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Alar Flare Preservation Using the Sandwich Technique as an Adjunct to Alar Base Reduction

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Background: Achieving an aesthetic balance and natural appearance when modifying soft tissues of the nasal tip, alae, and nostrils is fundamental to the success of rhinoplasty surgery. The present study aimed to investigate the ability of a simple "sandwich" technique combined with external alar base reduction to preserve the alar flare and achieve a natural and appealing alar contour.

Methods: The study included 40 patients who reported dissatisfaction due to excessive nasal flaring. Cartilaginous grafts were harvested from the septum in cases of primary rhinoplasty. Grafts were harvested from the conchal cartilage in cases of secondary rhinoplasty to ensure adequacy of the grafts. The grafts were inserted from the alar wedge excision point along the created pocket to be "sandwiched" in the soft tissue of the alar rim.

Results: The average preoperative alar flare was 35.2 mm (SD ±1.9 mm), with an average postoperative reduction of 3 mm. Difference between intercanthal distance and postoperative alar flare distance showed a mean of (−0.4 mm) (SD ±1.2 mm) and was highly significant with $P < 0.05$. A comparison between nasal base width and alar flare measurements was done. Difference between nasal base width and preoperative alar flare distance was (−9.2 mm) (SD ±2.6), and between nasal base width and postoperative alar flare was (−6.3 mm) (SD ±2.1). Postoperatively, overall patient satisfaction was scored 4.1 of 5.

Conclusion: The use of a trapezoidal graft, in combination with external alar base reduction, markedly improves the basal view while maintaining the natural alar flare and curvature. *(Plast Reconstr Surg Glob Open 2021;9:e3569; doi: 10.1097/GOX.0000000000003569; Published online 6 May 2021.)*

INTRODUCTION

Achieving an aesthetic balance and natural appearance when modifying soft tissues of the nasal tip, alae, and nostrils is fundamental to the success of rhinoplasty surgery.[1] Alar base aesthetics continue to increase in importance when evaluating rhinoplasty results; furthermore, social media and selfies have highlighted the importance of the basal view.[2]

The nasal basal view can aid in evaluating the relationship between the nasal tip and alar lobule and allow for the assessment of any alar-columella disharmony. Indeed, Casanueva and Gerecci have discussed the importance of achieving a smooth, natural transition with an "ideal tip-lobule line."[1,3] Changes in alar anatomy can alter basal view morphology and, more importantly, its dynamic relationship with the tip, which will affect projection and flare.

The maximum point of alar convexity beyond the alar crease is defined as the alar flare. This distance is considered ideally to be within 2 mm.[4] In 2017, Rohrich et al described alar flare types according to the most laterally projecting point of the alar rim to the sill base. Respecting the angle of this line during alar reduction can help maintain the natural curvature of the alar rim and preserve the natural alar-cheek junction without extending it to the ala.[5–7]

In addition to preserving the natural curve of the alar rim, one must ensure its structural support to prevent unnatural appearance of the ala. A depressed scar that distorts the floor of the nostril can lead to a characteristic "Q" sign/deformity.[1,6,8,9] A natural looking nose that respects nasal function as well as basal aesthetics is the sine qua non

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of modern rhinoplasty and the aim of the present study. Specifically, the present study aimed to investigate the ability of a simple "sandwich" technique combined with external alar base reduction to preserve the aesthetic alar flare and achieve a natural and appealing alar contour.

METHODS

Study Design

The present case series was conducted between 2017 and 2019 in both private practice and university hospitals. The target age group was between 20 and 50 years. The study included 40 patients (35 women, 5 men) in whom an alar grafting sandwich technique was employed during primary alar base reduction surgery (primary cases) or as a secondary alar base corrective surgery (secondary revision cases). All revision cases were operated on at least 1 year after their previous surgery. Reconstructive cases were excluded, as were patients with local nasal pathology such as rhinophyma and acne. Patients with a history of cleft, systemic or psychological problems, and deformities of the jaw or face were also excluded.

Preoperative Preparation

Before surgery, a detailed history was obtained from patients, including personal data, previous surgeries, and drug allergies. Preoperative consultation involved functional assessment and routine rhinoplasty evaluation in different views, starting with the frontal view in which facial proportions, facial symmetry, skin quality, and type as well as nasal aesthetic lines, tip, and alar rims were checked. Lateral view analysis included nasofrontal angle, nasal length, dorsum, supratip break, tip projection, tip rotation, alar-columellar relationship, periapical hypoplasia, and lip–chin relationship. Dorsum deviation was assessed from the superior view. Special attention was paid to the basal view to assess nasal projection, caudal septal deviation, columella, alar base, alar flaring, and nostrils. In this study, concentration was mainly focused on frontal and basal views, in which alar flaring can be assessed.

