

Cheek advancement flap for nasal reconstruction following surgical excision of basal cell carcinoma: early outcome and patient satisfaction

Emad M. Abdelrahman^a, Ahmed A. Shoulah^a, Sara O. Ghazal^b, Manal K. Nchoukati^b, M. Ashraf Balbaa^c

^aDepartment of General Surgery, Faculty of Medicine, Benha University, Benha,

^cDepartment of General Surgery, Faculty of Medicine, Menoufia University, Menoufia, Egypt, ^bDepartment of General Surgery, Medicine Program, Batterjee Medical College for Science and Technology, Jeddah, Saudi Arabia

Correspondence to Emad M. Abdelrahman, MD, Fareed Nada Street, Benha City 13518, Egypt. Tel: +20 102 481 2333/20 122 676 3986; fax: +20133213511; e-mails: emadsahan301@gmail.com, emad.sarhan@fmed.bu.edu.eg

Received: 15 November 2020

Revised: 18 December 2020

Accepted: 18 December 2020

Published: 18 May 2021

The Egyptian Journal of Surgery 2021, 40:322–329

Background

Many reconstructive techniques have been used for reconstruction of the nose after wide excision of basal cell carcinoma (BCC) with variable esthetic outcome. Patient satisfaction is a crucial determinant of the reliability of any reconstructive technique.

Aim

The aim of this prospective clinical study was to evaluate the cutaneous cheek advancement flap as a reliable method for nasal reconstruction following wide excision of BCC regarding early postoperative complications and patient satisfaction.

Patients and methods

The current study included 51 patients with BCC at side of nose who are eligible for wide excision and immediate reconstruction using cutaneous cheek advancement flap. Follow-up was planned for 3 months to report early postoperative complications. Esthetic outcome was assessed using Likert score and Vancouver's scar scale.

Results

The age of the included patients ranged from 46 to 63 years. The current study showed wound infection in 3.9% of patients, seroma occurred in three patients, whereas hematomas occurred in two patients. No total flap loss was reported, whereas partial flap loss occurred in one (1.9%) case. The patients' overall satisfaction was good, and only two (3.9%) patients showed poor esthetic outcome. There was a strong positive correlation between patients' evaluation and independent surgeons' assessment ($r=0.922$).

Conclusion

According to the current results, cheek advancement flap is a feasible and simple method for reconstruction of medium-sized and large-sized defects in the side wall of the nose with minimal postoperative complications and excellent esthetic outcome.

Keywords:

basal cell carcinoma, cheek advancement flap, reconstruction

Egyptian J Surgery 40:322–329

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1110-1121

Introduction

Basal cell carcinoma (BCC) is the most common malignant cutaneous tumor. It represents ~75% of all skin cancers [1]. The accurate incidence of BCC is significantly underestimated as BCC cases are not routinely recorded by cancer registries, and this is assumed to be owing to large number of cases and histopathological examination is not done for all excised lesions [2]. BCC affects mainly adults and elderly people. The male to female ratio is 2 : 1 [3]. Approximately 80% of all BCC cases occur on the face, and 25–30% of these tumors are found on the nose, with 2.5 times higher incidence of recurrence after excision [4].

BCCs are presented as slowly growing nodular skin lesion or as an ulcerated lesion, and this clinical presentation is the cornerstone of diagnosis. Addition of dermatoscopic findings increases the

accuracy of diagnosis up to 98.2%. Tumor biopsy is retained for ambiguous lesions or when the diagnosis is uncertain [5,6].

BCCs are classified into difficult to treat and easy to treat. According to the risk of recurrence, BCCs can be classified into low-risk and high-risk lesions. High-risk BCCs include all difficult-to-treat subtypes, whereas low-risk BCCs include easy-to-treat ones. The risk of recurrence increases with perivascular or perineural involvement and in immunocompromised patients [7]. BCCs of the nose are classified to be high-risk BCCs owing to their anatomical considerations and

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problems in presurgical identification of tumor margins [8]. Standard two-dimensional (2D) surgical excision of BCCs or microscopically controlled surgery (three-dimensional) are the main lines of treatment with preferable three-dimensional excision in recurrent BCCs, high-risk BCCs, or BCCs located in critical anatomical sites [9].

