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Aesthetic outcome of different subunits of face with various modalities of reconstruction in facial basal cell carcinoma

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Abstract---Background: The incidence of basal cell carcinoma(bcc) involving face is on rise. One of the most promising therapies to this tumour is excision, which leaves a defect that has to be reconstructed in a way that would bring the best possible aesthetic and functional outcome. Aesthetically face is classified into many subunits, each contributing cumulatively to the final appearance of face. Reconstructing these subunits after the excision of bcc to impart a near normal appearance is a very challenging task. The outcome depends on various aspects like the skin type, photodamage, the subunit involved and the type of reconstruction. Aim: This study aims to assess the effect of skin type, photodamage, the site of bcc and the type of reconstruction on the aesthetic outcome through modified Vancouver scar scale scoring system. Material and methods: A prospective study was conducted on 53 patients with facial basal cell carcinoma from February 2020 to February 2022. Patients were classified into Fitzpatrick types. Photodamages were assessed. Keloidal tendencies were ruled out. Aesthetic outcome of primary closure, Grafts, local flaps from the same, adjacent and far subunits into different subunits were statistically assessed through modified

Vancouver scar scale at 1 and 6 months by two plastic surgeons and the patient him/herself. Results: Twelve subunits of face with bcc were studied with 14 types of reconstruction including primary closure, full thickness graft, local flaps- advancement, rotation, transposition and axial flaps. Primary closure was most suitable for small defects of up to 1.5 cm in the upper eyelid lower eyelid and inferior orbital subunit, as the subunit itself is aesthetically favourable due to good pliable tissue, even the local advancement flaps and axial flaps had near normal appearance and was statistically significant. Nose was the most unfavourable subunit. At 1 month advancement, rotation and axial flaps, most of the local flaps had high scores being unpleasant aesthetically. At 6 months advancement and rotation flaps improved in appearance whereas axial flaps remained poor. Conclusion: The aesthetic outcome after the reconstruction of post bcc excision defect depends not only on the type of reconstruction, but also on the recipient subunit of face involved, the donor subunit, the type of skin and the photodamages, the skin has sustained.

Keywords---aesthetic outcome, different subunits, face, various modalities, reconstruction facial.

Introduction

Basal cell carcinoma (BCC) is a non-melanoma form of skin cancer that in 80% of all cases occurs within the cervicofacial area¹. In general, the risk for development of NMSC is associated with UV solar radiation exposure and the patient's skin type. Fair-skinned individuals who frequently burn and never tan (Fitzpatrick skin types I) are at a much higher risk for developing NMSC than their darker-skinned, rarely burning individuals². Sun-exposed areas of the head and neck are the most common anatomic locations involved in BCC⁷. Excision of malignant skin lesions located on the face with safe margins and adequate reconstruction can present a challenge to the surgeon. The primary objective is the excision of the lesion with oncological margins to preserve the function of the affected organ while seeking the best possible cosmetic result³. Current treatment modalities for skin cancers and premalignant lesions include surgical excision, electrocautery, curettage, cryotherapy, and irradiation, but surgical excision has been reported to be the best treatment modality for cancer treatment and preventing recurrence⁴. There are several reconstruction options after excision of skin tumours in this region of the face including primary repair, skin graft, local flap, regional flaps, distant and free flaps. The choice of reconstructive procedure is dependent upon several factors, including size, location, involvement of deeper structures, etc. Primary repair is used in small defects less than 2 cm when there is no tension on the edges of the defect. Depending on the donor site and the needs of the patient graft can be split-thickness or full-thickness. A split-thickness skin graft contains epidermis and a variable amount of dermis. A full-thickness skin graft includes all of the dermis as well as the epidermis. In skin grafts, the aesthetic outcome can be poor due to colour and texture mismatch of the transplanted skin. Flaps are classically categorised based on their vascular supply, composition, method of

transfer and design. Proper execution of facial reconstruction also relies on appropriate analysis and characterization of the defect⁴. Maxillofacial trauma has experienced an increase in number in the last decade. Though a number of studies have been done on pattern, incidence and cause of maxillofacial trauma in various local populations in India, no systematic review of the pattern and cause of maxillofacial trauma in India has been done. Hence, the purpose of this systematic review is to present the epidemiologic data on pattern of maxillofacial trauma in India. There are limited data on the aesthetic, functional and morphological outcomes of surgical treatment of facial basal cell carcinoma (BCC). Selecting the appropriate technique for surgical incisions, and reconstruction of facial defects after skin tumour excision has always been one of the surgeon's biggest concerns. The aim of the treatment of BCC is to eradicate the tumor. Surgical excision is the most effective treatment with the lowest overall failure rate. Around the world, therapeutic management of BCC depends on a variety of factors, the most important being tumor size, anatomic location, clinical and pathological sub type of the tumor, disease history, patient's age, and comorbidities⁶. The principle of aesthetic units and subunits of the face is the key concept driving facial reconstruction. Defects should be reconstructed with tissue from the same esthetic unit or subunit to optimize the match. The outcome of surgical excision of BCC is the formation of a scar. Scar assessment scales exist to evaluate the quality of the scar. Among these, the Patient and Observer Scar Assessment Scale (POSAS), Vancouver scar scale validated and reliable scale designed for the evaluation of all types of scars by professionals and patients^{8,9,10,11}.

