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Various local facial flaps for traumatic and surgical facial defects: Our institutional experience

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***Abstract*---**Aims: This study aimed to analyze the various modalities of reconstruction using local flaps for facial defects that occur after surgical excision and trauma and their advantages and disadvantages. Materials and Methods: A retrospective analysis was performed for 65 cases (age group from 20-45 years) with small to medium-sized facial defects from various causes over a period of 5 years. Patients with immunodeficiency, terminal illnesses and head injury were excluded. Treatment methods depended on size and location of defect. Results: Of the 65 patients, 15 had nasolabial flaps, 6 had V-Y advancement flaps, 3 had cheek advancement flaps, 2 had forehead flaps, 2 had Limberg flaps, 20 had fillet flaps and 17 were bilateral advancement flaps. Postoperatively none developed complications with acceptable functional and aesthetic outcome which were excellent in 55 patients, good in 5 patients and fair in 5 patients after 6 months of follow up. Conclusions: Local facial flaps are a simple, easy and versatile option to reconstruct small to medium sized facial defects and provides a good match with adjacent skin thus providing good aesthetic and functional results along with fast recovery.

***Keywords*---**facial defects, local facial flaps, nasolabial flap, V-Y advancement.

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Introduction

Local flaps are one of the most commonly used flaps for the reconstruction of facial defects. The results of skin grafting are less satisfactory for large areas to cover whereas distant flaps are bulky and have a poor color match. Local flaps are a good option for the reconstruction of facial defects with good color and texture match and a good success rate. As a principle of plastic surgery, should be replaced with, considering its quality and quantity. For this, a similar flap is always preferable to skin grafts, as it produces a superior match in color and texture. It has the additional advantages of producing a vascularized soft tissue cover for the skeleton and resistance to contractures.

Defects following head and neck surgery are often closed using direct sutures. This technique is used when the defect is small and local conditions allow adequate amounts of mobile tissue. However, for larger defects or in situations where direct suturing is not applicable, surgical defects may be filled any of the accepted methods. [1]. In this study, we assessed facial skin defects that occurred due to surgical excision and trauma, and their reconstructive techniques using local flaps.

Materials and Methods

This retrospective study was conducted at a tertiary care hospital over a period of 5 years, from January 2017 to January 2022. The study included 65 patients, comprising 26 males and 39 females between 20-45 years presenting with facial skin defects due to various etiologies and willing to undergo reconstructive procedures using local flaps.

Inclusion Criteria

Patients of 20-45years age groups with small (<3 cm) to moderate (3–6 cm) facial skin defects due to animal/human bite, avulsion injuries caused by road traffic accident/assault, any disease, defects following head and neck surgery, defects following excision of cutaneous lesions giving consent to undergo reconstructive procedure using local flaps were included in the study.

Exclusion Criteria

Larger defects (>6 cm), patients with recurrent tumor or regional/distant metastasis, patients suffering from diabetes, immunocompromised state, pregnancy, lactation **,** or other terminal illnesses such as liver, renal injury, head injury or any major medical illness that failed to achieve medical fitness were excluded from the study**.**

Statistical analysis

The data were entered into MS Excel software version 17 and analyzed using SPSS, IBM Comp, and Version 21. Descriptive data were expressed as proportions, means, and frequency tables. Categorical data were analyzed using the chi-squared test. Quantitative data were analyzed using an independent

Student's T test. P was set than 0.05. Sample Size: (n=92) Using Cochrane's formula $N \geq (Z\ (1-\alpha/2)2P\ (1-P)\ d2$; N= sample size Z (1-α/2) =Z statistic for 95% confidence interval; p= prevalence in view of different literature = 60%; d= absolute error=10%] Clearance was obtained from the institutional ethics committee. Informed, written and valid consent was obtained from all patients, a detailed history of all patients was obtained, a thorough clinical examination was performed, and necessary laboratory tests were performed. Preoperative preparation included administration of injection Tetanus Toxoid 0.5 ml intramuscularly over deltoid and Xylocaine sensitivity test by injecting 0.1 ml of 2% Xylocaine subcutaneously over volar surface of forearm. A detailed examination of the defect was performed, and its dimensions were noted. After explaining the procedure, possible outcomes, and prognosis of the surgery, pre-anesthetic fitness was obtained. General anesthesia was used for three cases of cheek advancement, and the rest of the cases were performed under local anesthesia using 2% lignocaine+ adrenaline (1:100000) infiltration.