Nasal reconstruction is a challenge owing to the multiple nasal convexities and concavities. Small-sized lesions can be excised with primary closure of the defect; however, medium and large defects are better to be reconstructed using local flaps, grafts, or combined methods. Many types of local flaps can be used for this reconstruction. Advancement flaps are considered important reconstructive methods following excision of cutaneous tumors, with favorable esthetic outcome [10]. Many factors affect the decision of using these flaps, including skin laxity, texture, color, and defect size and depth [11]. When considering an advancement flap, proper plan and design is required to ensure adequate tissue reservoir for the donor site. Moreover, suture lines should be along skin tension lines [12].

Cheek advancement flap is a simple method that is assumed to be a method of reconstruction for medium-sized and larger defects of the nasal side wall [13].

Although there are many types of local flaps that can be used for nasal reconstruction, some are very complex in design, cannot cover large-sized defects, or may leave a permanent donor site scar. These have motivated the authors to evaluate cheek advancement flap regarding postoperative complications and esthetic outcome.

Patients and methods

Study design

The current prospective study was conducted at the Surgery Department, Benha and Menoufia University Hospitals, throughout the period from January 2019 till August 2020. The study protocol was approved by ethical and research committee, of both institutes. A written informed consent was obtained from all participants after full explanation about the study design and possibility to use intraoperative or postoperative pictures.

Patients

The study included 51 adult patients who presented with BCC at side of nose who were eligible for wide local excision and immediate reconstruction of the nose using cutaneous cheek advancement flap. Exclusion criteria included patients with BCCs that are crossing

the midline or eroding the nasal cartilage or bone. Patients with central nasal lesions were also excluded. Preoperative assessment for all participants was done including complete medical history taking and detailed general and local assessment. Tissue biopsy was obtained when the diagnosis was uncertain or in ambiguous lesions.

Surgical technique

For all participants, preoperative marking of the lesion and the appropriate 2D safety margin was determined to be 5–10 mm. Then cutaneous cheek advancement flap design was performed by marking a transverse line over the infraorbital margin and another line along the nasolabial fold (Fig. 1a).

Under general anesthesia, complete excision of the tumor was done, with ~5–10-mm safety margin (Fig. 1b). Microscopic oriented safety margin was done when we were not sure about safety margin, and then proper hemostasis was performed. Flap dissection was carried on in the subcutaneous plane till proper mobilization was achieved. Simple advancement was done till it reached the farthest edge of the defect without tension and with proper care about its vascularity (Fig. 1c). Closure of the defect was performed using simple sutures (Fig. 1d).

Immediate postoperative management included prophylactic antibiotic therapy, analgesics, and antiedematous drugs. Postoperative follow-up with reporting of any flap loss either partially or totally was done. Moreover, seroma, hematoma, wound dehiscence, or infection was reported.