Relevant measurements obtained included intercanthal distance: (NL: 30–34 mm), nasal base width (distance between right and left alar curvature point), alar flare (distance between right and left maximum alar flare point, which usually extends a minimum of 2 mm beyond the alar base) (Fig. 1). Patients are usually divided into 3 groups based on alar flare, as follows. Group 1 includes patients exhibiting excess flaring with normal intercanthal distance; group 2 includes patients without flaring but with an increased base width; and group 3 includes patients exhibiting both flaring and increased base width. For this study, only patients from groups 1 and 3 were included. Patients in group 3 required additional sill reduction. Patients in group 2 were not included, as they only required sill excision.

Preoperative and postoperative photographs included frontal, basal, lateral, and oblique views as is typical for routine rhinoplasty cases, with special concentration on the basal and frontal views.

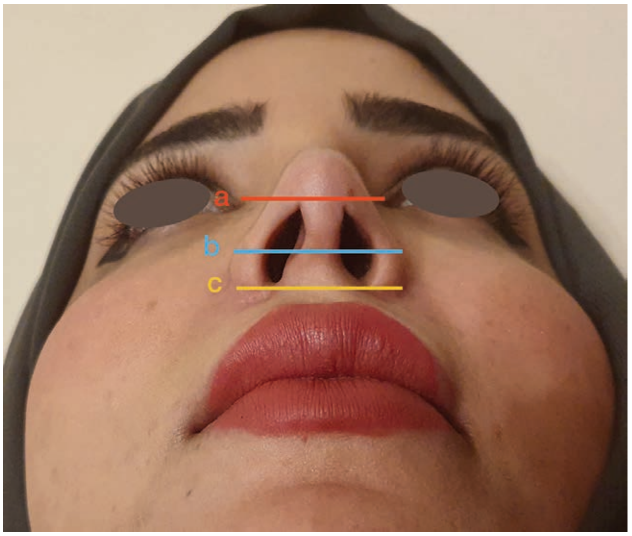

Fig. 1. Illustration of anthropometric measurements: (a) intercanthal distance; (b) alar flare distance; (c) nasal base width.

Consent

Before surgery, potential complications were explained to all patients, and each patient signed a standard informed consent form. Approval of the ethics committee was obtained.

Operative Technique

Primary rhinoplasty was performed under general anesthesia, whereas secondary base reduction was performed under local anesthesia with sedation, in patients undergoing alar base surgery alone. However, in cases that needed full secondary rhinoplasty, they were done under full general anesthesia. Primary and secondary rhinoplasty were performed using an open structural rhinoplasty technique.

Open rhinoplasty involved the following steps, based on the needs of each patient: Bony segments were managed via humpectomy or paramedian osteotomy together with lateral osteotomies using an endonasal approach. The middle third of the nose was managed based on the presence of a hump. In the case of hump absence, no management was required. Spreader grafts were used for humps up to 3 mm, whereas spreader flaps were used for humps >3 mm. For the lower third of the nose, focus was placed on tip definition. The tip was defined via suturing, and tip grafts were used whenever additional definition was required. Tip rotation was performed by adjusting the anterior septal angle together with septal extension grafts or free columellar strut grafts. This was in adjunct to septocolumellar suturing to aid in tip definition and projection.

Alar base reduction was planned and performed as the final step of rhinoplasty. Markings were made intraoperatively to ensure appropriate measurements after osteotomy and tip definition. Wedge excision extended between the most laterally projecting alar point and along the sill base junction. After wedge resection, the alar rim was dissected using Stevens Iris scissors to form a pocket in the

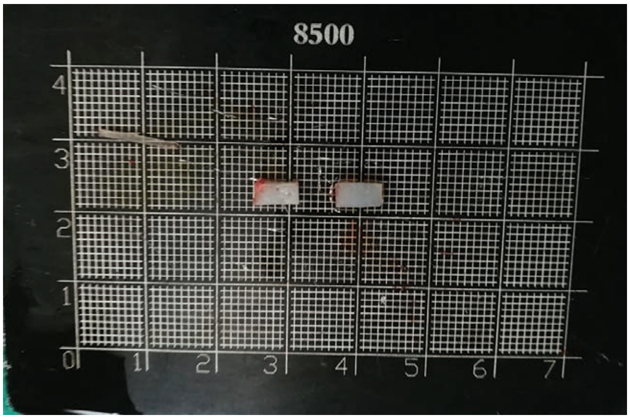

Fig. 2. Two harvested alar sandwich grafts.