In the case of cutaneous malignancies, after confirmation by histopathology report, all skin lesions were excised with an oncologically adequate margin (basal cell carcinoma, excision margin was 4–6 mm from the tumor, as in cases of squamous cell carcinoma, the excision margin was 4–6 mm, and for malignant melanoma, 5–2 cm margin excised) and sent for histopathology. In the case of dog-bite patients, all wounds initially received irrigation with normal saline solution up to a total volume of 500 ml. Subsequently, local scrubbing with povidone-iodine (Betadine 10%) was performed in all cases as needed. All category III exposures assessed as carrying a risk of developing rabies were given post-exposure prophylaxis with equine rabies immunoglobulin (40 IU per kg body weight) and Antirabies vaccination. The full dose of rabies

Immunoglobulin, or as much as anatomically feasible, was administered to and around the wound site. The remainder was injected intramuscularly at a site distant from the site of the vaccine administration. The Antirabies vaccine was administered as one intradermal injection at two sites on days 0, 3, 7, and 28. In patients with colloid lesions, intralesional triamcinolone acetonide (10 mg/mL) was administered 1 week before surgery. Intraoperatively, it was injected at the wound margins immediately after excision. Repeated injections were administered at 2 4 week intervals. In road traffic accidents/assaults, particular attention is given to the presence of a potential foreign body. Thorough debridement of unhealthy and necrotic tissues was performed. Reconstruction of small-to moderate-sized defect (3-6 cm) was performed using various local facial flaps. All the patients underwent surgery under aseptic conditions. Defect closure was performed using desirable local flaps according to the size and location of the defect. The flaps were secured with non-absorbable sutures, and dressing was performed.

After surgery, all patients were assessed on post operative day 1 for any bleeding/hematoma of the flap, ischemia, or congestion of the flap**.** All patients were reassessed on post operative day 7 for wound dehiscence, flap necrosis, or wound infection. After suture removal, patients were asked to follow-up on post operative 4 to assess hypertrophic scar formation/keloid, hyper pigmentation of the scar, and contracture formation. At post operative 15 weeks follow-up period,

the final esthetic appearance of the face was noted, and patient satisfaction was assessed using a scale ranging from 0 to 10 (0 -3= not satisfactory, 4–7=fair, 8-10=good).

Results

In our study out of 65 cases there were 26 males and 39 females. Various area wise divisions for defect closure study was done as follows,

1. Forehead defect-out occurred in 6 cases, 5 were females and 1 was male. Three patients underwent surgery after tattooing and scar removal. Two patients underwent surgery after tumor excision. One patient underwent surgery following posttraumatic defect. In all cases, a bilateral advancement flap was used.
2. Eyebrow defect-out occurred in 2 cases, 1 was female and 1 male. One patient underwent surgery following basal cell carcinoma excision, for which a bilateral advancement flap was performed. One patient underwent surgery following post traumatic defect, for which V-Y plasty was performed.
3. Of the 10 cases, 5 were females and 5 were male. In 7 cases, a bilateral advancement flap was performed, of which 4 cases had defects following BCC excision and 3 cases had defects following SCC excision. In 3 cases, the cheek rotation advancement flap was performed following defects secondary to parotidectomy, maxillectomy, and SCC excision.
4. 4. Of the 5 cases of nasal defects, 3 were females among which 2 cases with defects due to BCC excision underwent nasolabial flap. In another case the tip of the nose defect caused by a human bite was covered with a forehead flap. Of the two males, one underwent nasolabial flap and the other forehead flap, both of which were performed for posttraumatic defects.
5. Chin defects: Two cases, both of which were men. For one patient with a posttraumatic defect, V-Y plasty was performed. Another patient underwent bilateral advancement flap for defects due to an animal bite.
6. Of the 17 cases, 5 were females and 12 were men. Three patients underwent V-Y plasty for posttraumatic defects. Twelve patients underwent a nasolabial flap for defects due to SCC excision. Two patients underwent bilateral advancement flap for defects due to animal bites.

Table 1: Distribution of cases over facial region

Facial area	Male (26)	Female (39)	Total (65)
Forehead	1	5	6
Eyelid	1	1	2
Cheek	5	5	10
nose	2	3	5
lip	12	5	17
chin	2	0	2
ear	0	20	20
periorbital	2	1	3

Table 2: Type of flaps

v-y/y-v plasty	6
Limberg flap	2
forehead flap,	2
FILLET flap	20
Nasolabial	15
cheek advancement flap	3
bilateral advancement flap	17

Table 3: Various causes of facial defects

Etiology	location over face	Total number of cases
Squamous Cell Carcinoma	cheek-3	15
	lip-12	
Basal Cell Carcinoma	forehead-2	11
	eyebrow-1	
	cheek-4	
	nasal-4	
Dog Bite	lip-2	3
	chin-1	
human bite	nasal-1	1
Road traffic accident	forehead-1	8
	eyebrow-1	
	chin-1	
	lip-3	
	periorbital-2	
Keloid		20
Other benign lesions, scar excision, tattoo removal		7
total		65

Postoperatively, none of the patients developed complications. The functional and aesthetic outcomes were acceptable. Aesthetic results were excellent in 55 patients, good in 5 patients, and fair in 5 patients after 6 months. Highly satisfactory wound closure and patient satisfaction were achieved using local flaps for facial defects, with minimal donor area morbidity and good facial aesthetic outcomes.