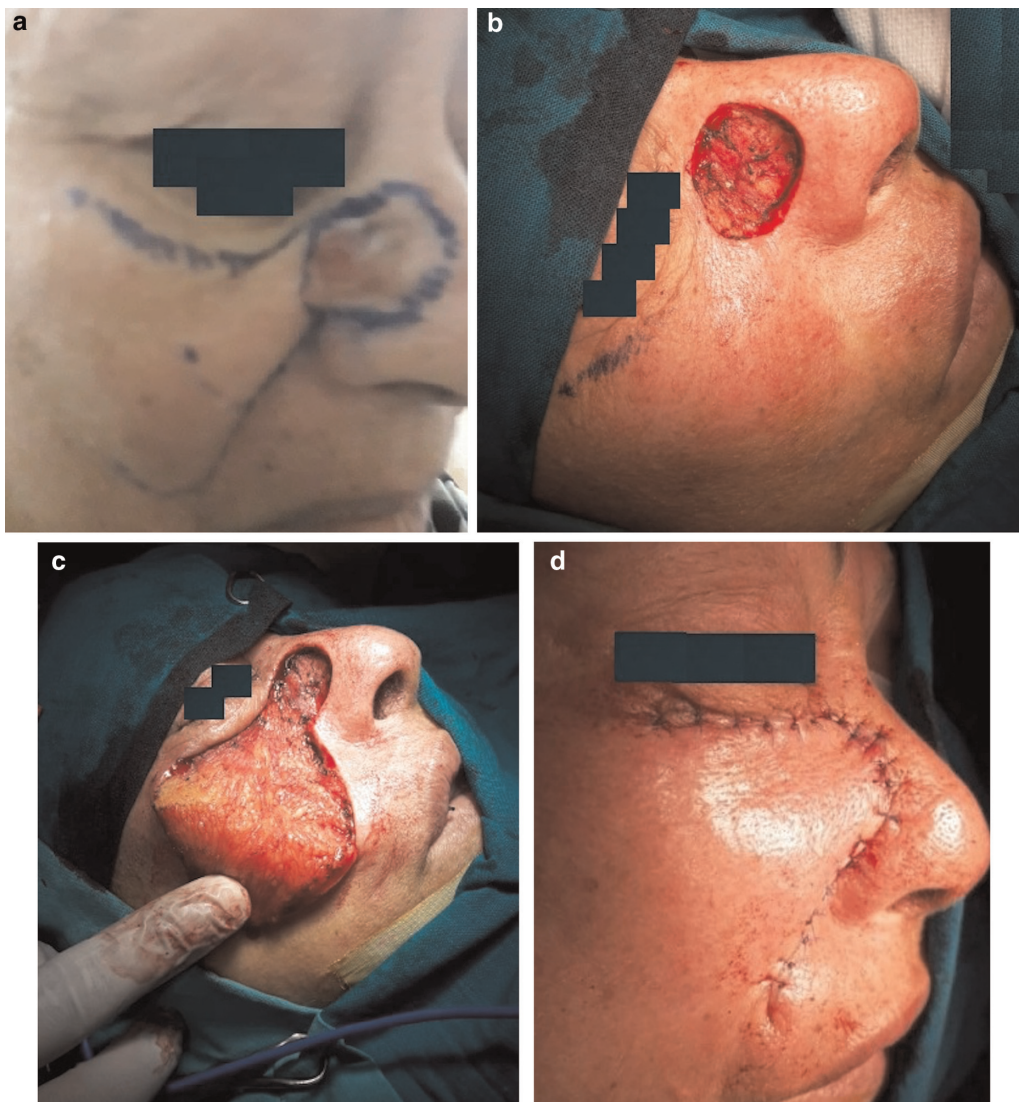
This close follow-up was performed for at least 3 months for postoperative complications. Moreover, the early esthetic outcome was reported (Fig. 2a and b).

Assessment

The study's primary outcome was proper surgical excision of the tumor with appropriate safety margin and successful closure of the defect using cheek advancement flap without major early postoperative complications.

