

AESTHETIC RECONSTRUCTION OF FACE FOLLOWING EXCISION OF BASAL CELL CARCINOMA IN A TERTIARY CARE INSTITUTION

Mangesh Kundlik Pawar^{*,1}, Aneesh Suresh^{*}, Ishita Katyal^{*}, Apurva Agrawal^{*} and Suparna N Prerepa^{*}

^{*}Department of Plastic Surgery, TNMC and BYL Nair Charitable hospital, Mumbai. India.

ABSTRACT Introduction: Basal Cell Carcinoma (BCC) is the most common skin malignancy worldwide with the head and neck region affected most commonly. Once the lesion is excised, careful planning is required to choose the appropriate method of reconstruction based on principles of facial aesthetic surgery. This paper discusses the management of BCC of the face with various local reconstructive options used at our institute and their outcomes. **Aims:** This study aims to establish the versatility of local flaps used for facial reconstruction to achieve an optimal functional and aesthetic outcome. **Materials and Methods:** This is a retrospective review of 45 cases of basal cell carcinoma (BCC) involving the face that were treated at our center from 2016 to 2020. All patients underwent surgical excision of BCC followed by reconstruction using local flaps. 28 patients were male and 17 patients were female with a mean age of 56 years. The duration of follow-up ranged from one year to 3 years. **Results:** In our study, the Limberg flap was the reconstructive option in 31.1% of cases. Paramedian forehead flap was used in 22.2% and primary closure was used in 15.6% of cases. Other reconstructive options include glabellar flap and dorsal nasal flap, lid switch flap, shutter flap, Mustarde cheek rotation flap and standard forehead flap. Few instances of morbidity were noted. Glabellar and dorsal nasal flap resulted in loss of nasal radix and trapdoor deformity was noted in Limberg flap used to cover cheek defect. None of the patients had a recurrence. **Conclusion:** Local flaps hold an important place in the plastic surgeon's armamentarium. The treatment can be tailored individually to achieve optimum functional and aesthetic reconstruction.

KEYWORDS Cutaneous Malignancies, Basal Cell Carcinoma, BCC, Local Flaps, Facial Aesthetic surgery

Introduction

Skin cancer is one of the most common cancers in the world and consists of melanoma and non-melanoma skin cancer (NMSC). BCC is the most common skin cancer, and it accounts for >90% of all malignant skin tumours of the head and neck and 75% of non-melanoma skin cancers [1,2]. The most common region

affected are the head and neck due to exposure to ultraviolet radiation and mainly occurs in the elderly due to cumulative exposure during their lifetime [1,2]. The various modalities of BCC treatment are surgical excision, cryotherapy, radiotherapy, electrodesiccation or topical therapies like 5-FU and imiquimod [3]. The ideal surgical treatment for BCC is complete removal either with safety margins or with micrographic control. Once the lesion is excised, and surgical defects are created, careful planning is required to choose the optimal method of reconstruction based on the knowledge and principles of facial aesthetic surgery. This paper discusses the management of BCC of the face with various local reconstructive options used at our institute and its outcomes.

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¹Corresponding author: Mangesh Kundlik Pawar; Department of Plastic Surgery, TNMC and BYL Nair Charitable hospital, Mumbai. India; E-mail: drmangeshpawar@gmail.com

Patients and Methods

This is a retrospective review of all cases of BCC involving the face that were treated at a tertiary care hospital, India, from 2016 to 2020. We assert that all the procedures contributing to this work comply with the ethical standards of the relevant national and institutional guidelines on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008.

Age, sex, site and size of the lesion were noted. Surgery was performed after confirmation of histopathological diagnosis. An intraoperative frozen section was done to examine the tissue margins. We report on the closure techniques utilized after complete excision of the lesion as well as any associated adverse outcome. Depending on the area, size and depth of the resulting defect after tumour excision, various techniques were used as mentioned below.

