation for patients, they have various advantages and disadvantages. The site, size, and shape of the defect and the medical history determine the choice of these flaps.

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When local flaps and grafts are inadequate, the forehead is a dependable option due to its reliability and anatomic likeness. The forehead flap is acknowledged as the best donor site for the nose and other facial part reconstruction due to its ideal color and texture. Reliability of success of this flap is a major advantage which comes from the adequate blood supply and local availability of feeder vessels, i.e., superficial temporal vessels and arcade formed from other vessels even though ligated and is a reason of its popularity.^[8]

However, free flaps are technique-sensitive, usually require good blood vessels at the recipient site, increase operation time, require extensive post-operative monitoring, and may be contraindicated in some patients with comorbid conditions.^[9,10] Locoregional flaps reduce vulnerability to infection and thrombosis, are easier to raise and transfer compared to free flaps, and can provide an excellent color match. The limited reach of locoregional flaps, difficulty in achieving three-dimensional reconstruction or coverage of extensive tissue defects, and the occasional need for a multistage procedure are some of their limitations.^[11]

Aim

The aim of the study was to analyze the versatility of forehead flap in maxillofacial/nasal and intraoral defects.

MATERIALS AND METHODS

This retrospective study was conducted to analyze the versatility of forehead flap in maxillofacial/nasal and intraoral defects under different study parameters such as age, sex, site, stages of tumor involvement, previous management, primary management, type of reconstruction,

and complications. Inclusion criteria include all the cases diagnosed with oral and nose malignancy and subjected to relevant investigations and underwent surgery were included in the adjuvant therapy was given based on final pathological report. Exclusion criteria include cases that had extensive nature of the disease and need neoadjuvant therapy or unresectable [Figures 1-3].

Information was sourced from the patient's case notes and operating theatre register. Information retrieved included age, gender, indication for surgical reconstruction, type of forehead flap, duration of hospital stays, and complications. All patients agree with this publication and use of photographs. Written informed consent obtained from all patients/parents/attendants, for inclusion in surgical procedure and use of the data for research purpose. Data recorded on a specialized pro forma. Medical records were reviewed retrospectively, including a clinical presentation at admission, laboratory values, performed pre-operative diagnostics, intraoperative findings, and histological results. All the patient's clinical, radiological, laboratory, and pathological findings were collected.

Preoperatively, the precise location of the superficial temporal artery was identified by palpation or with a pencil Doppler; to narrow the base of the flap precisely.



Figure 1: Flap for nasal defect



Figure 2: Flap for large upper lip defect



Figure 3: Flap for nasal defect

The flap elevated in a sub-facial plane just superficial to the periosteum of the frontal bone. The flap rotated over the lateral zygomatic arch onto the face. However, in some cases where needed when flap primarily designed for intraoral coverage, a tunnel between the donor site and the oral cavity created. Flap folded laterally and passed under the zygomatic arch, oral cavity entered through a tunnel made by a separate transverse cheek incision. After flap elevation for the face coverage, the flap was tailored to fit the defect and sutured the defect. The donor site was skin grafted. Postoperatively, the patient assessed for the vitality of flap within the first 12–24 h. The vitality and health are based on color, margin necrosis, and integrity of the flap which was confirmed superficial temporal artery pulse either manually or by Doppler. Flap sutures on the face were removed on the 6th post-operative day. Flap division, if necessary, was done after an average of 3 weeks. Follow-up was done for 4 months–12 months and on every follow-up visit, patients were questioned about

the degree of satisfaction with speech, swallowing, and esthetics and the results were statistically analyzed and discussed.

RESULTS

Of 25 patients based on age distribution, 2 patients were age <30 years, 4 patients between 31–40 years, 7 patients between 41 and 50 years, 5 patients between 51 and 60 years, and 7 patients above 60 years [Table 1].

Of 25 patients based on site of tumor involvement, 5 patients had a tumor in the lower lip, 1 patient in the anterior part of tongue, 2 patients in the lower alveolus, 2 patients in the upper alveolus, 1 patient in the floor of mouth, 9 patients in cheek, 3 patients in the upper lip, and 2 patients in nose [Table 2].

Of 25 patients, 17 patients were males and 8 patients were females [Table 3].

Of 25 patients based on the stage of tumor involvement, 3 patient had Stage I, 11 patients had Stage II, 7 patients had Stage III, and 4 patients had Stage IVa [Table 4].

Table 1: Cross-tabulation between the age distribution

Age group	No. of patients	Percentage
<30	2	8.0
31–40	4	16.0
41–50	7	28.0
51–60	5	20.0
>61	7	28.0

Table 2: Cross-tabulation between the site of tumor involvement

Site	No. of patients	Percentage
Cheek	9	36
Lower lip	5	20
Upper lip	3	12
Lower alveolus	2	8
Upper alveolus	2	8
Nose	2	8
Anterior part of tongue	1	4
Floor of mouth	1	4

Table 3: Cross-tabulation between sex distribution

Male	17
Female	8

Table 4: Cross-tabulation between stages of tumor involvement

Stage AJCC 2010	No. of patients	Percentage
I	3	12
II	11	44
III	7	28
IVa	4	16

Table 5: Cross-tabulation adjuvant therapy

Adjuvant therapy	No. of patients	Percentage
Radiation	18	72
Chemoradiation	1	4
No adjuvant	6	24

