Outcomes of the three-layer technique of nasal alar defect repair
Abdelrahman E.M. Ezzat, Marwa M. El-Begermy*, Mustafa I. Eid, Mohamed O. Ouf

Background
Nasal defects are usually defined as ‘partial’ or ‘full’ thickness. The main role of reconstructive surgery is replacement of the defective tissues with nearly similar tissues.

Design
This study was a retrospective case series with chart review. The study was conducted at academic tertiary care medical centers. The aim of this study was to evaluate a three-layer reconstruction (functional and esthetic evaluation).

Patients and methods
Nine patients presented to our office with a defect in the lower third of the nose after an accident or secondary to nasal lesion removal. In our technique, we described a single-stage, three-layer reconstruction. This technique was used to repair the full thickness alar and lower lateral cartilage defects. We designed the new three-layer repair based on the normal anatomy and histology using bilobed skin flap and lateral nasal wall mucosal rotational flaps with septal cartilage graft.

Results
Aesthetically acceptable results were obtained without the compromise of the nasal valve function, which was assessed using acoustic rhinometry. The acoustic rhinometric evaluation for the nasal valve (1.5–2 cm from the nostril) function showed that the cross-sectional area on the repaired side was 0.46–0.78 cm² and it was 0.52–0.81 cm² on the other side (P = 0.670), with a normal nasal cycle and without compromising the airway. Moreover, minimal donor site morbidity was observed.

Conclusion
The bilobed skin flap and rotational mucosal flap with septal cartilage graft for full thickness alar defect, is a novel technique with minimal donor site morbidity, acceptable postoperative shape and good functional results.

Keywords:
lower lateral cartilage, nasal ala, nasal defect, three layers flap

© 2016 Pan Arab Journal of Rhinology
time was 1.5 years. The mean age was 45.6 ± 10.4 years. There were six male and three female patients.

We used photographic analysis, patient satisfaction score, and acoustic rhinometry (AR) for evaluation of outcomes. The patient satisfaction score ranged from 0 to 10. It included patient satisfaction about the shape and function of the nose, both of them summated and divided over 2, so the end score was from 10. All patients signed a preoperative consent form for the operation and for being a part of the research. The work was approved by the ethical committee in our university.

Surgical technique

After measuring the defect size, the three-layer reconstruction was designed. (a) Outer layer repair (BLF): the two lobes of the skin flap were planned and outlined adjacent to the defect using a surgical marker (Fig. 1b). The first lobe proximal to the defect, used to reconstruct it, was designed with its midmark at 45° or less to that of the defect, and with its size more than that of the defect by about 3 mm to allow inward folding of the skin at the alar rim to form the skin of the vestibule. However, the size of the lobe distal to the wound used to repair the defect resulting from the proximal lobe was smaller than that of the proximal lobe. It was taken from the loose skin donor site and transposed 45° to cover the defect from the first lobe (Fig. 1c). (b) Inner layer repair: an endoscopic assisted mucosal flap was designed on the lateral nasal wall. The size of the flap equals the size of the defect plus the distance of the rotation area. (c) The middle layer: it was formed by a harvested septal cartilage inserted into a pocket between the inner and outer layers.

Results

Our study included nine patients with a defect in the lower third of the nose, six male and three female patients with a mean age of 45.6 years ± 10.4 years. All patients underwent three-layered defect repair performed using bilobed skin flap, nasal mucosal rotational flap, and cartilage graft in between. In all patients esthetically acceptable results were obtained, with minimal donor site morbidity (Fig. 2a and b). The photographic analysis revealed mild unequality, although this was not of concern to the patients. The patient satisfaction score ranged from 7 to 9 from an overall score of 10. There were no major complications.

The AR (A1 Acoustic Rhinometer; GM Instruments Ltd, Kilwinning, Scotland, UK) was used to obtain the acoustic measurements. An acoustic rhinometric evaluation for the nasal valve (NV) (1.5–2 cm from the nostril) function showed that the minimum cross-sectional areas (MCA) ranged from 0.46 to 0.78 cm² (mean ± SD = 0.62 ± 0.143) in the repaired side, whereas in the other side the it ranged from 0.52 to 0.81 cm² (mean ± SD = 0.665 ± 0.12) (P = 0.670; not statistically significant), with normal nasal cycle and without compromising of the airway (Fig. 3a and b, Table 1).

