Clinical Cancer Investigation Journal-ISSN: 2278-0513

Investigating the effect of using Alar rim free cartilage graft on the stability of nostril contour

Abstract

The appearance of the alar has an important role in maintaining the beauty of the nose and face. The purpose of this study was to investigate the effect of using an Alar rim-free cartilage graft on the stability of nostril contour in basal view of photography during a 6-month follow-up period in rhinoplasty patients. In this study, the VAS criterion is used to assess the concavity of the alar contour before surgery and 1, 3, and 6 months after surgery. The Shapiro-Wilk test is used to check normality, and Levon's test to check homogeneity of variances. The software SPSS version 26 was used in this study. All patients who underwent alar rim grafting for the first time were evaluated in this study. In the first month after surgery, the distance of the alar rim contour decreased in all patients. Three months after surgery compared to the time before surgery, this value decreased to 20 cases in women and 25 cases in men. At the six-month follow-up, the number of recurrences was almost the same in both sexes. The mean concavity of the rim according to the criteria of VAS criteria before surgery and at the intervals of 1 month, 3 months, and 6 months after surgery was 7.98, 5.42, 6.02, and 7.38, respectively. Transplantation of alar cartilage with a free margin is effective in stabilizing the contour of the nostril. This curve gradually returns in more than half of the patients at follow-up.

Keywords: *Rhinoplasty, Alar rim contour, Free graft, Alar retraction*

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Introduction

The appearance of the alar has an important role in the beauty of the nose and face (1). In addition to congenital defects such as alar depression or concave ala, also known as the cloverleaf nose (2), alar deformities are common complications of rhinoplastic surgery that may be caused by excessive or inadequate removal of alar cartilage (3). It is also used in nasal plastic surgery (4, 5). Deformities of the nostrils, including retraction of the nostrils, cause functional problems in breathing in addition to esthetic problems (6), so there is an efficient solution to reconstruct the nostrils and improve their function. Proper correction of alar rim deformity requires accurate preoperative diagnosis and selection of the correct surgical method. There are several techniques to improve this common but difficult problem (7).

Usually, repair of alar rim deformity requires a cartilage graft that can correct the rim of the nose, support the lateral crura (6), and eventually restore the contour of the nose (8, 9). Types of these grafts include the alar contour graft used for mild retraction, the lateral crural strut graft used for displacement of the lateral crura(10), and various types of alar rim grafting techniques such as articulated alar rim grafting (9), mono-unit alar rim graft (2), alar spreader graft, and composite graft (11). Autologous nasal septal cartilage, rib cartilage, and ear cartilage can be used for free grafting (12). Since the varicose vein in this area isn't in its anatomical position, there is always the possibility of touching and exposing the varicose vein through the skin during this operation (13). On the other hand, the effectiveness, speed, lack of need for follow-up surgery (8), and high ability to create a natural and similar contour in the

nostril (7) make this surgery one of the most popular methods in nasal contour reconstruction in recent years (14, 15).

Each of the techniques has its strengths and weaknesses, but surgeons can more confidently deal with nasal wing abnormalities if they have different treatment options that can meet the individual needs of each patient. In summary, in an attempt to provide a simpler yet structurally correct method for the correction of alar deformities, we have used free alar cartilage grafting as a new procedure, even considering the lack of sufficient studies. In this background, and especially in the Iranian population, this prompted us to further investigate open alar ridge surgery and analyze its results on the contour of this area during the 6-month follow-up period of patients.