Materials and Methods

A prospective observational study of Fifty-three cases of facial basal cell carcinoma were done from feb 2020 to feb 2022. All cases of facial BCC irrespective of age were included. Those not willing to take part in the study. Those with keloidal tendencies, Recurrent cancer, history of corticosteroids or chemotherapy, presence of comorbidities such as uncontrolled diabetes, lupus erythematosus scleroderma, and patients with defect >4 cm were excluded. Patients consent was taken and each subunit involvement of bcc was studied with respect to the size of lesion, type of skin, photodamage, the pliability of donor and recipient subunits. Each subunit was reconstructed with known optimal local flaps from same and different subunit including advancement, rotation, transposition and axial interpolation and transposition flaps according to the size of the defect after excision with sufficient margin as per the size of the tumour and when the frozen section of the lesion showed negative of tumour at the margin. At 1 and 6 months postoperatively, the patients' aesthetic condition and function were examined. Aesthetic assessment was performed by patient and two plastic surgeons using the Vancouver Scar Scale (VSS). The VSS consists of four parameters: pigmentation, vascularity, pliability, and height. The highest possible score is 13, indicating the worst scar condition, whereas a lower score indicates a more desirable scar. Descriptive statistical tests (like percentage, proportion, central tendency, standard deviation) and inferential statistics like chi square test and one sample t test were used to conclude on the results.

Results

A total of 53 study subjects were enrolled for the purpose of the study and analysed .

Table 1: Distribution of study subjects based on the Social Profile

Social Profile		Frequency	Percentage
Gender	Male	41	77.3%
	Female	12	22.7%
Age Group	30-40	6	11.4%
	41-50	23	43.4%
	51-60	15	65.2%
	Above 60	9	17.0%

In the present study nearly 77.3% of the respondents were Male and 22.7% were Female . Nearly 65.2% of them were aged between 51-60 years , 43.4% of them were aged between 41-50 years of age and 17% of them were above 60 years of age .

Table 2: Distribution of Study subjects based on types of Base cell carcinoma

Social Profile		Frequency	Percentage	P value
Types of BCC	Nodular	15		0.552
	Nodulo Ulcerative	13		
	Superficial	9		
	Pigmented	16		
Fitzpatrick	Type 3	20		0.36
	Type 4	33		
Site	Upper eyelid	2		0.004
	Lower eyelid	6		
	Medial canthus	2		
	Inferior orbit	2		
	Cheek	6		
	Lobule of nose	12		
	Ala of nose	4		
	Lateral nasal wall	2		
	Forehead	9		
	Preauricle	4		
	Auricle	2		
	Cheek-nose	2		
Reconstruction Type	Primary closure	6		0.080
	Full thickness flap	2		
	v-y plasty	4		
	Limberg flap	10		
	Bilobed flap	2		
	Cheek rotation flap	4		
	Tenzel flap	2		

	Nasojugal flap	2	
	Nasolabial flap	8	
	Paramedian forehead flap	6	
	Hatchet flap	2	
	Superior brow flap	2	
	o-z flap	1	
	Antia & buck flap	2	

Types of bcc seen were nodular, nodulo-ulcerative, superficial and ulcerative. we had all patients with three and four Fitzpatrick skin pattern as of Indians. Eighteen were of type 3 and 33 were of type 4, which was maximum. When looking at the site of involvement, it is obvious that bcc was more common in the nose, more specifically the lobule of the nose, followed by the forehead. Other subunits involved are the orbit with its subunit, cheek mainly medial malar and pre-auricular region. Two cases of auricular involvement were also seen. Two cases had simultaneous involvement of two different subunits – the nose and the cheek. Various reconstruction techniques ranging from primary closure, skin graft, local flaps, to regional flaps were utilized. All flaps ranged from two- eight in numbers.

