Scar hinge flap for inner lining reconstruction of full-thickness defects on the ala of the nose*

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Summary

Background: Reconstruction of inner lining of the nose often requires complex surgical procedures.

Methodology: To evaluate the scar hinge flap as an alternative reconstruction technique, 21 patients with full-thickness defects of the ala who received a scar hinge flap were retrospectively analysed.

Results: Twenty-one patients were included. The average defect size was 1.9 cm^2. Cartilage grafts were used in 11 patients. For skin reconstruction the scar hinge flap was covered by local flaps, interpolated melolabial flaps, full-thickness skin grafts, or paramedian forehead flaps. The mean follow-up was 10.7 months. No severe complications were observed.

Conclusions: The scar hinge flap is a safe and simple technique for reconstruction of the inner lining of the nose although it is limited being a two-stage procedure.

Key words: nose, surgical flaps, reconstructive surgical procedures, dermatologic surgical procedures, skin neoplasms

Introduction

Non-melanocytic skin cancer (NMSC), which includes basal cell carcinoma (BCC) and squamous cell carcinoma (SCC), is the most frequent type of skin cancer and commonly affects the face including its most prominent structure, the nose. Tumour-induced destruction of anatomical features can create difficult reconstructive challenges, especially when the nose with its complex three-layer structure comprising skin, fibrofatty tissue, cartilage, and underlying nasal mucosa that lines the nasal vestibule is affected [(1)]. Full-thickness nasal ala defects represent a reconstruction challenge for the dermatologic surgeon [(2)]. Repair of nasal mucosa is critically important when there is a full-thickness defect because second-intention healing can lead to contraction of the overlying flap, nasal distortion, and airway obstruction [(3)]. A variety of flaps have been designed that allow repair of the mucosal and cutaneous portions of the nasal ala defect in one- or two-step procedures [(4–7)]. Intranasal mucosa from the vestibule, middle vault, or septum may be used in an advancement flap to close the primary mucosal defect; the secondary defect is then allowed to re-epithelialize [(6,8)]. This method requires advanced surgical skills and may not be feasible for large defects. Labial, buccal, or hard palate mucosal grafts are another option, but sloughing and contraction of the overlying flap may complicate these [(9)]. When cartilaginous support is required, a septal hinge flap consisting of mucosa and cartilage is an option, but nasal dorsum collapse may complicate this type of repair [(6)]. Cutaneous hinge flaps from the lateral nasal sidewall, also known as "turn down" flaps, are a simple option for mucosal repair [(2,10)]. Hinge flaps create an additional donor defect on the lateral sidewall of the nose, thus for covering the defect a larger flap may be necessary.

The purpose of this study was to determine the feasibility and safety of a simple alternative technique for reconstructive sur-

gery of small to medium size full-thickness defects of the ala of the nose, the so-called scar hinge flap (SHF).

Materials and methods

Data analysis

A medical chart review at the Department of Dermatologic Surgery at Ruhr-University of Bochum, Germany was performed for patients who had undergone reconstruction of a full-thickness defect of the ala of the nose after microscopically controlled surgery (MCS). This was followed by additional review of the surgical protocols to identify the defects that were reconstructed using a SHF. All surgeries were performed between June 2005 and April 2012. Pre- and postoperative photographs were obtained. The study was conducted in the light of the declaration of Helsinki. Reconstruction of full-thickness defects by any other method than SHF was excluded. The following variables were recorded: patient demographics (age, and gender), histopathological diagnosis of the excised specimen, defect size, the use of cartilage grafts, the time between tumour excision and SHF, the reconstruction technique to cover the SHF, average time for post-operative control, complications, and the aesthetic outcome evaluated by a board certified dermatologic surgeon using an analogous scale (1 = excellent, 2 = very good, 3 = good, 4 = fair, and 5 = bad). Analysis of data was performed using the statistical package MedCalc (MedCalc Software, Mariakerke, Belgium).

Reconstruction techniques

In all patients, MCS was performed to achieve tumour-free margins, which resulted in a penetrating defect of the ala of the nose (Figure 1A). After assessment of the penetrating defect and determination that the patient was capable and willing to undergo reconstructive surgery with a SHF, the defect was measured and an antiseptic gauze was put in the nostril of the affected side serving as a tamponade. For coverage of the skin defect a hydrocolloid dressing was used. Secondary intention healing was started and patient call-in was ordered for continuous inspection of the wound. Once the wound edges showed signs of re-epithelialization, reconstruction with a SHF was initiated (Figure 1B-D). Depending on the size of the penetrating defect, the surrounding scar tissue was cut in a circular fashion (Figure 2B). The scar tissue and surrounding skin were carefully mobilized with blunt tipped scissors following a turn-over of the scar tissue including the epithelialized surface for reconstruction of the inner lining of the nose (Figure 2C). The scar tissue was closed with a purse-string suture (e.g. 6-0 Monocryl®). When a cartilage graft was needed above the SHF, auricular conchal cartilage was tagged (Figure 2D). Depending on the size of the defect and the use of cartilage graft the skin defect was closed with local

