

## Original Research Article

# A retrospective study to analyze local flaps for coverage of facial defects

Dinesh Chaudhary\*, Ashutosh Soni, Sanjeev Agarwal, J. L. Kumawat

Department of General Surgery, Geetanjali Medical College and Hospital, Udaipur, Rajasthan, India

**Received:** 18 September 2020

**Revised:** 16 November 2020

**Accepted:** 17 November 2020

**\*Correspondence:**

Dr. Dinesh Chaudhary,

E-mail: drdinesh1993dmc@gmail.com

**Copyright:** © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

### ABSTRACT

**Background:** Face is the center of attention during communication and the expression of emotion. Facial defects resulting from trauma and the excision of skin malignancies are relatively common. How this defect is treated is determined by a variety of factors including the location, size and the underlying cause of the defect, the projected functional morbidity, the medical history of the patient, and feasibility of surgery. Aim was to study various local flaps using for coverage of defect, outcomes and complications.

**Methods:** This was a retrospective cohort study. Our study shows result of 92 patients during January 2016 to December 2019 who had facial defects were taken up for the study. Reconstructive options were selected depending on defect size, location. Follow-up of patients ranged from 6 months to 1 year.

**Results:** The most common malignant tumors of the face are basal cell carcinoma, squamous cell carcinoma and melanoma. Local flap is always preferable than skin grafts as it produces a superior match in color and texture with the additional advantage of producing a vascularized soft tissue cover for skeleton and resistant to contractures.

**Conclusions:** In our study, variety of local flaps were used to cover the facial defects of the 92 patients with minimal post-operative complications.

**Keywords:** Coverage defects by local flaps, Facial defects, Local flaps of the face, Skin malignancies, Trauma

### INTRODUCTION

Local flaps are commonly used in reconstruction of facial defects by surgeons and plastic surgeons. Unfortunately, facial defects resulting from trauma and the excision of skin malignancies are relatively common. In local flap, tissue immediately adjacent to or near the primary defect is used to cover the defect. Face is the center of attention during communication and the expression of emotion. How this defect is treated is determined by a variety of factors including: the location and size of the defect, the projected functional morbidity, the underlying cause of the defect, the medical history of the patient, and feasibility. The most common malignant tumors of the face are basal cell carcinoma, squamous cell carcinoma and melanoma.<sup>1-3</sup>

While the results of skin graft are less than satisfactory for large areas to cover, distant flaps are bulky with a poor color match. Local flaps provide reasonable option for reconstruction of facial defects with good color and texture match and good success rate. Missing parts should be replaced with similar tissues considering their quality and quantity. For this, the similar flap is always preferable than skin grafts as it produces a superior match in color and texture. It has the additional advantage of producing a vascularized soft tissue cover for skeleton and resistant to contractures. Complications after reconstruction are hematoma, infection, necrosis, deviation site, scar etc. Aim was to study various local flaps using for coverage of defect, outcomes and complications.

**METHODS**

This was a prospective cohort study done at Department of Surgery, Geetanjali Medical College, Udaipur during January 2016 to December 2019. Our study shows result of 92 patients during January 2016 to December 2019 who had facial defects were taken up for the study. Reconstructive options were selected depending on defect size, location. Follow-up of patients ranged from 6 months to 1 year. All patients admitted in plastic surgery having facial defects in our institute were included in the study. Patients who were operated elsewhere, patients underwent reconstructive surgery other than local flaps, local flaps of various body parts except face.

After taking proper ethical clearance from the ethical committee the current study was conducted.

Sample Size: (n=92)

Using Cochran’s formula

$$N \geq \frac{(Z(1 - \alpha/2))^2 P(1 - P)}{d^2}$$

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%

**Statistical analysis**

The data was entered in MS Excel Software version 17 and analyzed using SPSS, IBM Comp, Version 21. The descriptive data was expressed in proportions, mean and frequency tables. The categorical data was analyzed by using Chi-Square test. The quantitative data was analyzed using independent student’s T test. P value less than 0.05 was considered statistically significant.