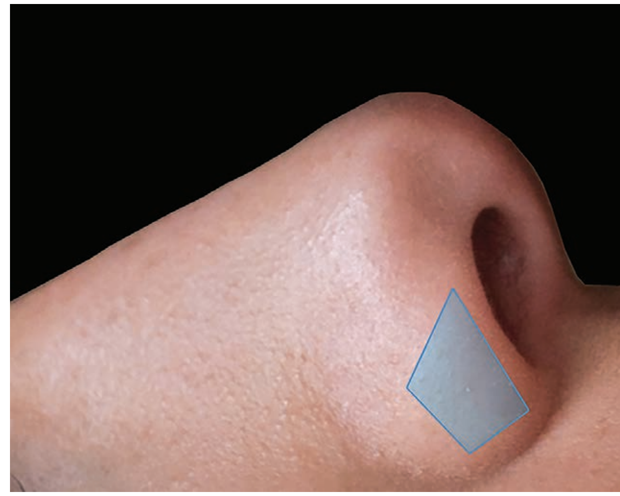

Fig. 3. Illustration of trapezoid-shaped graft.

remaining alar lobule. The pocket was formed subcutaneously directly along the alar flare margin, enough to insert the planned cartilage graft.

In cases of primary rhinoplasty, cartilage grafts were harvested from the septum. Secondary rhinoplasty cases required conchal cartilage graft harvesting to ensure the adequacy of grafts, as patients' septal cartilage had usually already been harvested during the first surgery, making it difficult to determine preoperatively whether the septum would be available for harvesting. Conchal grafts for secondary rhinoplasty cases also helped surgeons to perform the procedure under local anesthesia with minimal exposure and dissection. Double-layered conchal grafts were used to ensure appropriate graft strength and thickness. Alar grafts harvested from the septum were usually obtained from the caudal posterior part (the thickest part).

The graft was then prepared and cut into a rectangular-shaped strut, which averaged 6 mm in length, 3.5 mm in width, and 2 mm in thickness (Figs. 2, 3). Small angles were then removed according to alar curvature to obtain a trapezoidal graft. Grafts prepared for male patients were usually 2 mm longer. The graft was inserted from the alar wedge excision point along the created pocket to be "sandwiched" in the soft tissue of the remaining alar lobule. The same procedure was repeated on the other side. The wound was closed using 2–3 simple interrupted 5/0 polypropylene sutures, by inserting one stitch on either side followed by another bilaterally to ensure symmetry and prevent deviation in closure (**See Video [online],** which demonstrates how after alar wedge resection was completed, alar rim was dissected using Stevens Iris scissors to form a narrow tunnel. The tunnel was formed subcutaneously directly along alar flare margin. The prepared graft was then inserted from alar wedge excision point along the created tunnel to be sandwiched in alar margin soft tissue. The skin is then closed by simple interrupted 5/0 polypropylene sutures. For demonstration purpose, the contralateral side is closed without graft insertion to show the difference. The same procedure is then repeated on the other side. It is very important to ensure symmetry during closing.).

Postoperative Care

Patients who had complete open rhinoplasty had nasal packing for 48 hours, and nasal casts were removed after 1 week. External support and compression were done using thin adhesive bandages (Steristrips) for 2 weeks postoperative. Then, patients were advised to adhere the bandages only at night for 1 month.

Regarding external wounds, patients were instructed to clean the marginal, trans-columellar, and alar reduction incisions with normal saline and cotton swabs once a day, followed by application of topical antibiotic cream to keep the incisions moist and infection free and to reduce crusting. Follow-up visits were performed after 24 hours, 3 days, 1 week (at which time the stitches were removed), and then monthly for 6 months to 1 year. During follow-up visits, both measurements and assessments of patient satisfaction were obtained.