METHODS:

Photography

In the end, the pictures of the patients before and after surgery are discussed. For all patients, the photos are taken in a standard studio. The photos include photos before surgery, 1 month, 3 months, and 6 months after surgery. Patients who don't have follow-up photographs will be excluded from the study. Photography in the caudal (basal) view is the standard for this study. Photographs will be taken in the classic modes using the Canon EOS 60D digital SLR camera with a 105-macrometer lens of all patients both before and after surgery at the same center and with the same device, so the device settings should be the same and standard for all items. To verify the equality of the acquisition angle in the caudal view in the patients before and after surgery, fixed indicators on the patients' faces are used, such as the imaginary line between the two outer halves of the eyes, so that on the photos taken before and after surgery in the caudal view, the line The connection between the two outer halves of the eyes should be at the same level, and the position of the patient's head is such, that the highest point of the head is at the upper edge of the camera frame and the chin is at the lower border of the camera frame, and the patient is looking at a predetermined fixed object in the photographs before and after surgery, and also the height of the patient's chair is the same during the preparation of the photographs before and after surgery(16). VAS In addition, to ensure the stability of the photographs, a specific reference was used. For this purpose, a line between the two lateral canthus and a line between the lateral canthus and the midline of the chin were drawn on each photograph, and the distance between these lines and their angles is a measure to control the equality of the photographs. In addition, based on the obtained images, the degree of alar deformity will be scored based on the visual analog score (VAS) by comparing the images before and after the operation by two independent surgeons. Also, the amount of alar concavity is determined by the longitudinal axis of the nostril (7). This is a hypothetical line in the caudal view leading from the nasal apex to the base of the nose. In this study, the alar concavity parameter, as well as the intensity of the changes, will be measured using VAS and compared before and after surgery (Figure 1).