**Surgical procedure**

*Rotational flap*

They are pivotal flaps with a curvilinear configuration. They are used the most commonly in triangular defects. They are facilitating the pivotal movement of the flap. In below image defect is triangular shape and closed by rotation from surrounding healthy tissue.<sup>4,5</sup>

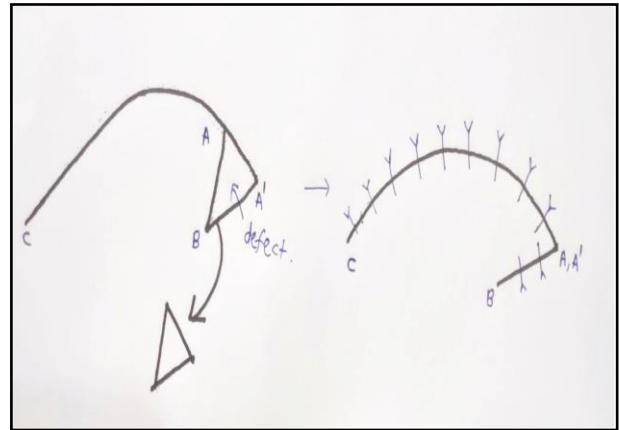
*Transposition flaps*

They have a linear configuration. They are pivotal flaps moving about a pivotal point. Two types: 1) Rhombic flaps. 2) Bilobe flap.

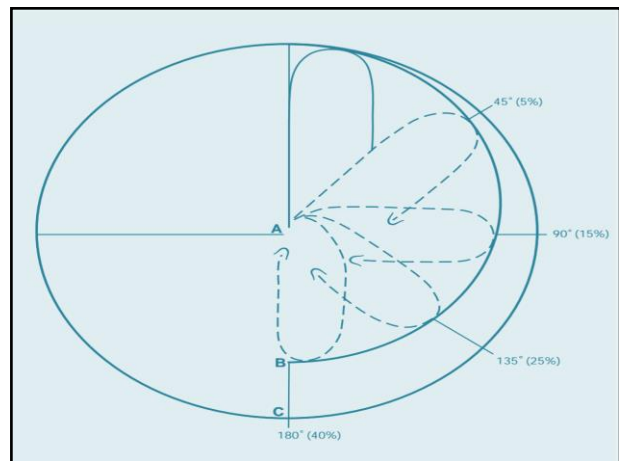
*Rhombic flaps (Limberg flaps)*

They depend on advancement for part of their tissue pivotal movement. A rhombus is an equilateral parallelogram. 2 equilateral triangles placed base to base

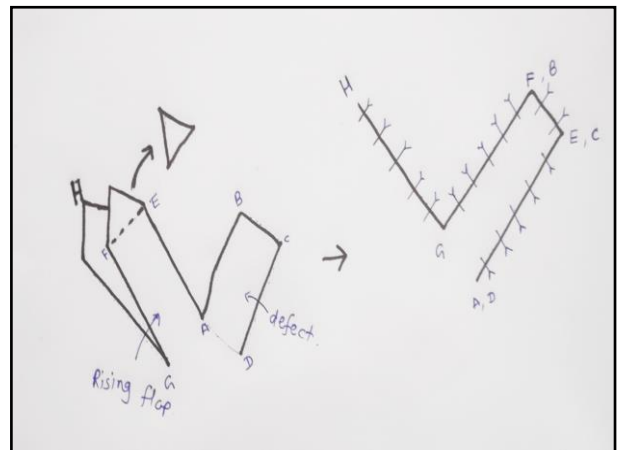
to form a rhombus with adjacent angles of 60° and 120°. All sides and the short diagonal of the defect must be equal in length in a 60°-120° rhombus defect and flap. In below image all possible configurations to cover defect are given. Their effective length decreases as they pivot. This reduction in effective length must be considered in designing such flaps.<sup>1,6</sup>