Table 6: Cross-tabulation between types of primary surgery

Types of primary surgery	No. of patients	Percentage
Wide local excision	19	76
Hemimandibulectomy	2	8
Partial maxillectomy/palate alveolar resection	2	8
Marginal mandibulectomy	1	4
Partial glossectomy	1	4

Table 7: Cross-tabulation between the distribution of complications

Complications	No. of patients	Percentage
Flap necrosis	2	8
Hemorrhage from superficial temporal artery	1	4
Cosmesis	2	8
Altered forehead sensation	4	16
Partial or total loss of split-thickness skin graft	2	8
Need for another flap	2	8
Marginal loss	1	4
Partial loss	1	4

Of 25 patients, 18 patient had adjuvant radiation, 1 patients had chemo RT, and 6 patients had no adjuvant treatment [Table 5].

Of 25 patients, 19 patients had wide excision, 2 patients had hemimandibulectomy, 2 patients had partial maxillectomy/palate alveolar resection, 1 patient had marginal mandibulectomy, and 1 patient had partial glossectomy [Table 6].

Of 25 patients, 2 patients had flap necrosis, 1 had a hemorrhage from the superficial temporal artery which was managed successfully with flap salvage, 2 had cosmesis, 4 had altered forehead sensation, 2 had a partial or total loss of split-thickness skin graft (SSG), 2 needed another flap, 1 had a marginal loss, and 1 had a partial loss [Table 7].

DISCUSSION

The significance of reconstruction of maxillofacial/nasal and intraoral defects cannot be overemphasized in view of its unique position in a person's life (for esthetic and function). Reconstruction of facial defects is a challenge, which needs prompt creativity and innovation and demands strict adherence to the basic principles of reconstructive surgery and tissue transfer. This study was carried out to see the viability of forehead flap after reconstruction of the maxillofacial/nasal region and intraoral defects and to restore the function and physical form as close to nature as possible.

As forehead flap is locoregional flap, of maxillofacial region and easily done in two stage surgery. While donor site defects are also acceptable after the skin grafting, this study determined the efficacy and efficiency of the forehead flap in maxillofacial/nasal and intraoral defects. Of these 25 patients flaps, only 15 patients showed flap related complications. Anyhow, the total loss of flap leading to alternate flap was in only 1 case (4%). The success rate of the flap was thus 96%. This shows a higher success rate of forehead flap in maxillofacial region reconstruction and is a highly reliable flap considering viability and donor match.

This research matches with the study of other researchers like Yan *et al.*^[12] on forehead flap, used for the reconstruction of basicranial and nasal facial defects after tumor dissection on 14 patients, there was partial necrosis only in 2 patients. The current study is near to this study, where partial necrosis was in 2 patients.

In the study of Cohen *et al.*,^[13] forehead flap was infected with abscess formation in the tunnel, used to transfer the forehead flap to the oral cavity for the closure of the

oral defect. He recommended a more direct route with a less dependent tunnel. In our study, we used tunneling in only 4 cases where needed. In the present study, we used forehead flap as lining purpose as well as the coverage of the solid structure like a bone graft or reconstruction plates for simultaneous reconstruction of mucosa and mandible. We experienced that the forehead flap has excellent adaptability to the transplanted bed, along with near-normal facial contour and tongue movements were not restricted.

Similarly, in the study of Millard,^[14] he used forehead flap for immediate coverage of an iliac bone graft for simultaneous reconstruction of mucosa and mandible following radical excision of jaw malignancy. In his study, he found excellent results and the tongue movements were not restricted and facial mandibular contour was maintained in the patient who had immediate forehead procedure. Later, a successful functioning denture was fabricated for this patient.

The biggest drawback of the forehead flap is the prominent residual forehead donor site scar due to full-thickness skin graft. Although this is the universal rule of surgery that first, we have to preserve the function, then we must consider the element of cosmetics. Due to its exceptional reliability, versatility, relative technical simplicity, and usefulness of the flap in the maxillofacial area have preserved its role when other options failed. However, the difficult reality is that many head and neck patients fall into the lower end of socioeconomic spectrum and are uninsured so cannot afford the expenses of free tissue transfer, technically it is not feasible for every patient because of lack of resources, as well as cancer patients are usually from older age group, and are not very much concerned about their esthetics. That's why this flap is still very much popular and the donor site defect can easily be camouflaged in the females by an appropriate hairstyle. In the present study, donor site closure has been done with both SSG and, in some cases, by a full-thickness skin graft. For prevention of hyperpigmentation, sunblocks have been prescribed to avoid excessive sun exposure at least for the first 4–6 months after reconstructive surgery.

CONCLUSION

Reconstruction with forehead flap in maxillofacial/nasal region and intraoral defects provides natural building material precisely fitted to reconstruct maxillofacial defects to a condition as near to normal as possible. Forehead flap is a reliable technique for reconstruction of maxillofacial region defects. It is easy to rise and can provide coverage

for wide defects as far as the para mandibular and submandibular regions. Moreover, it does not require patient repositioning. Furthermore, it is a very reliable flap with lower complications and higher patient acceptability and also technically simpler to perform.

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