Table 3: Site specific scoring at 1 month

site	Patient(1 st month)		Examiner 1(1 st month)		Examiner 2 (1 st month)		p- value		
	<\= 4	>\= 5	<\= 4	>\= 5	<\= 4	>\= 5			
Upper eyelid	2	0	2	0	2	0	0.003	0.00	0.00
Lower eyelid	6	0	6	0	6	0			
Medial canthus	2	0	2	0	2	0			
Inferior orbit	1	1	1	1	1	1			
Cheek	4	2	4	2	4	0			
Lobule of nose	3	9	0	12	0	12			
Ala of nose	0	4	0	4	0	4			
Lateral nasal wall	2	0	2	0	2	0			
forehead	Lateral	6	2	6	2	6			
	Central	0	1	0	1	0			
preauricle	3	1	3	1	4	0			
auricle	2	0	2	0	2	0			
Cheek-nose	0	2	0	2	0	2			

In this study we learn that not only the type of flap influences the aesthetic outcome, but the subunits themselves are aesthetically pleasing that even a primary closure, do not distort the appearance and score is near to the normal appearance. Orbital, cheek and lateral forehead are favourable regions though they are very obvious to look at, the healing of flaps and scars appearance is better compared to nose.

Table 4 : Site specific scoring at 6 months

site	Patient(1 st month)		Examiner 1(1 st month)		Examiner 2 (1 st month)		p- value		
	<\= 2	>\= 3	<\= 2	>\= 3	<\= 2	>\= 3			
Upper eyelid	2	0	2	0	2	0	0.020	0.002	0.00
Lower eyelid	5	1	4	2	5	1			
Medial canthus	2	0	2	0	2	0			
Inferior orbit	1	1	1	1	2	0			
Cheek	5	1	5	1	5	1			
Lobule of nose	4	8	3	9	1	11			
Ala of nose	0	4	0	4	0	4			
Lateral nasal wall	2	0	2	0	2	0			
forehead	Lateral	6	2	6	2	6			
	Central	0	1	1	0	1			
preauricle	3	1	4	0	4	0			
auricle	2	0	2	0	2	0			
Cheek-nose	0	2	0	2	1	1			

At the end of two months the scoring was better for orbit, cheek, auricle and forehead , the scores were still high for the subunits of nose. In all subunits, lateral nasal wall had a better scoring, ala had the poor scoring.

Table 5: Reconstruction wise scoring at one month

reconstruction	Patient(1 st month)		Examiner 1(1 st month)		Examiner 2 (1 st month)		p- value		
	<\= 4	>\= 5	<\= 4	>\= 5	<\= 4	>\= 5			
Primary closure	5	1	5	1	5	1	0.004	0.000	0.000
Paramedian forehead flap	0	6	0	6	0	6			
Limberg flap	6	4	6	4	6	2			
Bilobed flap	0	2	0	2	0	2			
Nasolabial flap	3	5	0	8	0	8			
Hatchet flap	2	0	2	0	2	0			
Tenzel flap	2	0	2	0	0	4			
Full thickness graft	0	2	0	2	2	0			
Superior brow flap	2	0	2	0	2	0			
v-y advancement flap	3	1	3	1	4	0			
Cheek rotation advancement	4	0	4	0	4	0			

flap									
Nasojugal flap	2	0	2	0	2	0			
Antia and buck flap	2	0	2	0	2	0			
o-z flap	0	1	0	1	0	1			

Primary closure of the wound always had a better score near to normal , surprisingly local flaps taken from the same subunit had a very good aesthetic scoring. Among the local flaps , limberg, cheek rotation, superior brow flaps, tenzel, v-y advancement, and nasojugal flap were highly satisfactory. Whereas bilobed flap had an unsatisfactory scoring at first month . nasolabial and forehead flap were highly unsatisfactory at the first month owing to the bulk of the flaps and the subunit with thin skin to which they were applied.

Table 6: Reconstruction wise scoring at six month

reconstruction	Patient(1 st month)		Examiner 1(6th month)		Examiner 2 (6th month)		p- value		
	< \= 2	> \= 3	< \= 2	> \= 3	< \= 2	> \= 3			
Primary closure	5	1	5	1	6	0	0.007	0.002	0.000
Paramedian forehead flap	1	5	0	6	0	6			
Limberg flap	7	3	7	3	8	2			
Bilobed flap	2	0	2	0	1	1			
Nasolabial flap	1	7	1	7	0	8			
Hatchet flap	2	0	2	0	2	0			
Tenzel flap	2	0	1	1	0	4			
Full thickness graft	0	2	0	2	0	2			
Superior brow flap	1	1	1	1	1	1			
v-y advancement flap	3	1	4	0	4	0			
Cheek rotation advancement flap	4	0	4	0	4	0			
Nasojugal flap	2	0	2	0	2	0			
Antia and buck flap	2	0	2	0	2	0			
o-z flap	0	1	1	0	1	0			

Nasolabial and paramedian forehead flap did not improve or score near normal even after 6 months time. Bilobed flap appearance improved and the score was near to normal. Superior brow is another transposition could not reach to near normal after 6 months.