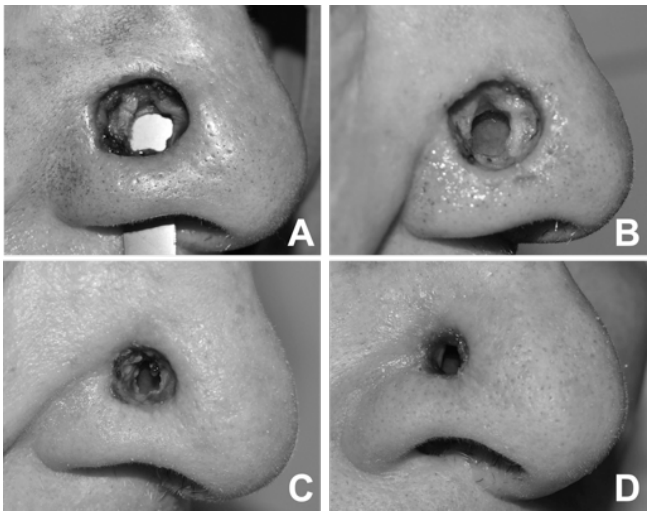

Figure 1. A) Full-thickness defect of the right ala of the nose after microscopically controlled surgery. The wound is allowed to heal by secondary intention. B)-C) Gradual wound closure and epithelialization from the wound edges. D) Sufficient epithelialization of the wound margins.

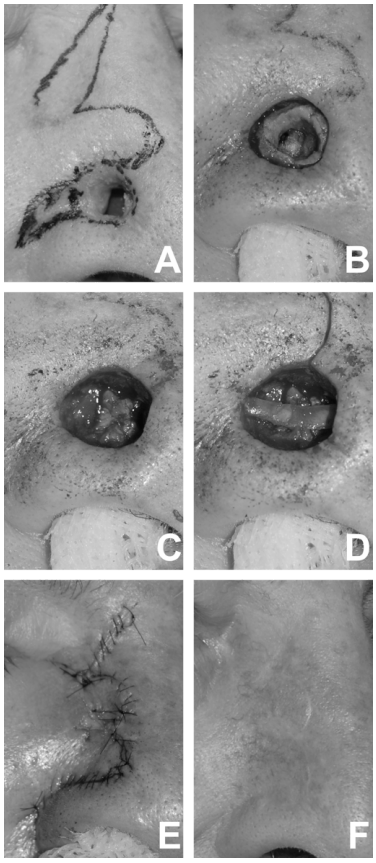

Figure 2. A) bilobed flap is designed to cover the skin defect after reconstruction of inner lining. B) Circularly incision of the fresh scar tissue. C) After blunt mobilization of the surrounding skin the scar tissue including the epithelialized surface for reconstruction of the inner lining of the nose was turned-over. D) Auricular conchal cartilage fashioned as cartilage graft above the scar hinge flap. E) The flap has been trimmed and sutured into the defect site. F) Excellent result 12 months after surgery.

flaps, paramedian forehead flaps, interpolated melolabial flaps, or full-thickness skin grafts (Figure 2A, E, F). All surgeries were performed in local anesthesia with 2% prilocaine. If anxiety was excessive, the patient was sedated with an intravenous benzodiazepine. Antiseptic gauze was used for tamponade of the nose on the affected side for 14 days.

Results

Between June 2005 and April 2012, 21 patients underwent reconstruction of the inner lining of the nose after MCS using a SHF. The average patient age was 70.6 years (range: 54-82 years); six (28.6%) were female and 15 (71.4%) were male. The mean defect size after MCS was 1.9 cm^2 (range: 1-2.7 cm^2). BCC represented 17 (81%) of the treated primary tumours, followed by SCC in four patients (19%). The average time between MCS and preparation of the SHF was 21.5 days (range: 16-29 days). In 11 patients (52.4%) an auricular conchal cartilage was tagged. After reconstruction of the inner lining the above lying defect was closed with local flaps (n = 11, 52.4%), interpolated melolabial flaps (n = 4, 19%), full-thickness skin grafts (n = 4, 19%), or paramedian forehead flaps (n = 2, 9.5%).

All of the patients were followed for a mean of 10.7 (range: 6-18, median: 12 months) months. Treatment-related complications occurred in four patients (19%). The most common complication was bleeding, which occurred in two patients (9.5%). One case of infection (4.8%) and one partial flap necrosis after paramedian forehead flap (4.8%) were seen. Functionality was impaired in one patient (4.8%) who reported ventilation problems after SHF and melolabial flap without cartilage graft. However, he refused any further correction. No severe complications were observed. The aesthetic result was evaluated as excellent in five patients (23.8%), very good in eight (38.1%), good in five (23.8%), and fair in three patients (14.3%) (Table 1).