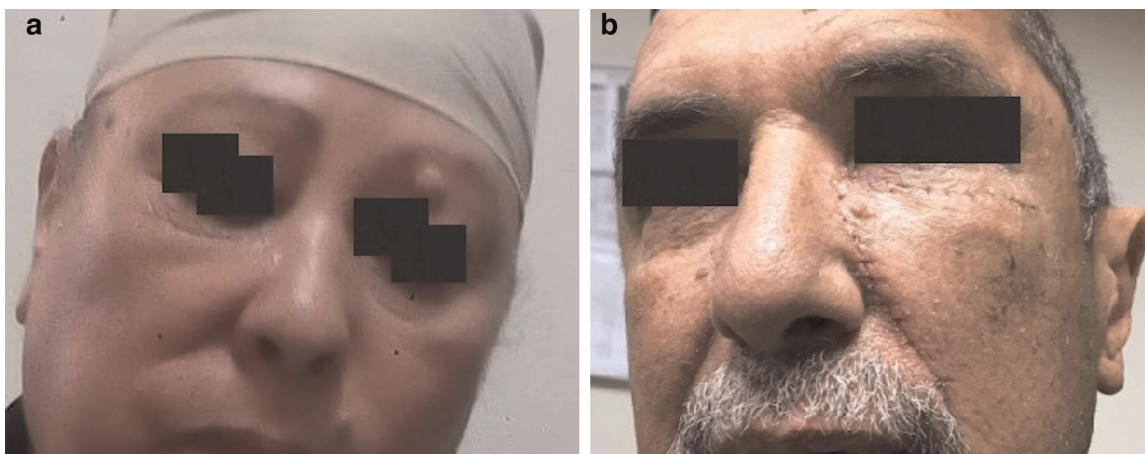
The secondary outcome was to achieve favorable patient satisfaction and good esthetic outcome. The assessment of patient satisfaction was achieved by Likert scale [14], which is the most commonly used survey scale for assessment of patient satisfaction since 1932 up till now. In this assessment, patient questionnaire regarding facial symmetry, the scar appearance, keloid, pigmentation, and finally, the

Figure 1



Operative steps. (a) Flap design. (b) Excision of BCC with safety margin. (c) Mobilization of flap. (d) Closure of defect by flap. BCC, basal cell carcinoma.

Figure 2



(a) Early esthetic outcome after 3 month of a 61-year-old female patient. (b) Early esthetic outcome after 1 month of a 54-year-old male patient.

eye opening was simply presented as a five-point score (1=excellent, 2=good, 3=fair, 4=poor, and 5=bad). On the contrary, esthetic outcome was obtained by assessment of the final scar appearance. This was done by three independent plastic surgeons using Vancouver's scar scale [15,16], which assesses the scar according to four main categories: vascularity, pliability, pigmentation, and height (Table 1). Total score ranges between 0 (normal skin) and 13 (the worst imaginable scar).

Statistical analysis

Quantitative parameters were described using range (minimum and maximum), mean, and SD, whereas qualitative parameters were described as frequency with percent. SPSS-21 (Statistical Package for Social Sciences, version 21, Armonk, NY: IBM Corp., USA) was used. Relation between related variables has been assessed by measuring correlation coefficient. One-way mixed analysis of variance was used to compare between measured variables, and the significance level was set at *P* value less than or equal to 0.05. Rank correlation coefficient (*r*) was used to measure Person's linear correlation between quantitative variables, namely, VSS and patient satisfaction.

Results

In the current study, 51 patients were recruited, with a mean age of 55.29 ± 5.01 years (range, 46–63 years). A total of 30 (58.8%) patients were males, whereas

21 (41.2%) patients were females. Table 2 includes the encountered comorbidities and tumor characteristics of the enrolled patients. Postoperative histopathological examination revealed that all the excised tumors were BCC. The diameter of the excised tumors ranged from 16 to 23 mm, with a mean of 18.53 ± 2.01 . All the tumors have been excised with a clinical safety margin that ranged from 7 to 10 mm, and a mean of 7.63 ± 0.66 , relevant to the original tumor size. Histopathological examination confirmed a pathological safety margin that ranged from 3 to 7 mm, with a mean of 5.27 ± 1.02 . There was a statistically significant difference between clinically and histopathologically assessed safety margin ($P < 0.001$). The tumor excisions revealed a defect size ranged from 30 to 43 mm, with a mean of 33.82 ± 2.93 . Table 2 also includes the number of patients who have encountered immediate postoperative complications such as seroma or hematoma formation, wound dehiscence, partial or total flap loss, or keloid formation (Fig. 3).