Figure 1 : Mucocutaneous lower lip lesion

Fig 2: Cheek flap advancement in a 50 year old female

Figure 3: V-Y Advancement flap intraop and postoperative pictures.

Discussion

Following types of flaps were performed in the study population and their description is as follows:

Nasolabial flap

The superiorly based nasolabial flap is useful for defects of the nasal sidewall, ala, and tip, while the inferiorly based nasolabial flap is useful for defects of the upper and lower lip, nasal floor, and columella. Thus, an interpolated design is desirable. The blood supply to this flap is excellent because of the perforating branches of the facial artery[1], the color and texture are excellent matches, whereas the donor site scar is acceptable in the nasolabial sulcus. A flap was designed on the nasolabial fold using a template defect. It is best to ensure that the flap matches the defect size exactly. The medial incision for the flap followed the nasolabial sulcus, and the lateral incision was placed no higher than the inferior defect margin. The flap is elevated in the subcutaneous plane, and the plane deepens as it proceeds superiorly. The flap was rotated counterclockwise on the side of the defect and transferred to the defect.[4-8]

Fillet flap

The flap was marked such that the pedicle was in a hidden position. Following infiltration of local anesthesia around the keloid (2% lidocaine with epinephrine 1:100,000), a superficial incision was made in the keloid, 2 mm away from its margin, until approximately halfway. The keloid flap, which consists of the epidermis and a thin layer of dermis that preserves the vascular plexus, was raised from the fibrous keloid core. It is preferable to make a thicker flap in the first instance and curettage the excess tissue afterward. After raising the flap completely, the fibrous keloid core was removed, and bleeding was meticulously controlled. The redundant flap was trimmed and the wound was closed using 6-0 nylon interrupted sutures. Pressure dressing was applied. No intra-or per operative preventive procedures were performed. All specimens were sent for pathological evaluation and diagnosed as keloids.

V-Y advancement flap

The V-shaped flap was not stretched or pulled toward the recipient site (defect site). It achieves its advancement through recoil or by being pushed forward (unique to V-Y). They allow them to move into the recipient site in a nearly tension-free manner. The defect was repaired with wound closure tension by advancing the two borders of the remaining wound toward each other. The wound closure suture line assumes a Y configuration, with the common limb of Y representing the suture line. A V-shaped flap is stretched or pulled towards a linear incision made at the apex of the triangular flap.[2, 4]

Cheek advancement flap

The incision line runs transversely from the defect to the preauricular crease, earlobe, and occipital hairline, inferiorly. When the incision line of the flap was extended to the inferior earlobe and the anterior occipital hairline, a larger flap could be elevated. The flap was elevated above the sub muscular aponeurotic system (SMAS) and reconstructed the defect area by advancing while keeping sub dermal plexus.

Forehead flap

Guiding principles for flap design and elevation include

1. Maintaining an axial pattern whenever possible.
2. Utilizing the pedicle ipsilateral to the defect.
3. Extending the flap at right angles across forehead with caution and only when extra length is necessary.
4. Utilizing a reasonably narrow pedicle.
5. Early subperiosteal dissection.

The anatomical studies of Shumrick and Smith demonstrated the position and course of the supratrochlear artery, running 1.7 to 2.2 cm lateral to the midline in a vertical vector. The artery runs in the sub muscular plane to a more superficial, subcutaneous position beginning 1 cm above the brow[11] and is located approximately 2 cm lateral to the midline near the medial eyebrow. The base of the flap was designed 1.5 cm wide to include the pedicle. Widely infiltrating the surgical field will help define surgical planes and minimize blood loss. Flap elevation began distally. It is thickly elevated to the level of the galea, and then ~1 cm above the brow. The dissection is carried subperiosteally and continues over the orbital rim. Modifications included a narrower pedicle, axial pattern, ipsilateral rotation, subperiosteal dissection with periosteal scoring, and skin grafting at flap elevation. The avoidance of transferring hair at all times was the best.