Table 1. Characteristics and clinical data of 21 patients.

N	21
Mean age, years (range)	70.6 (54-82)
Sex	
Female, n (%)	6 (28.6)
Male, n (%)	15 (71.4)
Tumour	
Basal cell carcinoma, n (%)	17 (81)
Squamous cell carcinoma, n (%)	4 (19)
Skin reconstruction	
Local flap, n (%)	11 (52.4)
Interpolated melolabial flap, n (%)	4 (19)
Full-thickness skin graft, n (%)	4 (19)
Paramedian forehead flap, n (%)	2 (9.5)
Complication	
Overall, n (%)	4 (19)
Bleeding, n (%)	2 (9.5)
Infectious, n (%)	1 (4.8)
Partial flap necrosis, n (%)	1 (4.8)
Ventilation problems, n (%)	1 (4.8)
Aesthetic outcome	
Excellent, n (%)	5 (23.8)
Very good, n (%)	8 (38.1)
Good, n (%)	5 (23.8)
Fair, n (%)	3 (14,3)
Bad, n	0
Mean defect size, cm^2 (range)	1.9 (1-2.7)
Cartilage grafts, n (%)	11 (52.4)
Mean time between surgical procedures, days (range)	21.5 (16-29)
Mean follow-up, months (range; median)	10.7 (6-18; 12)

Discussion

For covering skin defects of the nose, a variety of surgical techniques are available, including local flaps, skin grafts and pedicled flaps [6,11]. As long as the bony and cartilaginous elements of the nasal skeleton remain intact, defect reconstruction is limited to skin coverage. Respecting the aesthetic units of the nose is important to achieve satisfying results.

However, in case of penetrating defects with loss of the inner lining, the reconstruction becomes more delicate as restoring the functional aspect of the nasal mucosa deserves attention. A variety of sophisticated and complex procedures have been described for penetrating defects of different sizes and location of the nose. Examples are the ipsi- or bilateral mucoperichondrial hinge flap, composite hinge flaps containing a sandwich of cartilage between mucoperichondrium and the turbinate mucoperiosteal flap as described in detail by Baker [12]. Reconstruction with the previously mentioned flaps is challenging and a domain of experienced ENT and facial plastic surgeons. They require quite an amount of surgical experience and thorough knowledge of the complex anatomy of the inner nose. In our collective, we investigated the use of a much less complex procedure, the so-called SHF. The SHF is a previously described

technique which has fallen into oblivion in nasal reconstruction [13]. It has been described as a secondary reconstructive technique for restoring the inner lining of the nose with additional wound closure by a covering local or pedicle flap. Recently, a cohort of 106 patients was described who showed penetrating defects of the ala rim. In all cases, a SHF was planned for inner lining. Over the SHF a composite graft from the concha was placed. The authors report an excellent graft take on the SHF with no complete graft loss, probably due to the good blood supply supported by the SHF on the base of the composite graft [14].

In the present study, the SHF shows to be a reliable reconstructive technique with a low complication rate and good aesthetic results. Nevertheless, it should be pointed out that it was intentionally used for small to medium-size, penetrating defects. Larger defects are not suitable for SHF closure as there is a significant chance of nasal ala distortion during the phase of secondary intention healing. In case of small defects, light distortion is acceptable as it can be corrected by mobilizing the tissue during the preparation of the SHF which is solely used for reconstruction of inner lining. In case of defects including the ala margin, one should consider that one side is missing, which makes closure with a SHF more difficult. Depending on a variety of factors such as defect size, localization and general condition of the patient, a variety of reconstructive techniques can be used for covering the remaining defect lying above the SHF.
One disadvantage of the SHF is the fact that the patient needs to wait quite a time for scar tissue to form as it is the basis for SHF reconstruction. Epithelialization of the defect borders can take up to several weeks, which needs to be discussed with the patient.
In summary we believe that SHF is a safe and simple reconstructive technique associated with good aesthetic outcome for penetrating, small to medium-size defects of the ala of the nose.

Study limitations

As a limitation of the study, patients who had an SHF procedure were not administered validated tests to examine their quality of life or some other psychometric construct during the time between tumour excision and definite reconstruction. Nor were there investigations attempting to look at patient satisfaction after the procedure.

Author contributions

SH and MS: Conception and design of the study, acquisition, analysis and interpretation of data, drafting and writing the article, revising it critically and approving the final version. DG: Acquisition of data, revising it critically for important intellectual content and approving the final version. TK: Revising it critically for important intellectual content and approving the final version. FGB: Conception and design of the study, drafting and revising it critically for important intellectual content and approving the final version.

Conflict of interest

The authors have no conflict of interest to declare.

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