Using Likert scale [14], patients' satisfaction was evaluated. Patients were evaluated from excellent to poor, with the highest percentage was good (56.9%) and least was poor (3.9%). The esthetic outcome using Vancouver's scar scale ranged from 1 to 7, with a mean of 3.33 ± 1.32 (Table 3). As shown in Fig. 4, there was a strong positive correlation between patients' evaluation and independent surgeons' assessment ($r = 0.922$).

Table 1 Vancouver's scar scale [15,16]

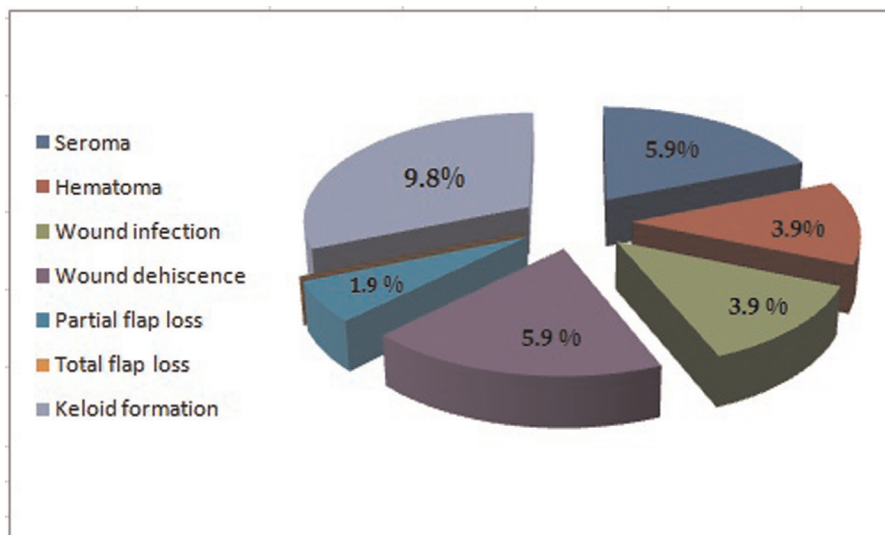
Scar characteristic	Score
Vascularity	
Normal	0
Pink	1
Red	2
Purple	3
Pigmentation	
Normal	0
Hypopigmentation	1
Hyperpigmentation	2
Pliability	
Normal	0
Supple	1
Yielding	2
Firm	3
Ropes	4
Contracture	5
Height (mm)	
Flat 0 <2	1
2~5	2
>5	3
Total score	13

Table 2 Patients' comorbidities, tumor characteristics, and postoperative complications

Parameters	<i>n</i> (%)
Comorbidities	
DM	8 (15.7)
HTN	6 (11.8)
IHD	10 (19.6)
Postoperative complications	
Seroma	3 (5.9)
Hematoma	2 (3.9)
Wound infection	2 (3.9)
Wound dehiscence	3 (5.9)
Partial flap loss	1 (1.9)
Total flap loss	0
Keloid formation	5 (9.8)
Size (diameter in mm) (mean±SD)	18.53±2.01
Defect (diameter in mm) (mean±SD)	33.82±2.93
Safety margin (mm) (mean±SD)	
Clinically	7.63±0.66
Histopathologically	5.27±1.02
<i>P</i> value	<i>P</i> =0.001*

DM, diabetes mellitus; HTN, hypertension; IHD, ischemic heart disease. *Statistically significant.

Figure 3



Postoperative complications.

Table 3 Patients' satisfaction and physician's evaluation

Parameters	n (%)
Patients' satisfaction	
Excellent	14 (27.5)
Fair	6 (11.8)
Good	29 (56.9)
Poor	2 (3.9)
Physician evaluation	
Range	1–7
Mean±SD	3.33±1.32