**Figure 1: Rotational flaps**



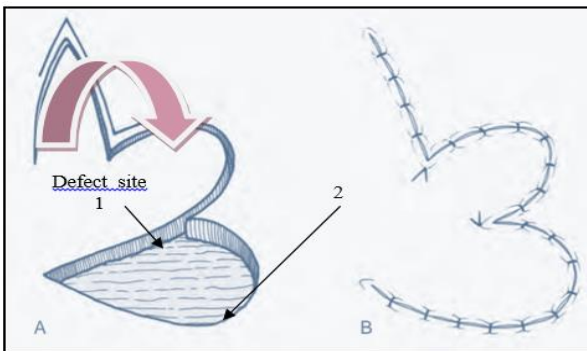
**Figure 2: Transposition flaps**



**Figure 3: Rhombic flaps**

*The bilobe flap*

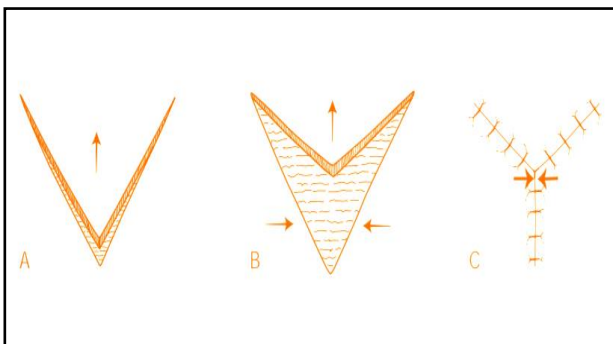
The bilobed flap is a useful and time-honored technique for reconstructing defects of the nose and the eyelid region, especially defects of the lower third of the nose. The bilobed flap is appropriate for partial-thickness losses of less than 1.5 cm of the lateral aspect of the nose, ala, and tip area. This flap is essentially a rotation flap divided into two transposition flaps, with an excellent blood supply from angular and supra-orbital arteries. It recruits skin from the mid dorsum and sidewall. The two flaps have a common base and typically form an arc of no more than 90-110° to avoid tension development on wound closure. The angle between the defect and first lobe is equal to that between the first and second lobe. The size of the first lobe equals that of the defect, and the second lobe is 2/3 the size of the first lobe. The primary flap closes the defect, and the secondary flap is used to close the donor site. The donor site of the second lobe is primarily closed (Figure 4).



**Figure 4: 1st straight arrow directed movement of flap and 2nd curved arrow directed movement of flap.**

*V-Y and Y-V advancement flaps*

V-shaped flap is not stretched or pulled toward the recipient site (defect site). It achieves its advancement by recoil or by being pushed forward (unique of V-Y). They allow to move into recipient site in nearly tension-free fashion. The defect is repaired with wound closure tension by advancing the two borders of the remaining wound toward each other.

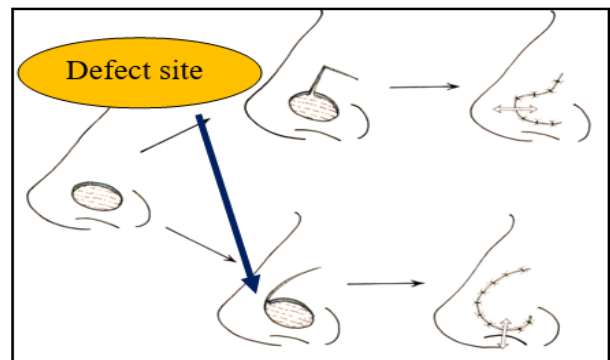


**Figure 5: V Y Plasty**

Wound closure suture line assumes a Y configuration, with the common limb of the Y representing the suture line. The Y-V advancement flap has a similar principle to the V-Y flap. V-shaped flap is stretched or pulled toward linear incision made at the apex of triangular flap.<sup>1,7</sup>