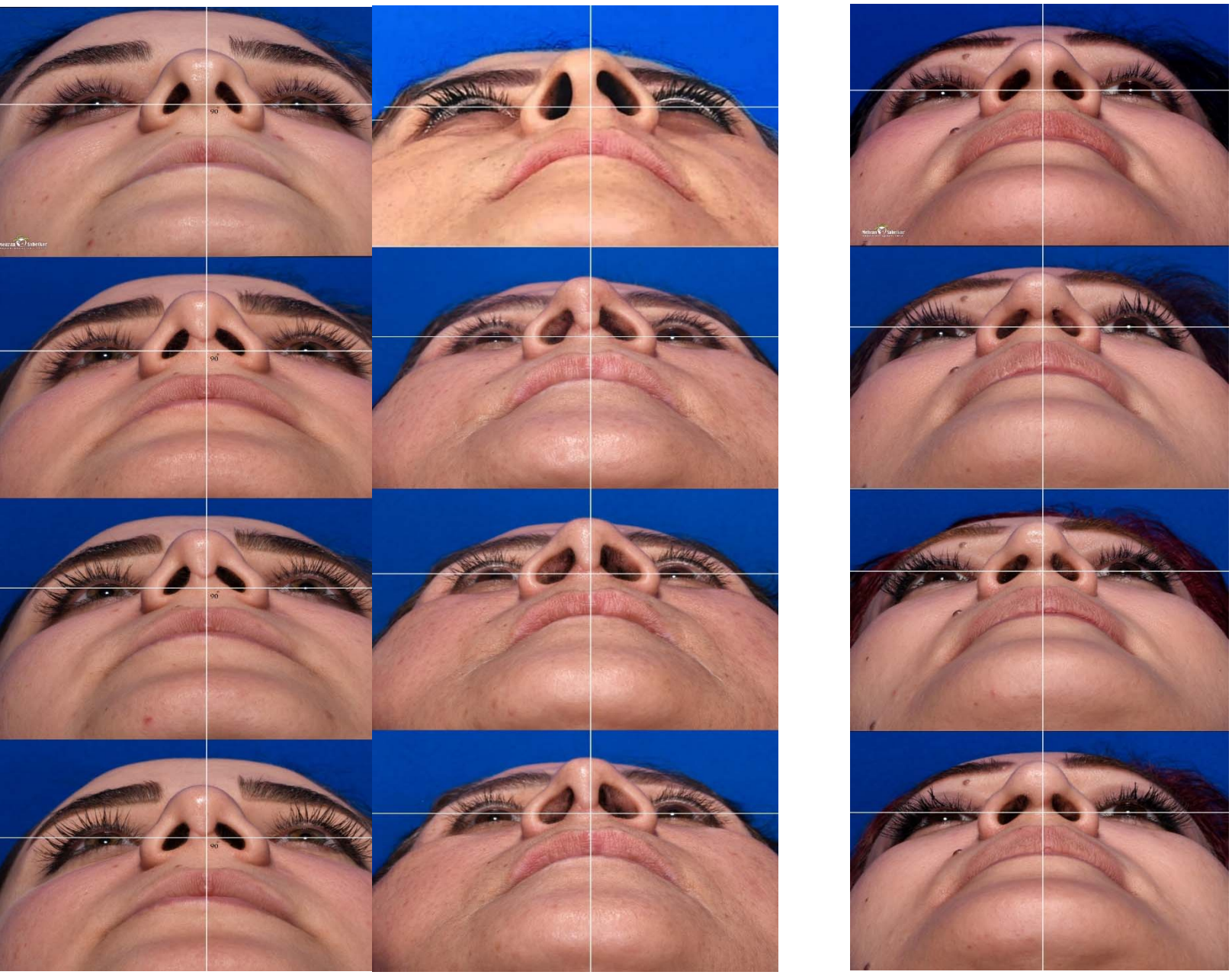

Figure 1: Photograph before and after the surgery and equalization of proportions

Measurement

After taking images of patients in the caudal view at the time points before surgery and 1 month, 3 months, and 6 months after surgery, these images are collected in a format. To evaluate the impact of surgery rate, we use the VAS criterion and contour stability. The VAS scale is a psychometric measurement tool developed to document disease-related characteristics of symptom severity in specific patients and to achieve the rapid (statistically measurable and reproducible) classification of symptom severity and disease control. The value range of this instrument is 0 to 10. In this study, the VAS criterion is used to assess the concavity of the alar contour before surgery and 1, 3, and 6 months after surgery based on the judgment of two surgeons (including the operating surgeon and the consulting surgeon). Then, the VAS ratings of each surgeon for each patient are entered into the corresponding checklist, and their average is calculated. To check the stability of the alar contour, its changes are recorded in millimeters before surgery and at intervals of 1, 3, and 6 months after surgery. To calculate the extent of alar contour changes, each image taken 1 month, 3 months, and 6 months after surgery is compared in Photoshop software with the images of patients before surgery. If the alar rim contour changes inward, the amount of negative charge (in millimeters), and if it changes

outward, the amount of positive change (in millimeters), and zero if there is no change are considered.

Data analysis

Frequency and percentage are used to describe qualitative data and mean and standard deviation are used for quantitative data. In addition, appropriate descriptive tables and charts are used for both scales of measurement scales. Before analyzing the data against the objectives, the statistical assumptions are reviewed. For this purpose, the Shapiro-Wilk test is used to check normality, and Levon's test is used to check the homogeneity of variances. If the appropriate assumptions for the quantitative variables are met, independent t-tests, paired t-tests, repeated measures ANOVA, and generalized estimating equations (GEE) are used, and if the assumptions aren't met, Mann-Whitney tests are used. Wilcoxon, and if the assumptions are not established for GEE aren't met, the data are transformed appropriately to normalize or determine homogeneity of variance. To test the qualitative variables, if the assumptions are met, the Chi-square test is used, and if the assumptions aren't met, the Chi-square test is used. Fisher's exact test is used. To adjust for confounding factors, possible confounding variables are entered into the model GEE. The software used is SPSS version 26. The significance level is set at 0.05 for all tests.

Technique of surgery

A similar open-surgical approach is used in all patients. In all patients, the surgery is performed by a single surgeon, and the sequence of surgical plans and methods and the surgery time are the same in all patients. To open the soft tissue envelope, the rhinoplasty method is again used. Alar contour clamps are placed at the end of the procedure, just before suturing, because these clamps are delicate and may loosen or break during manipulation. Septal cartilage is used in all patients because it can be harvested in the primary surgical field. It's important to note that although alar contour grips are not as large (on average 2 to 3 mm wide and 1.5 cm long), they should be of similar size, strength, and shape. The applied grips are cut to have an almost triangular shape with a base of 3 mm, a height of 1.5 mm, and a thickness of 1-1.5 mm, which has almost the same shape and strength.