Patients were asked to provide subjective assessments of their satisfaction with the nasal base, as well as their overall satisfaction, using a scale ranging from 1 to 5 (1: very dissatisfied; 5: very satisfied). The following points were addressed: satisfaction with overall nose size, nose shape in profile, nose length, width of nose bottom (flare), and difficulty breathing. The objective part of our evaluation was based on our comparison of preoperative and postoperative measurements, as well as the ideal target for each patient.

Data were statistically described in terms of mean ± SD, or frequencies (number of cases) and percentages when appropriate. Comparison between pre- and postoperative results was done using paired *t* test. Two-sided *P* values less than 0.05 were considered statistically significant. All statistical calculations were done using computer program IBM SPSS (Statistical Package for the Social Science; IBM Corp, Armonk, N.Y.) release 22 for Microsoft Windows (Microsoft Corp, Redmond, Wash.).

RESULTS

The present prospective study included 40 patients ranging in age from 21 to 45 years, with a mean age of 31 years (SD ±6). The female-to-male ratio was 7 to 1, with women comprising 87.5% of the sample. The duration of follow-up ranged from 4 to 20 months, with a median of one year follow-up. A total of 32 patients underwent primary rhinoplasty, but 8 patients underwent secondary rhinoplasty. Of the 25 primary cases, 16 patients underwent external alar base reduction and 9 patients had combined external alar base with sill reduction. Regarding the secondary (revision) cases, 4 patients had a history of previous alar base reduction but were unsatisfied with the unnatural appearance of the alar base. The other 4 patients underwent primary alar base reduction with our team. All patients underwent sandwich alar grafting. Grafts were harvested from the septum in all patients undergoing primary rhinoplasty, whereas conchal grafts were used in all patients undergoing secondary rhinoplasty.

Preoperatively measured intercanthal distance was approximately 32 mm (SD ±1.3 mm), and the width of the nasal base was 26 mm on average (SD ±1.6 mm). The average preoperative alar flare was 35.2 mm (SD ±1.9 mm), with an average postoperative reduction of 3 mm (Fig. 4, Table 1). Measured results were compared with ideal measurements based on previous literature, as shown in Tables 2–3.[10] Our results were also compared with preoperatively measured facial dimensions. Difference between intercanthal distance and postoperative alar flare distance showed a mean of (−0.4 mm) (SD ±1.2 mm) and was highly significant with $P < 0.05$. Comparison between nasal base width and alar flare measurements was done. Difference between nasal base width and preoperative alar flare distance was (−9.2 mm) (SD ±2.6) and between nasal base width and postoperative alar flare was (−6.3 mm) (SD ±2.1). Both values were highly significant (Tables 2, 3).

Postoperatively, patients had an overall satisfaction grade of 4.1 (SD ±0.7) of 5 with a minimum score of 3 of 5 (Figs. 5–12).

Complications

No serious complications were noted during our study. There were no healing problems or severe scarring in any patients during the follow-up period. Slight asymmetry was present in 3 cases; one of these patients needed a secondary corrective procedure.

DISCUSSION

In this study, the ability of a simple sandwich technique combined with external alar base reduction to preserve the alar flare and achieve a natural and appealing alar contour was investigated. Our findings indicated that patient satisfaction ratings were high overall (4.1 of 5), and that the sandwich technique allowed for an improved basal view while maintaining the natural alar flare and curvature.

Damage to individual "natural" nasal features such as the alar-facial crease or destruction of the alar rim