Discussion

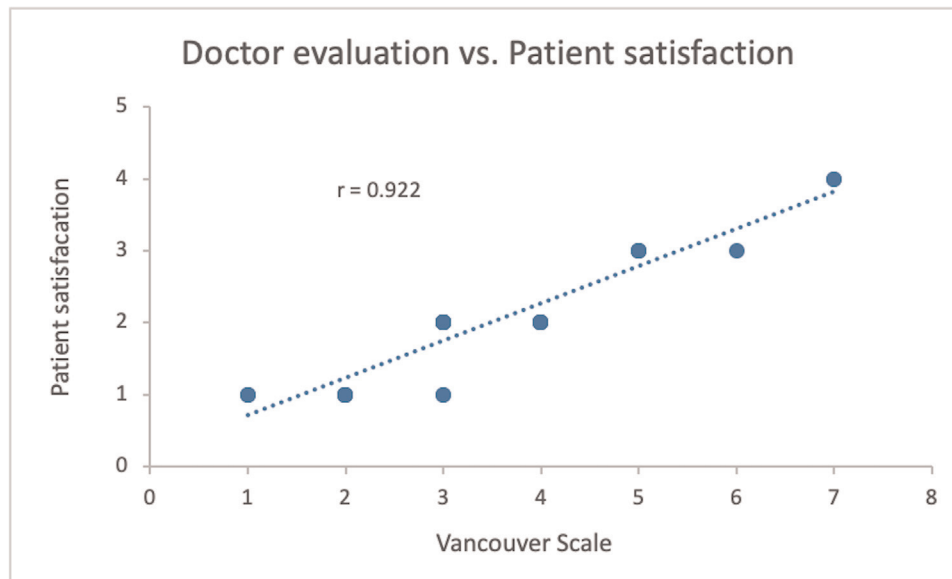
The first ground rule in oncologic surgery is adequate extirpation of the tumor followed by reconstruction. Once excision of the tumor on oncological basis is established, it is the surgeon's role to determine the best method of defect closure or coverage in view of respective patient, tumor, and defect considerations. Proper defect reconstruction provides better functional and esthetic results with minimal potential complications [17].

European consensus-based interdisciplinary guidelines established by multidisciplinary experts from European Organization of Research and Treatment of Cancer, the European Association of Dermato-Oncology and the European Dermatology Forum, have recommended surgical removal of medium-sized and large BCCs. Easy-to-treat BCCs represent ~95% of cases, and standard complete 2D surgical excision is the appropriate treatment. Microscopically controlled surgery is usually done for recurrent BCCs, high-risk BCCs, and BCC in critical anatomical sites [6].

These guidelines recommended 2–5-mm safety margin for low-risk BCCs, whereas for high-risk BCCs, especially when micrographic surgery is not available, a safety margin of 5–15 mm should be applied depending on individual tumor features. On the contrary, the recommended deep margins are down to the level of the fat and down to the fascia, periosteum, or perichondrium in BCCs involving the face [9]. In the current study, the main consideration was not to compromise oncological safety in favor of esthetic outcome. The excised tumor clinical safety margin ranged from 7 to 10 mm, which was quite adequate as per the recommended guidelines. In general, clinical safety margin does not necessarily correspond to the histological safety margin. The current study revealed statistically significant difference between the preoperative clinically determined safety margin and the histopathological safety margin ($P < 0.001$). This may be assumed to be owing to microscopic infiltration that cannot be detected clinically, and also owing to tissue shrinkage after fixation for histopathological examination. Shrinkage of the excised safety margin has been reported also by Kerns *et al.* [18] and Blasco-Morente *et al.* [19], to be 17–20% in length and up to 10% in width. However, up to date, there are no recommendations to support the need for re-excision if histologically free margins are achieved [6].

Many complications may follow nasal reconstruction using facial flaps and usually require prolonged antibiotic therapy or even secondary surgery. These complications usually occur within the first 4 weeks after surgery and include wound infection, wound dehiscence, or even flap loss either partially or

Figure 4



Correlation between physician evaluation versus patient satisfaction.

totally. Those postoperative complications are very crucial in determining the esthetic outcome [20].