If the grafts are not nearly identical in size and thickness, these strong grips may cause the tip of the nose to deviate toward the weaker side after healing or create an asymmetrical alar contour. The envelope of the alar contour is carefully cut between the vestibular and nasal skin under the subcartilaginous incision with long and sharp Stevens scissors, and the alar rim is everted and exposed with a sharp hook.

The dissection should be performed in such a way that the pocket formed is placed exactly in the middle of the thickness of the soft tissue of the altar, and the pocket doesn't reach the surface of the skin to avoid the risk of perforation of the skin and proximity to the mucosa and the interior of the nose. This dissection creates a secure pocket for the placement of the clip (Figure 2).

Figure 2: Creating an envelope

The pocket should extend into the alar lobule and ideally deeper than the base of the alar and almost to the point where the alar rim connects to the facial skin. The free cartilage grip created with cartilage forceps is removed and inserted into the sheath from the envelope. After inserting the clips into the envelope, the nasal skin is rewrapped for closure. Excess cartilage protruding from the envelope is removed. Finally, the resulting subcartilaginous incision is sutured with a 4.0 Vicryl suture with loose knots. A splint is then applied, and patients are discharged. The postoperative procedure is the same for all patients, including postoperative medications, hospitalization time, splinting time, splint removal time, tapping method, and recovery time will be the same for all patients.

RESULTS:

In this retrospective study, 50 patients (26 men (52%) and 24 women (48%)) from 1401 referred to Rasht Province Hospital for rhinoplasty were studied. The mean age of the patients was 33.98 years (minimum age 20, maximum age 50), for males was (32.65 ± 8.96) and for females was (35.42 ± 7.31). The highest age was 49, and the lowest was 21 years. The mean concavity of the rim according to the criteria of VAS criteria before surgery and at the intervals of 1 month, 3 months, and 6 months after surgery was 7.98, 5.42, 6.02, and 7.38, respectively, and the mean values of the rim contour changes were 2.67, 1.35, 1.76, and 1.76 and 2.38.

After rhinoplasty, patients were followed up at one-month, three-month, and six-month intervals for alar rim concavity and contour rim of alar, and photographs were taken of the patients' noses in caudal view.