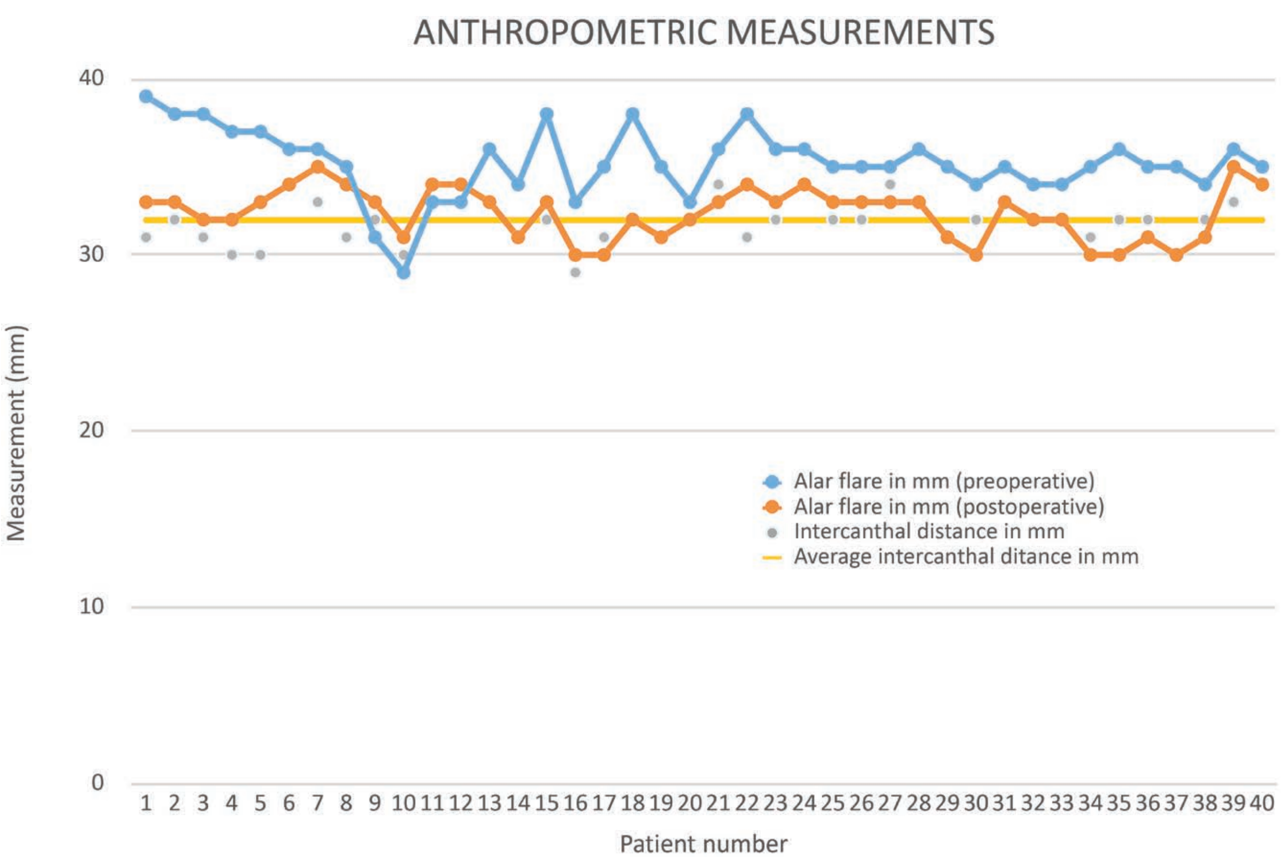

Fig. 4. Chart demonstrating pre- and postoperative anthropometric measurements; preoperative alar flare (in mm), postoperative alar flare (in mm), intercanthal distance (in mm), and average intercanthal distance (in mm).

Table 1. Paired Sample Statistics Showing the Relationship between the Preoperative Nasal Base Width and the Pre- and Postoperative Alar Flare Measurements

Paired Samples Statistics					
		Mean	N	SD	SEM
Pair 1	Nasal basal width preoperative	26.05	40	1.568	0.248
	Alar flare preoperative	35.23	40	1.954	0.309
Pair 2	Nasal basal width preoperative	26.05	40	1.568	0.248
	Alar flare postoperative	32.38	40	1.462	0.231

SD, standard deviation; SEM, standard error of the mean.

curvature can lead to unnatural and unsatisfactory results following rhinoplasty.

In an era with smartphone photography and social media (specifically "selfies"), basal view aesthetics is becoming increasingly important. The patients' concerns regarding the basal nasal view are thus greatly highlighted following rhinoplasties.

Meticulous preoperative assessment and planning is the cornerstone of a successful rhinoplasty, especially for nasal base surgery. Nasal base anatomical analysis is complex, and there are multiple factors to consider when attempting to alter the nasal base (columellar base, central columellar pillar, infra-lobular triangle, soft triangle, lateral wall, alar base, nostril sill), which all determine the nostrils opening shape.[9] Alar base surgery, apart from being the final step during a rhinoplasty procedure, is considered crucial and can dramatically affect the final outcome if not precisely performed. Aufricht stated that "nothing causes such an obvious discrepancy in harmony after rhinoplasty as oversized nostrils".[11] In more objective words, when describing the outcome of alar base surgery, one should comment on 3 items: scar, symmetry, and shape. Shape is the scope of current study and to achieve a natural normal flare and basal slope.[9] Rohrich et al described the different alar flare types based on the axis between the base and the most laterally projecting point and provided recommendations for excision patterns in each case. Regardless of alar flare morphology (type 1–3) as described by Rohrich et al in 2020, the distance between the most laterally projecting point and the alar base is about 3–4 mm.[2] In current study, natural alar flare could be achieved by inserting the cartilage graft in created alar lobule pocket. In the literature, different excisional techniques have been used for alar flare management, although none have included filling of the alar base to resume a natural flare after excision.