*Nasolabial flaps*

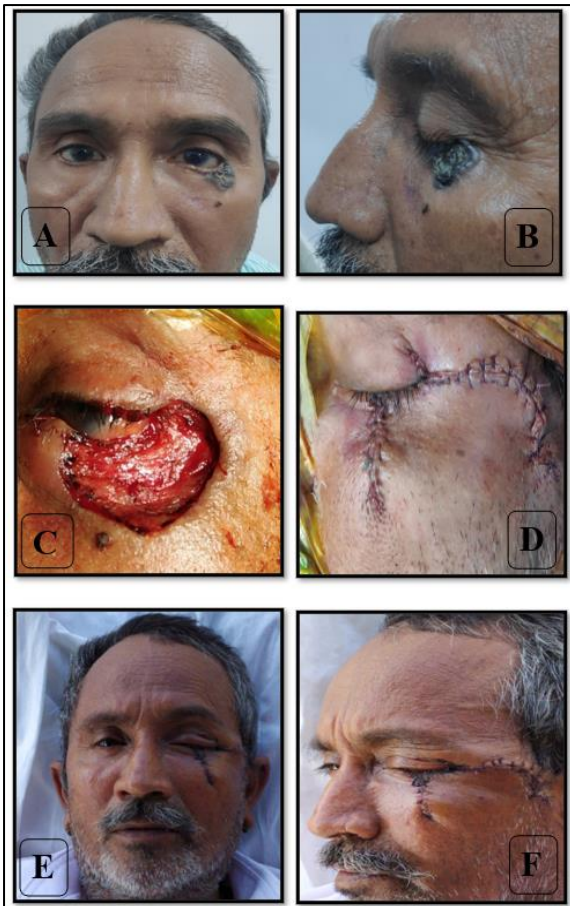
The superiorly based nasolabial flap is useful for defects of the nasal sidewall, ala, and tip, while the inferiorly based nasolabial flap is useful for defects of the upper and lower lip, nasal floor, and columella. An interpolated design is cosmetically desirable. The blood supply to this flap is excellent due to perforating branches of the facial artery.<sup>1</sup> The color and texture are excellent matches, while the donor site scar is acceptable in the nasolabial sulcus. Using a template defect, a flap is designed on the nasolabial fold. It is best to make the flap exactly match the defect size. The medial incision for the flap follows the nasolabial sulcus, and the lateral incision is placed no higher than the level of the inferior defect margin. The flap is elevated in the subcutaneous plane, and the plane goes deeper as it proceeds superiorly. The flap is rotated counterclockwise on the defect side and transferred to the defect (Figure 6).<sup>7-11</sup>



**Figure 6: Nasolabial flaps**

**RESULTS**

Our study shows result of 92 patients from January 2016 to December 2019 using local flaps for coverage of facial defects. Out of 92 flaps, 24 flaps were v-y/y-v flaps, 33 were rotation flaps, 12 were transposition flaps used. Two patients developed partial suture dehiscence and two patients developed postoperative hematoma. One patient developed a bad scar over suture line by using bilobed flap and needed revision surgery for that. The W plasty done in that patients and had good outcomes. Postoperative hematoma developed in transposition (Rhombic flap) and rotation flap. But with good antibiotics cover and dressings gave the better outcomes. The facial defects were covered by using limberg flap survived completely without any postoperative complications.



**Figure 6: Post dog bite** A) Post dog bite at right labial area and locally arv injected, B) Stay suture of transposition flap, C) Limberg advancement flap covered at defect, D) and E) Front view of face with eye opening and eyes closed.

**Table 1: Distribution of cases over facial region.**

Facial area	Male (52)	Female (40)	Total (92)
Forehead	10	13	23
Eyelid and eyebrow	11	7	18
Cheek and nose	23	15	38
Chin	8	5	13
<b>Type of flaps</b>			
v-y/y-v plasty	17	7	24
Transposition (Rhombic flaps)	10	8	18
Rotation	21	12	33
Nasolabial	6	8	14
Bilobe	0	3	3

Any patients had defect near to eyebrow or eyelid by using proper local flaps gave good postoperative outcomes without any angle deviation, eye opening difficulty, epiphora, ectropion, eyelashes, exposure sequel. Eyelid closure was adequate, the margin was well aligned and stable. Cosmetically, no color mismatch was also present (Figure 7). The one patient had post dog bite

facial defect. We gave her ARV with regular doses and ARV at local defect site during operation (Figure 8).