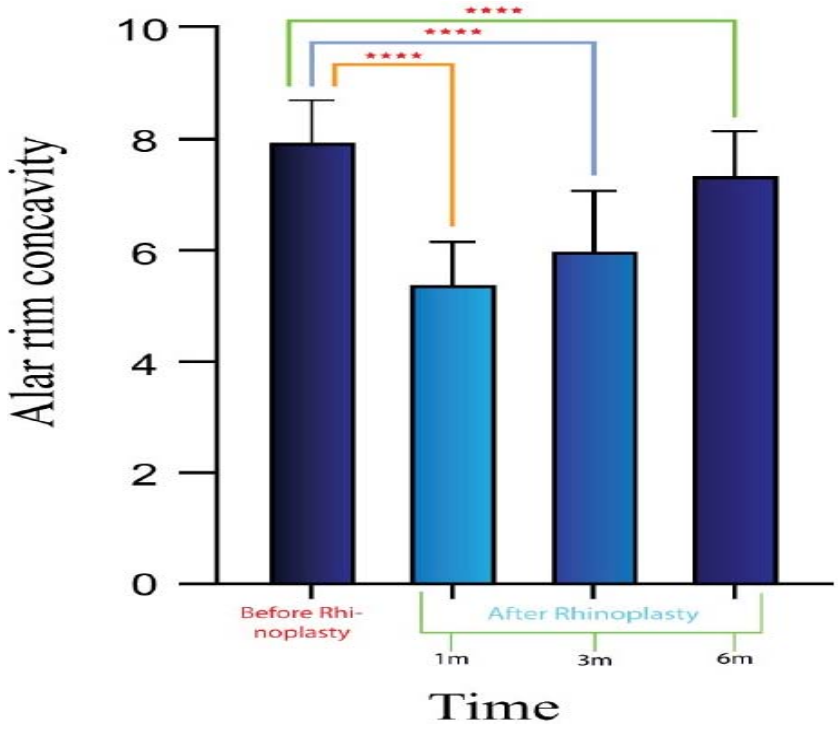

Figure 3: Alar rim concavity score distribution graph based on VAS criteria

According to Figure 3, the correlation between the extent of rim alar before and after surgery (1, 3, 6 months) was significant (P1=0.000, P3=0.000, P6=0.000).

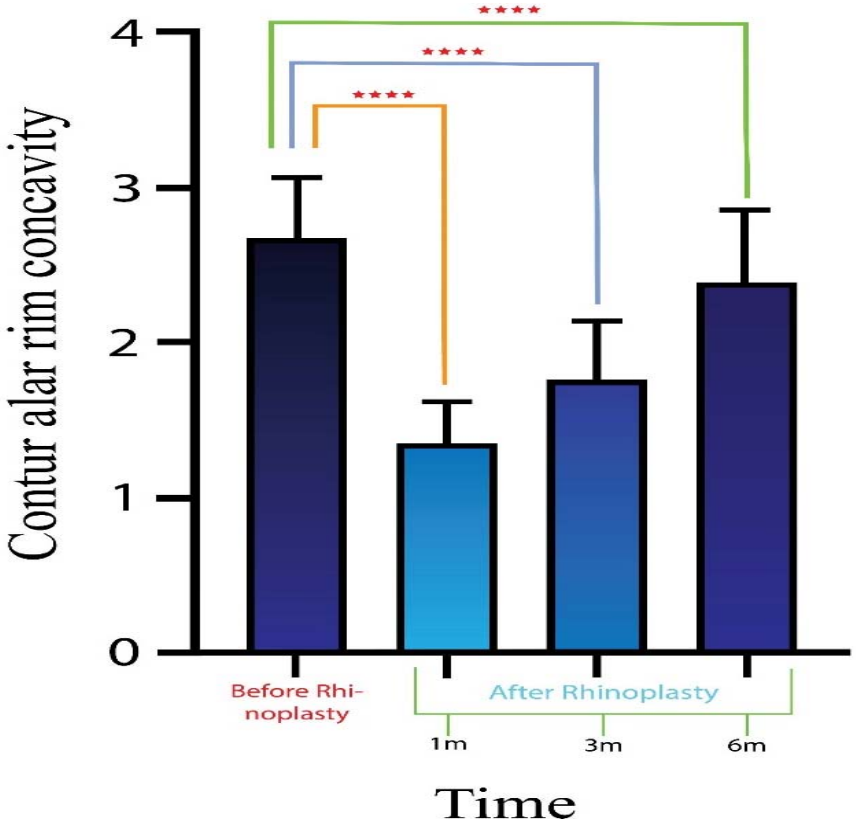

Figure 4: Distribution graph of rim alar contour scores

According to Figure 4, the correlation between the extent of contour changes of the alar rim before and after surgery (1, 3, 6 months) was significant (P1=0.000, P3=0.000, P6=0.000).

Table 1: Changes in alar rim concavity based on VAS criteria after surgery

Alar rim concavity based on VAS criteria after surgery.						
month 6		3 month		1 month		
Mean)Std.D(	Range	Mean)Std.D(	Range	Mean)Std.D(	Range	
7.38 (0.85)	6-9	6.04 (1.18)	4-9	5.54 (0.86)	4-7	Male
7.38 (0.92)	6-9	6 (1.14)	4-8	5.29 (0.81)	4-7	Female
7.38 (0.87)	6-9	6.02 (1.15)	4-9	5.42 (0.83)	4-7	Total

As can be seen in Table 1, the mean values for alar rim concavity one month after surgery were calculated to be 5.42±0.83, which was a significant decrease compared with the preoperative values (P=0.000). Three months after surgery, there was a relative increase in alar rim concavity values compared with the first month (6.02±1.15), indicating a

relative recurrence of alar rim concavity (P=0.000). (Increased Vas scores in 6 cases, indicating complete recurrence of Alar concavity.). At follow-up in the sixth month after surgery, mean alar rim concavity scores showed a greater increase (7.38±0.87) (P=0.000); to match preoperative values in 33 cases (66% of patients) cases it was equal to their pre-operative scores, confirming the complete return of alar rim concavity to preoperative values.