The current study showed wound infection in 3.9% of cases, and this is higher than other studies [20–23], which encountered 0.5–2.6% infection rates. This difference can be attributed to inclusion of more simple techniques requiring less dissection and mobilization in their studies and reconstruction of smaller defects than what is reported in our study. In the current study, three patients developed seroma, whereas hematomas occurred in two patients, and this matches the early results of van Onna *et al.* [24], who reported the same incidence of hematomas.

No total flap loss was reported in the current study, but partial flap loss was reported only in one (1.9%) case. In a similar study [24], the authors encountered 2% distal tip necrosis as well. However, in other studies using other facial flaps, as the one performed by Rustemeyer *et al.* [22], they reported 3.4 and 1.7% for total and partial flap loss, respectively. Wollina *et al.* [25], in a review study on 312 patients with nasal reconstruction, have attributed the occurrence of partial flap loss to the presence of associated comorbidities such as diabetes mellitus and atherosclerosis. The low rate of necrosis encountered in cheek advancement flap could be attributed to the feasibility of the cheek advancement flap that depends on the laxity of cheek, which in turn provides enough advancement without tension. In addition, the cheek advancement flap is characterized by relatively a wide base that ensures adequate blood supply even to its periphery.

As the nose is one of the most affected areas by BCC, plastic surgeons should become familiarized with different reconstructive options for this site [12]. Nasal reconstruction presents a unique challenge, as in such reconstruction, both functional maintaining nasal air flow and good esthetic outcome should be achieved [26,27]. A wide variety of techniques have been developed to combine complete tumor removal with good esthetic and functional outcomes [28]. Salgarelli *et al.* [29] used in their study a diversity of flaps to construct nasal defects after tumor excision. They recommended that the anatomical nasal subunits are the main determinant of the selected reconstructive techniques in addition to the other esthetic considerations such as skin color, contour, and texture.

The cheek advancement flap is one of the workhorses in the reconstruction of large defects in the cheek area. It was primarily described by Beare [30] in 1969. It was originally designed as an upward transposition flap. Later on, it was tuned and modified by Mustarde [31], and Schrudde and Beinhoff [32] to have wider indications in facial reconstruction. It can be planned alone or in combination with other flaps like a Glabella rotation flap to reconstruct very large defects [13,25]. In the current study, there was a wider extension of usage of the cheek advancement flap to reconstruct lateral nasal wall defects.

The cosmetic outcome of local flap reconstructions is usually superior to other reconstructive techniques [27,33]. Facial skin scar is usually associated with adverse physical and psychological disturbances in

patients undergoing surgical treatment for cutaneous malignancy with subsequent negative effect on quality of life [34]. In terms of evaluation of the facial scars by using subjective methods, both VSS and patient satisfaction scale had acceptable interobserver reliability [16]. Typical esthetic deficits for local flaps consist of the bulkiness phenomenon and color mismatch between the reconstructed area and the surrounding skin [35].

In the current study, the patients' overall satisfaction was good, and only two (3.9%) patients showed poor esthetic outcome. These two cases have encountered postoperative complications such as wound dehiscence and partial flap loss. These results are comparable and even better to those reported in several studies [22,23,36,37] that assessed the esthetic outcome of other facial flaps. In the current study, there was a significant positive correlation between VSS and patients' satisfaction score ($r=0.922$). This favorable esthetic outcome is assumed to be owing to the design of cheek advancement flap, where all suture lines are designed to be placed along relaxed skin tension lines in consideration to the esthetic units of the nose.

Conclusion

According to the current results, cheek advancement flap is a feasible and simple method for reconstruction of medium-sized and large-sized defects in the side wall of the nose with minimal postoperative complications and excellent esthetic outcome.

Acknowledgements

All authors appreciate the effort of Dr Eman I. Elgendy, Lecturer of Pathology, Benha University, for her dedicated work in intraoperative assessment for safety margin of the excised basal cell carcinoma.

Author contributions: All authors contributed in data acquisition, drafting of the manuscript, and revision of the manuscript. All authors have approved the final manuscript.

Financial support and sponsorship
Nil.

Conflicts of interest

There are no conflicts of interest.

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