Middle Eastern and North African patients undergoing rhinoplasty have specific goals and anatomical features that must be considered and respected during surgical planning. Indeed, there is great variability in the dimensions of the nasal base and eyes among patients of varying ethnicities.[9,12,13] Alar flaring, a bulbous tip, and increased nose size are common complaints among patients. North African patients face similar challenges, as the alar flare can be disturbed after alar wedge excision.[9] In addition, their nasal skin is usually thick and sebaceous, making changes made in the cartilage framework less evident.[14,15] This framework can easily collapse, and modifications may become hidden underneath the heavy envelope. These findings support the routine and essential use of alar rim grafts in rhinoplasty surgeries. Moreover, in this study, we compared and designed the alar flare with respect to each patient's preoperatively measured dimensions, which helped us to achieve a more natural looking appearance and higher ratings of satisfaction.

Numerous alar base modification techniques have been reported in the literature. Specifically, studies have described 3 different techniques for the management of patients exhibiting alar flaring in addition to a wide nasal base. Tissue excision from the alar lobule as well as from the inside of the nostril is performed to decrease alar flaring and nostril width, respectively. Additional techniques include flap advancement and the use of cinching sutures

Table 2. Statistical Analysis of the Difference between Postoperatively Measured Alar Flare and Intercanthal Distance

		Paired Differences							
					95% CI of the Difference				
		Mean	SD	SEM	Upper	Lower	*t*	df	*P*
Pair 1	Intercanthal distance—alar flare postoperative	−0.400	1.236	0.195	−0.795	−0.005	−2.046	39	0.047

CI, confidence interval; SD, standard deviation; SEM, standard error of the mean.

Table 3. Statistical Analysis of the Difference between Alar Flare and Nasal Base Width

Paired Samples Test									
		Paired Differences							
					95% CI of the Difference				
		Mean	SD	SEM	Upper	Lower	*t*	df	*P*
Pair 1	Nasal basal width preoperative – alar flare preoperative	−9.175	2.601	0.411	−10.007	−8.343	−22.313	39	0.000
Pair 2	Nasal basal width preoperative – alar flare postoperative	−6.325	2.105	0.333	−6.998	−5.652	−19.006	39	0.000

CI, confidence interval; SD, standard deviation; SEM, standard error of the mean.

Fig. 5. Preoperative basal view of patient 1 (secondary revision rhinoplasty patient presenting with collapsed external nasal valves and wide nasal alae with no previous alar base reduction).

Fig. 6. Postoperative basal view of patient 1 (open rhinoplasty with alar base reduction, alar contour grafts, and the study trapezoid grafts; cartilage was harvested from the conchae bilaterally).

that help advance the alae together. However, no previous studies have reported the use of alar flare grafts in combination with external alar reduction.[6]

Achieving a favorable outcome during alar base surgery depends on addressing symmetry, scarring, and shape. In the literature, different excisional techniques have been used for alar flare management; however, none have included cartilage grafting of the alar base to resume a natural flare after excision.

Fig. 7. Preoperative basal view of patient 2 (primary rhinoplasty patient presenting with wide nasal alae).

Fig. 8. Postoperative basal view of patient 2 (open rhinoplasty with alar base reduction and the study trapezoid grafts was done).

Alar asymmetry, collapse, or a pinched nose appearance as well as sill changes are common postoperative complications. Postoperative rates of dissatisfaction and revision are high in the literature. A "tear-drop" or "Q" deformity may result from improper excisions of the lateral alar wall. Preserving the alar curve is crucial

Fig. 9. Preoperative basal view of patient 3 (primary rhinoplasty patient presenting with wide nasal alae and boxy nasal tip).