'Limberg flap' or rhomboid flap is a local transposition flap. Its designed as a parallelogram with 60 and 120 angles. All the sides of the rhomboid are equal. The flap is designed such that the long diagonal falls along the Lines of Maximum Extensibility (LME). This ensures that the scar is well concealed. Limberg flap is one of the most versatile flaps used to achieve defect closure in all areas of the body, especially the face. (See Photo 1)

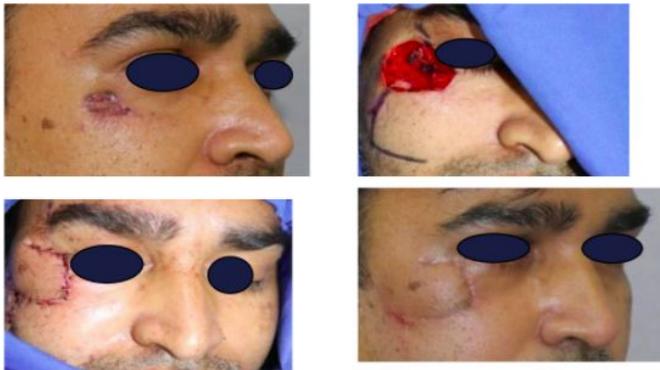


Photo 1 – Cheek defect closure with 'Limberg Flap'. A trapdoor deformity of the healed scar was noted at follow up.

'A glabellar flap' was mainly used for the reconstruction of defects over the root of the nose and medial canthal region [4,5]. Being a versatile flap, it provides skin with good colour and texture match and can be performed under local anaesthesia as a single-stage procedure. Disadvantages include the bulky appearance of the nasal dorsum and medial canthal region due to the thick glabellar skin and scar over the center of the forehead [4,6]. Despite the disadvantages, it is one of the best options for defect closure in this region. (See Photo 2)

'Dorsal nasal flap' was first described by Reiger and moved excess tissue from glabella to the dorsum, sidewall and tip of the nose [7]. It is based on the facial and angular vessels [8]. Skin laxity in this region is assessed by the 'pinch test', which involves grasping the skin between the thumb and index finger [9]. Donor site is closed primarily. Advantages are similar to that of the glabellar flap. Disadvantages are that the depth of the radix may become obliterated, create an iatrogenic epicanthal fold and may require a standing cutaneous deformity (dog-ear) excision [4].



Photo 2 – 'Glabellar Flap' for lesion at left side of root of nose. A Bulge is noted over the healed region.

Dermabrasion can be performed at 6 weeks if necessary [10].

'Cheek rotation flap or Mustarde Flap' is used to reconstruct defects of the cheek, lower eyelid or canthal region. It can cover a large area and has a robust blood supply. Donor site morbidity is minimal, and scars are well hidden within RSTLs. (See Photo 3)



Photo 3 – Cheek defect closure with ipsilateral 'Mustarde Flap' showing good result at 6 months.

'Paramedian forehead flap' was used to reconstruct defects over the nose. It is an axial flap based on the supratrochlear artery [5,11]. The forehead flap provides the ideal match in terms of colour and texture for replacing the skin cover over the nose.

However, forehead flap skin is thicker than the native nasal skin, and hence it does not mould well. This requires modifications like a three-stage reconstruction of the forehead flap instead of a two-stage procedure, intra-operative or post-operative flap