**Figure 7: Post traumatic** A) Post traumatic facial defect over right lateral forehead, B) Transposition flap used to cover defect, C) After 1 year at trauma site, cosmetically better results, D) Patient fully satisfied and happy without any complications.



**Figure 8: BCC at nose.**

**Table 2: Postoperative complications of flaps.**

Type of flaps	Complications	Comments
v-y/y-v plasty	2 Patients developed partial suture dehiscence. 1 patient develop hematoma post operatively.	
Transposition (limberg flaps)	No any obvious complication	
Rotation	Post op hematoma in 1 patient.	Most common used Minimal post op complication.
Nasolabial	No any obvious complication	
Bilobe	1 patient had post op scar	Need revision surgery W plasty done



**Figure 9: A) BCC at left nasal wall -lateral view, B) front view, C) Limberg flap used and after 6 months flaps outcomes -lateral view, D) front view.**

All patients had no anesthesia related complications. We had no post-operative infection or complete necrosis in our patients. All the patients were satisfied after the operation. All flaps survived completely, and there were no any example of flap loss. Follow-up ranged from 6 months to 1year. Tumor recurrence was not seen in any of the patients, during this period. Figure 6 (BCC at left lower eyelid), A), B) front andlateral view of patient of BCC at left lower eyelid, C) After excision of BCC and made defect, D) rotation flap-suturing after closing defect

by rotation advancement flap, E) and F)After 15 days of postoperative no any complication with normal eye opening, no epiphora, ectropion.

Total 92 patients, 71 (77.17%) patients of trauma and 21 (22.82%) patients of skin malignancy. Out of them BCC was 16 patients and 5 patients had SCC.

**DISCUSSION**

The forehead comprises a single facial aesthetic unit but is divided into four reconstructive regions: central, paramedian, temporal, and glabellar. The hairline delineates the superior and lateral borders, while the glabella, eyebrows, and supraorbital rim form the inferior border. The forehead receives a majority of its vascular supply from the internal carotid artery system. Surgeons should be conscious of the course of the facial nerve to preserve the forehead's motor innervation. The nerve travels along Pitanguy's line. The forehead receives sensory innervation from the supratrochlear and supraorbital nerves as well as the zygomaticotemporal and auriculotemporal nerves.<sup>7</sup>

Local flaps, especially rotation and advancement flaps, are used in forehead reconstruction. Lateral forehead defects can occasionally be managed with superior advancement of cheek and temple tissue. Rotation flaps are an alternative for moderate-sized defects of the lateral and paramedian forehead regions.<sup>13</sup>

From an aesthetic point of view, the cheek may be divided into three overlapping units: 1) suborbital, 2) preauricular and 3) buccomandibular. Zone 1, the suborbital zone, extends along the lateral border of the nose to the nasolabial fold, across the cheek below the gingival sulcus towards the sideburn, up the anterior sideburn to the lateral crow's-foot line and then along the lower eyelid-cheek junction. In this location, wounds not amenable to primary or skin graft closure may respond well to rhomboid, circular or bilobed flaps. In addition, cervicofacial flap design or tissue expansion with rotation from a more lateral site is helpful for larger defects. Zone 2, or the preauricular area, extends from the helical junction with the cheek across to the sideburn to overlap with Zone 1 at the malar prominence. This area includes the tissues over the parotid-masseteric fascia and extends inferiorly to the mandibular angle and lower mandibular border. The local flaps (rotation and transposition flaps) may be used for reconstruction at this location. The Zone 3 is buccomandibular area extending from a vertical division at the middle cheek down to the mandibular margin and from the oral commissure back up to a horizontal division line halfway up the cheek. The transposition flaps may be most useful here.<sup>6,10,13,14</sup>