Discussion

Basal Cell Carcinoma (bcc) is characterized by being locally invasive with rare metastases and arises from basal cell of the epidermis^{12,13,14}. 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, mainly due to cumulative sun exposure over long time¹¹. It is often observed in the head and neck areas, especially the eyelid and nose. It is more common in males^{15,16}. In this study most of the patients were between the age 40- 60 years. Many lines of treatment have been practiced including surgical excision, radiotherapy, electro-dissection, Mohs technique, cryosurgery and curettage¹⁷. Surgery is still considered the main line of treatment with better outcome^{9,10}. Challenges in periocular reconstruction following the excision of cutaneous malignancy include providing stable eyelid margin, symmetry, smooth internal surfaces, adequate eyelid closure to avoid exposure sequelae, restoring normal tension and providing sufficient horizontal and vertical eyelid dimensions for maximal function. Orbital part of face has a characteristic skeletal frame work, remaining within the coronal facial plane with enough soft tissue covering the cavity and providing fullness to the orbital socket. The adequate pliable tissue in this region is again an advantage in using the lower most rungs of the reconstructive ladder. When compared to the most commonly involved nasal subunits, the orbital subunits including the eyelids canthi and inferior orbital, all the modality of reconstruction including primary closure, local flaps from immediately adjacent flaps and the axial transposition flap had a better scoring, patient satisfaction and scar camouflage. In contrast to the nose where the axial interpolation flaps had a very poor scoring and more patient dissatisfaction. Most of nasal skin is of the sebaceous type. The skin covering the bony parts is relatively mobile, while the skin over lower nasal parts is thicker, and adherent to the cartilage¹⁸. Being the most prominent part of face protruding above the coronal plane of rest of the face with thicker skin and close attachment with the underlying structures makes it difficult to achieve a convincing reconstruction¹⁹. Most common site of bcc is nose²⁰.

Likewise in this study too, it was nose with 18 cases and lobule being the most common with 12 cases. local flaps like rotation and advancement from the nasal subunits provided good result whereas, local flaps from other subunits always distorts the subunits of nose and also, do not match the thickness of the nasal tissue. They provide a bulkier flaps to the nose hence acceptance is on lower side. Among the different nasal subunits, the lateral nasal unit had the comparatively better scoring and patient satisfaction. Cheek involvement is not uncommon in this study, 6 cases were there, 4 at the sub-orbital region and 2 at the medial cheek. Mustarde rotation advancement flap was considered for suborbital lesions as all were more than 2 cm and all had a very pleasing appearance as early as one month. Choi et al. suggested that a lateral cheek rotation flap is preferred for cheek defects, as it has a similar tissue texture to the defect area and requires less time intraoperatively¹⁸. Likewise flap from the cheek subunit with similar colour thickness and consistency blended with the defect and had a near normal scoring and good patient satisfaction. Two medial cheek defects were reconstructed with limberg flap. Though they were scoring high at one month they scored well and were highly satisfactory at the end of 6 months.

Pre-auricular subunit which is again a part of cheek has a slightly hidden from the prominent portion of face and like other cheek subunit it scores well with local advancement and rotation flaps. Early scoring is good and patient satisfaction is also fair. In the forehead region lateral forehead subunit is another favourable site where local advancement rotation flaps do produce better scoring and aesthetically pleasing appearance. In contrast to the lateral subunit, the central subunit is a more obvious in appearance ,any local flaps including rotation or advancement have a obvious scar and the scores are moderate and patient satisfaction was low. Auricle which is least involved in the study had small lesion which was treated with antia and buck advancement. Though there was some reduction the size of the ear the scar was almost nonobvious and gave a no-scar appearance and had good patient satisfaction Lastly, there were two cases where in two different region subunits were simultaneously involved and was reconstructed with a single flap. There was loss of obvious structural angles and patient was dissatisfied with the final appearance . but the overall score was moderate and patient had some amount of acceptance. While considering the graft , it always has a very high score and unpleasant appearance due wide contrast in the colour and excessive contraction . the appearance was unacceptable by both patients and examiners. Patients in this study are of fitzpatrick type 3 and 4 . it was seen in the study that patients with fitspatrick 3 had obvious scarring and high scores compared to the type 4. and patients with photodamage had higher scores compared to patients without. type 3 patients with photodamage were more affected aesthetically. It was observed that orbit and cheek were most favourable subunits and any type of reconstruction including primary closure, local flaps or interpolation flaps had good scoring and paitient satisfaction.at the same time, flaps from same subunit had good scoring than from other subunit due to match in all characteristics of soft tissue. It was seen in these patients had photodamage of their skin which imparted more scarring and pigmentation to the flap and unsightly appearance.

Conclusion

The ideal facial reconstruction should provide a good colour and texture harmony with adjacent tissues. Optimal aesthetic reconstruction of facial defects is dependent on the availability of donor sites with similar colour, texture, sebaceous quality, and thickness to the defect tissues.

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