S. no	Age	Sex	Location	Defect Size	Closure Technique	Flap Size	Complications/Morbidity
1	60	F	Nose Dorsum, Ala, Sidewall and tip	10 x 8cm	Paramedian forehead Flap	15 x 10 cm	Lack of nasal contour. Requires further refinement/ thinning
2	41	M	Right Cheek	4 x 3 cm	Limberg Flap	6 x 5 cm	Trapdoor deformity
3	65	M	Right Medial canthus	4 x 4 cm	Glabellar Flap	6 x 5 cm	Bulky Flap and loss of nasofrontal angle
4	26	M	Right Forehead	3 x 3 cm	Limberg Flap	5 x 4 cm	Nil
5	72	M	Left Cheek	12 x 8 cm	Standard Forehead Flap	20 x 10 cm	Skin graft over donor site
6	68	F	Right Nasolabial region	6 x 4 cm	Mustarde Flap (Cheek Rotation)	10 x 8 cm	
7	74	M	Left Forehead	3 x 3cm	Primary closure	-	
8	65	M	Midline forehead	7 x 6 cm	Shutter flap		
9	65	M	Right side root of nose	2 x 2 cm	Glabellar flap	3 x 3 cm	Bulky Flap
10	68	M	Left scalp	3 x 2 cm	Rotation Flap		
11	40	M	Right cheek	4 x 3 cm	Limberg flap	5 x 4 cm	
12	60	F	Nasal tip	2 x 2 cm	Paramedian forehead flap	8 x 4 cm	
13	70	M	Left lower eyelid	3 x 2 cm	Paramedian forehead flap	6 x 3 cm	Bulky appearance of lower eyelid
14	60	F	Root of nose	4 x 3cm	Paramedian forehead flap	5 x 4 cm	
15	56	F	Right temporal	2.5 x 1.5	Limberg flap	3 x 2 cm	
16	65	F	Right preauricular region	3 x 2 cm	Primary closure	-	
17	45	M	Left ala	2 x 2.5 cm	Paramedian forehead flap	4 x 9 cm	
18	70	F	Left nasolabial fold	4 x 3 cm	Primary closure		
19	43	F	Right temporal region	1.5 x 1 cm	Limberg flap	2.5 x 2.5 cm	
20	40	M	Right nasal ala	1 X 1 cm	Nasolabial Flap	3 x 2 cm	
21	45	M	Left Cheek	4 x 3 cm	Limberg Flap	6 x 5 cm	
22	55	M	Left medial canthus	3 x 3 cm	Glabellar Flap	4x 4 cm	Bulky Flap
23	38	M	Left Forehead	2 x 2 cm	Limberg Flap	4 x 3 cm	
24	45	F	Right zygomatic region	3 x 2 cm	Limberg Flap	5 x 3 cm	
25	74	F	Right Upper Eyelid	3 x 2 cm	Lid Switch Flap	1.5 x 2 cm	2-stage procedure
26	65	M	Left scalp	5 x 3 cm	Primary closure		
27	71	F	Dorsum and left side wall of nose	3 X 2 cm	Dorsal nasal Flap	5 x 3 cm	Standing cutaneous deformity
28	60	M	Right scalp	3 x 2 cm	Primary closure	-	
29	48	F	Left cheek	3 x 2 cm	Limberg Flap	4 x 4 cm	
30	50	M	Nasal Dorsum	6 x 3 cm	Paramedian forehead flap	7 x 4 cm	
31	66	M	Left lower eyelid	4 x 3 cm	Paramedian forehead flap	5 x 3 cm	
32	62	F	Root of nose	4 x 3cm	Paramedian forehead flap	6 x 4 cm	
33	68	F	Right temporal	2 x 2 cm	Limberg flap	3 x 3 cm	
34	65	M	Right nasolabial region	5 x 3 cm	Mustarde flap (Cheek rotation)	8 x 6 cm	

35	35	M	Left ala	3 x 2 cm	Paramedian forehead flap	8 x 3 cm	
36	71	M	Right nasolabial fold	3 x 2 cm	Primary closure	-	
37	44	F	Right temporal region	1.5 x 1 cm	Limberg flap	2 x 2 cm	
38	42	M	Right Nasal Ala	1 X 1 cm	Nasolabial Flap	1.5 x 3 cm	
39	41	M	Right Cheek	4 x 3 cm	Limberg Flap	6 x 6 cm	Trapdoor deformity
40	65	M	Left Cheek	4 x 4 cm	Limberg Flap	6 x 6 cm	
41	50	M	Root of nose	3 x 2 cm	Paramedian forehead flap	4 x 3 cm	
42	63	M	Right temporal	2 x 2 cm	Limberg flap	2.5 x 2.5 cm	
43	65	F	Right ala	2 x 2 cm	Nasolabial Flap	4 x 3 cm	
44	40	F	Right nasolabial fold	3 x 3 cm	Primary closure		
45	47	M	Right Nasal Ala	1 X 1 cm	Nasolabial Flap	1.5 x 3 cm	

thinning to achieve the best possible aesthetic result [12,13].

'Nasolabial flap' is typically used to reconstruct small ala and sidewall defects [1,14]. It utilizes cheek skin from the nasolabial fold as a random pattern extension from the cheek flap. As a result, there is minimal landmark distortion during transfer, and the scar is well hidden along the nasolabial fold (2). Also, a nasolabial flap can be used to simulate the convexity of a nasal ala [15,16].

'Shutter flap' was used to close small or large central forehead defects [17]. This method modifies the Kazanjian and Converse technique where superiorly based flaps are raised bilaterally and moved towards the midline, akin movement of a camera shutter [18].

Lower lid sharing or lid switch is used for full-thickness defects of 30 to 60 percent of the upper lid [19-23]. The flap is based on the marginal arcade and is rotated 180° into the upper eyelid. The minimum flap height should be 5mm to include the inferior marginal arcade and is done in a staged manner. The advantages include 'like for like' reconstruction and the possibility of retaining eyelashes [24]. Lid switch flap is similar to the Abbe-Estlander flap described for the lip to reconstruct lips.

Results

A total of 45 patients with BCC were treated from 2016 to 2020 (Table 1). None of the patients presented with recurrence. No flap loss was observed. The mean age was 56 years (range 26-74 years, standard deviation 12.66 years). Twenty-eight (62%) patients were male, and seventeen (38%) were female.