Advancement flap design (based on an incision that allows "sliding" movement of the tissue) is relatively simple and can be successfully applied to repair a wide variety of small or moderate-sized cheek defects. Because

the distal end of the V-Y flap is surgically isolated from the donor site, soft-tissue distortion associated with alternative advancement flaps is minimized. The advancing tissue can also be based on a neurovascular bundle. The V-Y advancement flap is equally effective for coverage of large cheek wounds and small defects of those approximating the lid or lateral cheek.<sup>6,10</sup>

Reconstruction of the nose is extremely complex. Whenever possible, scar lines should be placed along relaxed skin tension lines. Aesthetic units of the nose need consideration. The nose is divided into nine subunits, which include the dorsum, the tip, the columella and the paired lateral sidewalls, the alar lobules, and the soft triangles. The subunit principle of nasal reconstruction, described by Burget and Menick, advocates the replacement of the entire subunit if the defect involves greater than half of the subunit. This technique disguises scars by placing them within the border of a subunit.<sup>15</sup>

The skin covering the bony parts is highly movable while the skin over cartilage parts is thicker, tighter and bound to the cartilage. Healing by secondary intention of convex surfaces like the nose tip should be avoided since healing often is delayed and may lead to uneven scars.<sup>7</sup>

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. In the case of defects with diameters between 1.5 cm and 2.0 cm and involving the alar lobules, a nasolabial transposition flap is useful for reconstruction. The nasolabial fold can supply enough skin to resurface the ala, and the contractility of the nasolabial flap can be used to simulate the round, expected bulge of the normal ala.<sup>8-11</sup>

The chin presents a reconstructive challenge due to its limited laxity and general intolerance of skin grafts. For large defects, V-Y advancement flap may be used.<sup>7</sup>

The most common malignant tumors of the face are basal cell carcinoma (BCC), squamous cell carcinoma (SCC) and melanoma.<sup>14</sup> BCC is defined by the World Health Organization Committee on the histological typing of skin tumors as “a locally invasive, slowly spreading tumor which rarely metastasize, arising in the epidermis or hair follicles and in which, in particular, the peripheral cells usually simulate the basal cells of the epidermis”.<sup>2</sup>

BCC constitutes approximately 75% of non-melanoma skin cancers. It is usually observed in older patients, especially in those frequently and intensively exposed to ultraviolet radiation during their lives. BCC is often observed in the head and neck areas, especially the eyelid and nose. It is more common in males. The tumor grows slowly. BCC may be treated with surgery, cryotherapy, radiotherapy and curettage and electrodesiccation.<sup>1,2</sup>

Appropriate follow-up after complete BCC excision has been discussed by several previous studies. Park *et al.* report only a 1% recurrence rate after complete excision of BCC and suggest no follow-up of these patients is required.<sup>3</sup>

Our study of the ninety patients suggests that local flaps for closure of facial defects due to trauma or skin malignancies give the better outcomes cosmetically than skin grafting and any other reconstructive methods with or without minimal post-operative complications. We most commonly used rotation flaps for facial reconstruction. Our clinical observation suggests various area of face defects covered by specific type of flap which provides good cosmetic and minimal post-operative complications. The details are given below table. We also observed that local flaps participate in the normal facial movements, smiling and speech. Reconstructed structures should simulate the original tissue and the adjacent tissues. Contour, thickness, color, texture, hair bearing and skin elasticity balanced with the adjacent tissues. W plasty and bipedicle local flaps rarely used in face.

