

Forehead Flaps in Craniofacial Reconstruction: A Case Series

Authors and Affiliation:

Bhuvana Lakshmi S., R. Manoharan, S. Prakash

Department of Plastic and Reconstructive Surgery, Thanjavur Medical College and Hospital,
Thanjavur, Tamil Nadu, India

Address for Correspondence:

Dr Bhuvana Lakshmi S. MBBS, MS, (MCh)

Department of Plastic and Reconstructive Surgery

4th floor, PMSSY Block

Thanjavur Medical College and Hospital

Thanjavur

Tamil Nadu

PIN: 613007

e-mail: bhuvana.lakshmy@gmail.com

Mobile: 8971019363

ABSTRACT

Aim of the Study:

To describe methods and outcomes of using the forehead flap for reconstruction in patients with diverse facial defects.

Patients and Methods:

A retrospective analysis was conducted on patients who underwent forehead flap surgery for facial defect reconstruction at our centre between January 2022 and December 2023. This comprised of 7 individuals with various aetiologies. Patient demographics, preoperative assessments, surgical details, postoperative complications, and long-term outcomes were studied.

Results:

Of the 7 patients included in the study, 4 had post traumatic defects, 3 had defects following surgical resection. Forehead flap had been used for reconstruction of scalp, eyelids, nose, palate, lips and floor of mouth. Surgical outcomes were mostly successful with good patient satisfaction, although some patients had peri-operative complications due to co-existing morbidities.

Conclusion:

Forehead flaps are versatile, effective, reliable with tolerable morbidity; and can hence be used for addressing a variety of craniofacial defects

Keywords:

forehead flap, facial reconstruction, staged reconstruction, post burn defect, nose defect, scalp defect, case report

INTRODUCTION:

Facial reconstruction surgery encompasses a diverse range of techniques aimed at restoring both form and function to the face following trauma, cancer excision, congenital anomalies, or other pathologies. Among these techniques, the use of forehead flaps stands out as a versatile and reliable method for achieving excellent aesthetic and functional outcomes.

The term “forehead flap” refers to a pedicled flap containing skin and subcutaneous tissue, harvested from the forehead region. Various forms of the forehead flap have been in use for centuries, the earliest record being by Sushruta circa 600BCE for reconstruction of posttraumatic nasal defects.

In this case series, we present how the forehead flap has been applied in various scenarios at our centre, demonstrating its efficacy and versatility.

CASE 1: MULTI-STAGE RECONSTRUCTION OF POST BURN FACIAL DEFECT

Patient History:

A 49-year-old male presented with 3rd degree burn over his face due to a road traffic accident. Following escharectomy and serial debridements, he was left with a skin defect involving right cheek, lower and upper eyelids, dorsum and ala of nose and part of median forehead with exposure of bone over nose and forehead areas.

Surgical Approach:

A laterally based forehead flap, pedicled on left side, was raised preserving superficial temporal vessels and inset into the facial defect to provide coverage of the exposed structures. In a second stage, the flap was divided and reinset to recreate upper and lower eyelids and in third stage to recreate nasal ala. Finally sling suspension with tendon autograft done for ectropion correction to enable lid closure.

Outcome:

The forehead flap provided ample tissue for reconstruction of cheek, nasal dorsum, median forehead, upper and lower lids, and nasal ala; enabling timely protective cover as well as eventual functional improvement with minimal donor site morbidity. Following lid reconstruction, patient is currently under evaluation to undergo keratoplasty for restoring vision in injured eye.

CASE 2: “LIFEBOAT” IN ONCOLOGICAL RECONSTRUCTION

A 50 year old male who had undergone resection of carcinoma of oral cavity along with primary reconstruction using pectoralis major myocutaneous flap and deltopectoral flap, presented to our centre 4 months later with flap necrosis and dehiscence. He had defect involving upper and lower lip and chin on right side

Surgical Approach:

Remnant of previous flaps were re-elevated and redraped to cover chin region and provide lining. Laterally based forehead flap was raised with pedicle on right side and inset into upper lip region. In second stage, forehead flap pedicle was divided, flap waltzed and inset into lower lip region.

Outcome:

Flap healed well and patient was satisfied with outcome. The forehead flap proved to be a reliable lifeboat in a situation where other regional options had been exhausted.

CASE 3: NASAL RECONSTRUCTION

Patient History:

A 29 year old female presented with history of assault with sharp weapon causing amputation of her nose. She was found to have loss of bilateral ala, columella and distal septum with skin loss over dorsum of nose and exposure of cartilage.

Surgical approach:

Left side paramedian forehead flap was planned in oblique manner due to patient's short forehead. Flap elevated and inset over central part of defect. Bilateral nasolabial flaps were also used to cover remaining defect over ala. In a second stage, after 3 months, rib cartilage grafts were used for reconstruction of internal framework.

Outcome:

Prompt cover prevented necrosis / infection of exposed cartilage. Flap healed well and following framework reconstruction, patient has improved airway patency.

CASE 4: MAXILLA AND PALATE RECONSTRUCTION

Case History:

35 year old male presented with complaints of oroantral fistula following previous history of dental infection. He was found to have defect of floor and walls of right maxillary antrum.

Surgical Approach:

Partial maxillectomy was done to remove unhealthy bone. Forehead flap was raised based on right side, folded over and tunnelled into oronasal region. Flap was draped and inset so as to cover lateral nasal wall and palatal defect.