Limberg flap

They depend on the advancement of part of their pivotal tissue movements. The rhombus is an equilateral parallelogram. Two equilateral triangles were placed base-to-base to form a rhombus with adjacent angles of 60° and 120°. All sides and the short diagonal of the defect must be equal in length in a 60°-120° rhombus defect and flap. In the image below, all possible configurations to cover the defects are shown. Their effective lengths decreased as they pivoted. This reduction in effective length must be considered when designing such flaps.[2, 3]

Bilateral advancement flap

The modified bilateral advancement flap maximizes the amount of tissue that can be introduced into the defect. It relies on both advancement and transposition principles and borrows tissue from two planes. Thus, the length of the flap can be shortened to increase the flap survival. Bilateral transposition flaps were created from the tissues on both sides of the wound. These were then approximated and sutured together to form a single new tip (apex), which was then advanced and sutured into the concave base of the opposing advancement flap at its midpoint.

Conclusion

Local facial flaps are a simple, easy and versatile option to reconstruct small to medium sized facial defects and provides a good match with adjacent skin thus providing good aesthetic and functional results along with fast recovery.

Conflicts of Interest: None Declared.

Funding: None required as it was retrospective record based study.

Informed Consent

Written informed consent taken from all the study participants..

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Author Contributions

Dr. Rajalakshmi G and Dr. Megha B contributed to the design and implementation of the research, Dr. Nagaraja M to the analysis of the results and Dr. Mohammed Arif to the writing of the manuscript.

References

1. Michael Gleeson, George G Browning, Martin J Burton, Ray Clarke, Hibbert John,Nicholas S Jones, Valerie J Lund, Linda M Luxon, John C Watkinson(2008) Scott-Brown's Otorhinolaryngology, Head and Neck Surgery, 7th edn. Hodder Arnold: London.volume 3, 2847.
2. Nakayama M, Tabuchi K, Nakamura Y, Hara A. Basal cell carcinoma of the head and neck. J Skin Cancer. 2011; 11:20-8.
3. Eisenbaum SL, Barnett MP. In V-Y flap reconstruction for nasal alae defects. Grabb's Encyclopedia of Flaps. Berish S, editor. Vol. 1. Philadelphia, PA, USA: Lippincott Williams and Wilkins; 2009:101-104.
4. Meaike JD, Dickey RM, Killion E, Bartlett EL, Brown RH. Facial skin cancer reconstruction. In Seminars in plastic surgery. 2016; 30(03):108-21.
5. Zitelli JA. The nasolabial flap as a single-stage procedure. Arch Dermatol. 1990; 126:1445-8.
6. Goh CS, Perrett JG, Wong M, Tan BK. Delayed bipedicled nasolabial flap in facial reconstruction. Arch Plastic Surg. 2018; 45(3):253.
7. Rao JK, Shende KS. Overview of local flaps of the face for reconstruction of cutaneous malignancies: Single institutional experience of seventy cases. J Cutaneous Aesthetic Surg. 2016; 9(4):220.
8. Baker SR. Local Flap in facial reconstruction. 2nd ed. St. Louis, MO, USA, Mosby. 2007.
9. Ebrahimi, A., Ashayeri, M., & Rasouli, H. R. (2015). Comparison of Local Flaps and Skin Grafts to Repair Cheek Skin Defects. Journal of cutaneous and aesthetic surgery, 8(2), 92–96. https://doi.org/10.4103/0974-2077.158444
10. Rolekar NG, Goil P, Rao J (2019) Local facial aps: a workhorse for reconstruction of facial malignancies defects. Int J Otorhinolaryngol Head

Neck Surg,5:755-9.http://dx.doi.org/10.18203/issn.2454-5929.ijohns20191744.

11. Shumrick K A, Smith T L. The anatomic basis for the design of forehead flaps in nasal reconstruction. Arch Otolaryngology Head Neck Surg. 1992; 118(4):373–379. [Pub Med] [Google Scholar] [Ref list]
12. Bryan J. Correa, MD,[1] William M. Weathers, MD,[1] Erik M. Wolfswinkel, BS,[1] and James F. Thornton, The Forehead Flap: The Gold Standard of Nasal Soft Tissue Reconstruction Semin Plast Surg. 2013 May; 27(2): 96–103.
13. M Harahap The modified bilateral advancement flap Dermatol Surg. 2001 May; 27(5):463-6.
14. Kyung Pil Kim, Ho Seup Sim, Jun Ho Choi, Sam Yong Lee, Do Hun Lee, Seong Hwan Kim, Hong Min Kim, Jae Ha Hwang The Versatility of Cheek Rotation Flaps Arch Craniofacial Surg. 2016 Dec; 17(4): 190–197.