Discussion

The basic rule of nasal reconstruction is that the missing tissue should be replaced with a similar tissue harvested from adjacent or remote locations [6]. International guidelines suggest that surgical reconstruction replaces
Three-layer technique for nasal alar defect repair

Ezzat et al. 3

Skin cover, skeletal support, and lining [7]. A total defect, defined as one that extends through the entire thickness of the ala so as to penetrate the mucosal lining, requires reconstructive strategies that recreate external lining, support, and inner lining [8].

The skin of the lower one-third of the nose has limited mobility, and the color and sebaceous textures are unique; thus, neither distant nor local flaps are good matches. Moreover, the free margin of the alar rim is mobile and easily distorted with imprecise closures [9].

Local flaps could be used, although some flaps cannot be mobilized in young patients with taut skin; it is extremely difficult to exactly reproduce the natural arch of the ala and its boundary with the cheek [10]. Lining flaps are critical components of the repair of a full-thickness alar defect, because inadequate replacement can cause airway obstruction and contraction of the overlying flap. Lining for the ala can be derived from several sources: intranasal advancement flap, septal hinge flap, oral mucosal graft, hinge flap from nasal sidewall, nasolabial flap, or full-thickness skin graft [11].

A modified BLF utilizing skin from the lower dorsum and cheek was therefore recommended for those defects [4]. The BLF is very useful for several reasons; for example, it covers the primary defect by ‘spreading the load’ of tissue loss over two adjacent skin flaps and enables the preservation of skin creases and skin folds when used in areas around the nose and ear. [12]. The Zitelli BLF technique uses flaps that are rotated by 45 to 55°, with a total rotation of 90 to 110°, compared with the 180° of the original design [13]. The BLF is also known as the ‘workhorse flap’ for the reconstruction of defects of the lower third of the nose [12]. In our technique, we described a single-stage, three-layer reconstruction. This technique was used for the full thickness ala nasi defects. We designed the new three-layer repair based on the normal anatomy and histology using BLF skin and lateral nasal wall mucosal rotational flaps with septal cartilage graft.

The NV region plays a key role in nasal breathing. AR is a well-established method for objective evaluation of NV function [14]. It provides reproducible metric data concerning the degree and location of airway obstruction, which can be transformed into an objective measure for comparison [15]. AR is a noninvasive, rapid, and highly reproducible method to measure MCA and nasal volumes and it requires minimal cooperation from the patient [16].

In our study, an AR evaluation for the NV (1.5–2 cm from the nostril) function showed that the cross-sectional area ranges between 0.46 and 0.78 cm² in the repaired side, and between 0.52 and 0.81 cm² in the other site without compromising the airway. This result correlates with the normal values obtained by Roithmann et al. (1995) [17], in which the average MCA was 0.62 cm² at 2.35 cm from the nostril and 0.67 cm² at 2 cm from the nostril, respectively, before and after topical decongestion of the nasal mucosa. In a study on 79 untreated healthy nasal cavities, Roithmann et al. (1997) [18] stated that the NV area showed two constrictions: a proximal constriction, which averaged 0.78 cm² in cross-section and was situated 1.18 cm from the nostril, and a distal constriction, which averaged 0.70 cm² in cross-section at 2.86 cm from the nostril. Moreover, Morgan et al. [19] found that, in the MCA of NV, race was the main determining factor, with Orientals and...
Whites having significantly lower MCA compared with Blacks ($P < 0.0001$) (Orientals: mean 0.63 cm$^2$ and range 0.55–0.71 cm$^2$; Whites: mean 0.69 cm$^2$ and range 0.62–0.77 cm$^2$; and Blacks: mean 0.87 cm$^2$ and range 0.79–0.95 cm$^2$).

Reynolds and Gourdin stated that the NV insufficiency is a relatively common complication of Mohs surgery and reconstruction of the lower third of the nose. Treatment is difficult, but prevention is possible in many instances. Therefore, surgeons should be well aware of this entity and techniques that may aid in its prevention [20]. In our technique, the functional outcomes were satisfactory and within the normal physiological values of NV.

Conclusion
The bilobed skin flap and rotational mucosal flap with septal cartilage graft for full thickness alar defect repair was an easy technique with minimal donor site morbidity and good postoperative shape and functional results. Hence, we propose more frequent usage of this technique and further investigation into its evaluative technique.

This study was previously presented as a scientific poster at the 21st Rhino Egypt annual meeting, February 19–21, 2015, Cairo, Egypt.

Acknowledgements
Ethical approval: all procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent: informed consent was obtained from all individual participants included in the study.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

References