All lesions were sent for intra-operative frozen section to ensure precise resection at the margins as well as the base. Patients were followed up for about 1 year, depending on the time of presentation.

Limberg flap was the reconstructive option in 14 patients (31.1%), paramedian forehead flap was the option in 10 patients (22.2%), and primary closure was suitable in 7 patients (15.6%). These were the most commonly used options to achieve defect closure (69%). Other flaps, which were used sparingly but remained an important part of reconstructive armamentarium, include nasolabial flap in 4 patients (8.9%), glabellar and dorsal nasal flap in 4 patients (8.9%), Cheek rotation or Mustarde flap in 2 patients (4.4%) and Shutter flap, scalp rotation flap, lid-sharing and standard forehead flap in one patient each (8.9%).

Few patients encountered some deformity at their well-healed defect region as follows. In patients with Glabellar and dorsal nasal flap, a bulge was noted at the healed defect site with the loss of nasal radix. In addition, trapdoor deformity was observed in the limberg flap performed over the cheek region. The rest of the patients had no morbidities related to their healed scars.

Discussion

BCC are usually slow-growing and indolent lesions and often treated with 'Mohs Micrographic surgery' or complete excision with margins and intraoperative frozen section could be utilized [25, 26]. Micrographic surgery results in a defect with 45° bevelled edges [25, 26]. Failure to correct this bevelled edge at the reconstruction time may be a barrier to precise wound apposition. Hence freshening of wound edges is required prior to reconstruction to achieve a superior aesthetic outcome. Given the low recurrence rate, the procedure that achieves the most aesthetically pleasing result is selected.

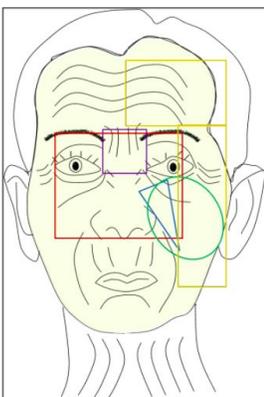
Achieving aesthetic surgical outcomes after reconstruction requires knowledge of facial aesthetic regions. The size and location of the defect and the structures adjacent to the defect are assessed to determine where tissue can be recruited for construction without adversely affecting adjacent structures. When possible, scars should be positioned at the border of aesthetic units to provide the best camouflage. When scars cannot be placed in borders of aesthetic units, they are aligned parallel to relaxed skin tension lines (RSTLs). RSTLs result from the intrinsic elasticity of the skin and are perpendicular to the lines of maximum extensibility (LMEs). Therefore, wound closure oriented in an axis parallel to RSTLs results in less wound closure tension and more favourable scar camouflage [27]. (See Figure 1)

The Limberg flap was the reconstructive option in 31.1% of cases in our study. Paramedian forehead flap was used in 22.2%, and primary closure was used in 15.6% of cases. Other reconstructive options include glabellar flap and dorsal nasal flap, lid switch flap, shutter flap, Mustarde cheek rotation flap and standard forehead flap. (See Figure 2)

In a similar study conducted by Rao et al. in an Indian population, paramedian forehead flap was used as a single modality treatment following excision of BCC over face [2]. In the study by Goldman et al., a nasolabial flap was the reconstructive option



Figure 1 - Relaxed skin tension lines.



	Limberg Flap (31.1 %)
	Paramedian Forehead Flap (22.2 %)
	Dorsal Nasal Flap and Glabellar Flap (8.9 %)
	Nasolabial Flap (8.9 %)
	Cheek advancement Flap (4.4 %)

Figure 2 - Percentage wise distribution of various flaps utilized for defect closure.

in 76.9% of cases. A bilobed flap was used in 11.5%. Other flaps used for defect closure were a Rintala flap, tunnelled island flap and frontal flap [1].

In another study by Wollina et al., retrospective analysis of 321 cases of BCC was reported with primary closure possible in 105 tumours, advancement flaps used in 91, rotation flaps in 47, transposition flaps in 34 and combined procedures in six cases. In 36 patients, full-thickness skin grafting (FTSG) was used, and in two patients, healing by secondary intention was preferred [28].

Conclusions

In conclusion, our study demonstrates the versatility of local flaps for defect closure on the face. A plastic surgeon should be well-versed in the basic reconstructive principles, and these diverse local flaps hold an important place in the surgeon's armamentarium. This will enable us to achieve the best possible functional and aesthetic results. Furthermore, the treatment can be tailored to obtain optimal results and avoid complications.

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Conflict of interest

There are no conflicts of interest to declare by any of the authors of this study.

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