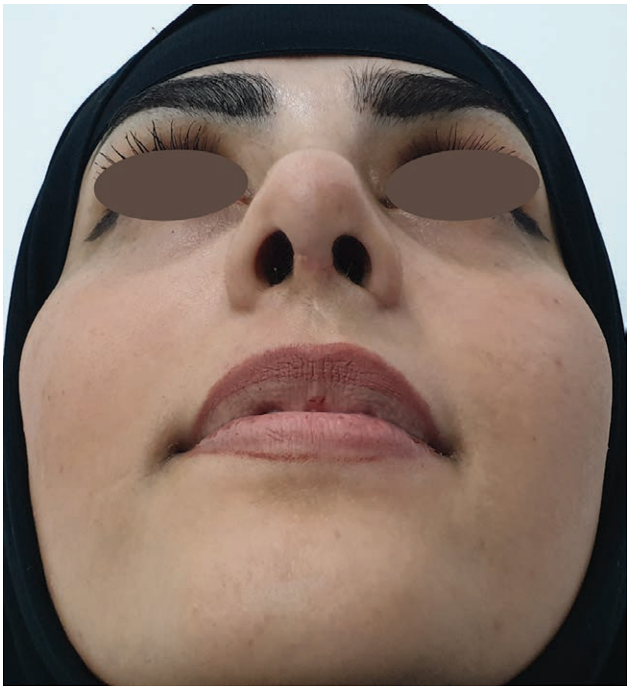

Fig. 10. Postoperative basal view of patient 3 (open rhinoplasty with alar base reduction and the study trapezoid grafts was done).

when performing wedge excisions to achieve a normal flare.[16,17]

Alar excision surgeries are associated with several complications, including asymmetry, unnatural appearance, and scarring.[18] To prevent excessive alar excision, surgeons must reevaluate measurements intraoperatively after the other rhinoplasty steps have been completed.[1] Complications encountered in this study were asymmetry problems, which are not the main scope of this study.

Fig. 11. Preoperative basal view of patient 4 (primary rhinoplasty patient presenting with wide nasal alae and boxy nasal tip).

Fig. 12. Postoperative basal view of patient 4 (open rhinoplasty with alar base reduction and the study trapezoid grafts was done).

Extended alar contour grafts have evolved in technique and versatility, allowing for a decrease in tip isolation and preservation of natural alar curves. Rohrich et al have stressed the value of alar rim grafts, which decrease complications and improve aesthetic and functional results.[8,19]

Although numerous studies have utilized alar contouring and grafts to maintain the integrity of the region,[10,20] none have mentioned the use of wedge cartilage to provide extra alar support and ensure normal alar flare. Previously described grafts usually depended on providing support to the upper half of the alar rim without reaching the alar flare. Thus, external alar reduction is frequently associated with flattening and an unnatural appearance.

The use of columellar struts (either free grafts or septal extension grafts) were used in the authors' practice as a routine step. They assist in tip projection and act as a main pillar for the cartilaginous framework of the nose, which maintains projection and long-term results.[21] Providing adequate stable projection to the tip during rhinoplasty may affect the need to correct excess alar flare. In rhinoplasties requiring alar base reduction, adding an alar flare sandwich graft in conjunction with other grafts, such as alar rim grafts and columellar struts, can provide a continuous cartilaginous framework that supports and maintains the basal margin of the nose. This accentuates aesthetic results and allows for controlled contouring in thick-skinned individuals.

Trapezoidal grafts used for alar flare in the current study were harvested mainly from the septum. However, conchal grafts were used when alar base surgery was done as a separate procedure under local anesthesia or in revision cases with inadequate septal cartilage. Conchal cartilage was found to provide sufficient support to the alar rim structure and its curvature was similar to the natural alar contour. In complex revision rhinoplasty cases, in which abundant cartilage grafts are necessary, costal cartilage grafts can be used. Nevertheless, harvesting of costal cartilage is associated with higher morbidity and is firmer in consistency, which decreases its malleability.[22]

CONCLUSIONS

Maintaining the cartilaginous framework of the nose is crucial during rhinoplasty, as this assures aesthetic and functional longevity of the results. The technique described in this study has the benefit of being easy, is applicable to all patients, and substantially improves both nasal base aesthetics and function. The use of a trapezoidal graft, in combination with external alar base reduction, has become a routine step in our practice, given that it markedly improves the basal view while maintaining the natural alar flare and curvature. Thus, we aim to further investigate the use of this technique in a randomized controlled study.

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PATIENT CONSENT

The patients provided written consent for the use of their images.

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