Outcome:

Postoperatively, flap was healthy and healing well. Patient later succumbed to CVA due to preexisting comorbidity, hence long term result could not be observed.

CASE 5: FLOOR OF MOUTH RECONSTRUCTION

Case History:

55 year old male presented with carcinoma of floor of mouth right side. He underwent composite resection and radical neck dissection. Coverage of floor or mouth defect was needed

Surgical Approach:

Laterally based forehead flap was raised pedicled on right side. Flap folded over and tunnelled into oral cavity. Neck incision was closed primarily for cover and forehead flap inset into floor of mouth to provide lining.

Outcome:

Patient developed dehiscence of neck wound postoperatively and coverage was given using deltopectoral flap. Forehead flap was reinset and healed well.

CASE 6: SCALP RECONSTRUCTION

Patient History:

A 30-year-old female presented with a large scalp defect over superior aspect of cranium resulting from a traumatic avulsion injury sustained in workplace accident. There was skin loss over a 15x15cm area and galea was also lost over central region with exposed calvarium, posing significant risk of infection.

Surgical Approach:

A forehead flap based on the right superficial temporal artery was utilized. Flap was transposed to cover area of exposed bare bone. Remaining raw areas with galea available over floor were covered with split skin grafts

Outcome:

The forehead flap helped to provide timely coverage of the scalp defect. In late postoperative period, patient developed some raw areas following edge necrosis and graft loss, which could be covered with more skin grafts.

CASE 7: NASAL RECONSTRUCTION

Patient History:

59 year old male presented with nasal defect following road traffic accident. There was loss of right ala and nasal tip skin and soft tissue.

Surgical Approach:

Left paramedian forehead flap was planned and raised with supratrochlear vessels included in base. Flap was inset into defect and division was done after 3 weeks.

Outcome:

Flap healed well. There was minimal cosmetic deformity of donor site. Patient was satisfied with outcome.

DISCUSSION

Forehead flap was utilised in 7 patients in our centre over a 2 year period. 4 were for post-traumatic defects (including one case of facial burns), 2 were post oncological resection and 1 was post-infective.

2 oncological patients had delay in wound healing, but flap eventually settled well. 1 post-traumatic patient developed flap edge necrosis (as anticipated due to avulsion injury). 1 patient expired due to comorbid conditions.

It was noted that in some of the above cases, microsurgical reconstruction may have been considered as well. However, due to urgency of the situation or morbidity of patient general condition, this had not been a viable option then.

Overall surgical outcomes were successful – flaps healed well and provided cover / lining or as necessary. Donor sites all healed well with minimal cosmetic concern. Patients all reported improvement in quality of life and acceptable cosmetic results. Long term follow-up confirmed the same.

This case series demonstrates the strengths of forehead flap. With thoughtful surgical planning and execution, these flaps can be used effectively to address complex defects involving various multiple facial regions to restore both form and function. Importantly, the forehead flap fills a

crucial role as “lifeboat” plan when other regional options have been exhausted and there is deficiency of resources/expertise.

CONCLUSION:

Forehead flaps are a valuable tool for craniofacial reconstructions surgeons. They are versatile and reliable; useful in a spectrum of situations, including as a lifeboat.

REFERENCES

1. Ramsey ML, Brooks J, Zito PM. Forehead Flaps. [Updated 2023 Jun 26]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK499907/>
2. Correa BJ, Weathers WM, Wolfswinkel EM, Thornton JF. The forehead flap: the gold standard of nasal soft tissue reconstruction. *Semin Plast Surg.* 2013 May;27(2):96-103. doi: 10.1055/s-0033-1351231. PMID: 24872749; PMCID: PMC3743909.
3. Alotaibi AS, Shah Mardan QNM, Almarghoub MA, Mahabbat NA, Almarshad FA, Hashem FK. The pedicled lateral forehead flap in reconstructing oral floor defect - The last resort; case report. *Int J Surg Case Rep.* 2021 Dec;89:106521. doi: 10.1016/j.ijscr.2021.106521. Epub 2021 Oct 18. PMID: 34775321; PMCID: PMC8593219.
4. Itani Y, Yotsuyanagi T, Yamauchi M, Sugai A, Kato S, Yamashita K, Isogai N. The Laterally Extended Paramedian Forehead Flap for Nasal Reconstruction: The Delay Technique Revisited. *Plast Reconstr Surg Glob Open.* 2020 Jun 15;8(6):e2871. doi: 10.1097/GOX.0000000000002871. PMID: 32766039; PMCID: PMC7339298.
5. Tilt, Alexandra MD; Malphrus, Elizabeth BA; Hannan, Catherine MD; Patrick, Lauren MD. Paramedian Forehead Flap for Reconstruction of Nasal Tip Defect. *Plastic and Reconstructive Surgery - Global Open* 8(4):p e2713, April 2020. | DOI: 10.1097/GOX.0000000000002713
6. Ahmed SS, Ghassemi A, Rehman SA, Ansari MK. Forehead flap in maxillofacial surgery: Our experiences. *Natl J Maxillofac Surg.* 2015 Jan-Jun;6(1):72-5. doi: 10.4103/0975-5950.168228. PMID: 26668457; PMCID: PMC4668737.
7. Jellinek, Nathaniel J. MD*,†,‡; Nguyen, Tri H. MD§; Albertini, John G. MD||,¶. Paramedian Forehead Flap: Advances, Procedural Nuances, and Variations in Technique. *Dermatologic Surgery* 40():p S30-S42, September 2014. | DOI: 10.1097/DSS.000000000000112