**Table 3: Types of flaps**

Area	Flaps used	Flaps work well in part of area
Forehead	≥ 1 advancement	Mdian and Para-median
	Limberg	Temporal (lateral)
Medial cheek	Limberg	Best used
	V-Y / Y-V plasty	Defects at or below the level of the nasal alae
Lateral cheek	Limberg	Smaller defect
	Rotation advancement	Larger defects
Nose	Nasolabial	Anterior aspect of the alar groove.
	Bilobe	Nasal tip, caudal dorsum, or caudal sidewall.
Eyelid	Rotation advancement	Lateral /upper
	Limberg	Lower eyelid

**CONCLUSION**

In our experience, local flaps give the best results. They are the first choice for reconstruction of the face. They are simple to elevate and less operating time. For facial defects, local flap provides a versatile and safe alternative. This depends on tissue laxity, vascularity and resulting donor-site distortion. Although many flaps are described, most defects can be best closed by V-Y advancement, transition, rotation flaps. Outstanding functional and cosmetic results can be achieved. Proper execution requires considerable technical skill and experience. Furthermore, a thorough understanding of anatomy and aesthetics is required. With improvements

in microsurgical technique and the increased availability of free tissue transfer such as perforator flaps, reconstruction of facial defects has recently undergone rapid evolution. However, the local flaps are still the workhorse for facial reconstruction, placing them at prior step in reconstruction ladder.

### **Limitation**

For very large fascial defect this flap is not useful. No skin grafting or free flap has been used in this study.

*Funding: No funding sources*

*Conflict of interest: None declared*

*Ethical approval: The study was approved by the Institutional Ethics Committee*

### **REFERENCES**

1. Nakayama M, Tabuchi K, Nakamura Y, Hara A. Basal cell carcinoma of the head and neck. *J Skin Cancer*. 2011;11:20-8.
2. Jacobs GH, Rippey JJ, Altini M. Prediction of aggressive behavior in basal cell carcinoma. *Cancer*. 1982;49:533-7.
3. Park AJ, Strick M, Watson JD. Basal cell carcinomas: do they need to be followed up? *J Royal College Surg Edinburgh*. 1994;39(2):109-11.
4. Hynes B, Boyd JB. The nasolabial flap. Axial or random? *Arch Otolaryngol Head Neck Surg*. 1988;114:1389-91.
5. Belmahi A, El SM, Gharib NE, Bencheikh R, Ouazzani S. The bilobed flap: a very efficient method in aesthetic reconstruction of small skin defects at the alar and tip regions of the nose. *Annales Chirurgie Plastique Esthetique*. 2003;48:211-5.
6. 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.
7. Meaie JD, Dickey RM, Killion E, Bartlett EL, Brown RH. Facial skin cancer reconstruction. In *Seminars in plastic surgery*. 2016;30(03):108-21.
8. Zitelli JA. The nasolabial flap as a single-stage procedure. *Arch Dermatol*. 1990;126:1445-8.
9. Goh CS, Perrett JG, Wong M, Tan BK. Delayed bipediced nasolabial flap in facial reconstruction. *Arch Plastic Surg*. 2018;45(3):253.
10. 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.
11. Baker SR. *Local Flap in facial reconstruction*. 2nd ed. St. Louis, MO, USA, Mosby. 2007.
12. Hakverdi S, Balci DD, Dogramaci CA, Toprak S, Yaldiz M. Retrospective analysis of basal cell carcinoma. *Indian J Dermatol Venereol Leprol*. 2011;77(2):251.
13. Millard DR. In: *Midline forehead skin flap*. *Grabb's Encyclopedia of Flaps*. Berish S, editor. Vol. 1. Philadelphia, PA, USA: Lippincott Williams and Wilkins. 2009:99-100.
14. Kim KP, Sim HS, Choi JH, Lee SY, Lee DH, Kim SH, et al. The versatility of cheek rotation flaps. *Arch Craniofacial Surg*. 2016;17(4):190.
15. Burget GC, Menick FJ. The subunit principle in nasal reconstruction. *Plast Reconstr Surg*. 1985;76(2):239-47.

**Cite this article as:** Chaudhary D, Soni A, Agarwal S, Kumawat JL. A retrospective study to analyze local flaps for coverage of facial defects. *Int Surg J* 2020;7:4052-8.