Table 2: Changes in the contour of the alar rim after the operation

Changes in the contour of the alar rim						
6 Month		3 Month		1 Month		
Mean (Std.D)	Range	Mean (Std.D)	Range	Mean (Std.D)	Range	
2.365 (0.500)	1.4-3.3	1.688 (0.420)	1-2.7	1.338 (0.342)	0.9-2	Male
2.413 (0.448)	1.5-3.2	1.842 (0.311)	1.4-2.6	1.367 (0.179)	1-1.6	Female
2.388 (0.471)	1.4-3.3	1.762 (0.375)	1-2.7	1.352 (0.273)	0.9-2	Total

Table 2 shows that the alar rim contour values one month after surgery were 1.352±0.273, a significant decrease compared with the values before surgery (P=0.000). Three months after surgery, these values had a relative increase compared with the first month (1.762±0.375), indicating a sign of relative recurrence of alar contour (P=0.000). (In 5 patients, marginal alar contour values were equivalent to preoperative values at 3 months after surgery.) At follow-up in the sixth month after surgery, alar rim contour values showed a greater increase (2.388±0.471) (P=0.000); thus, six months after surgery, these values were equivalent to preoperative values in 34 cases (68% of patients), confirming the complete return of alar rim contour to the preoperative state.

Table 3: Cumulative table of frequency and percentage of alar rim concavity based on VAS criteria in 1, 3, and 6 months after surgery compared to before surgery

		Gender			
		Male		Female	
		N	Percent	N	Percent
Treated after 1 month	Yes	26	100.0%	24	100.0%
	No	0	0.0%	0	0.0%
Treated after 3 months	Yes	24	92.3%	20	83.3%
	No	2	7.7%	4	16.7%
Treated after 6 months	Yes	9	34.6%	8	33.3%
	No	17	65.4%	16	66.7%

According to Table 3, in the first month after surgery, the alar rim concavity decreased in all patients (in both sexes) decreased; this amount three months after surgery compared to before surgery in 24 cases (92.3%) in females and 20 cases in males (83.3%), but six months after surgery, with the reappearance of this concavity, it approached the numbers before surgery, reaching 9 cases (34.6%) in females and 8 cases (33.3%) in males (Table 3).

In the first month after surgery, the distance of the alar rim contour decreased in all patients (in both sexes) compared to the longitudinal nasal section; three months after surgery compared to the time before surgery, this value decreased to 20 cases in women (83.3%) and reached 25 cases (96.2%) in men, but as with alar rim changes, the number of recurrences at six-month follow-up was almost the same in both sexes, 8 cases (33.3%) in men and 8 cases (33.3%) in women. we reached 30.3%).

DISCUSSION:

Rhinoplasty is considered one of the most popular cosmetic surgeries, especially when patients have a deformity of the tip of the nose (17). However, in this type of surgery, changes in the curvature of the nose must be controlled. The appearance of the alar has an important role in maintaining the beauty of the nose and face (18). On the other hand, the close connection of the fins with the tip of the nose and the internal nasal valve has a direct effect on the entry of sufficient air into the nose and normal breathing (19). In addition to congenital defects, alar deformities are also a common complication of rhinoplasty, which can be caused by excessive or inadequate removal of the cartilage (20). Alar deformities cause not only cosmetic problems but also functional problems with breathing, as they lead to the collapse of the external nasal valve of the nose (21). Correction of nasal alar deformities has always been a major challenge in nasal surgery because there are no supporting structures under the skin in this area (22). Correcting an alar rim deformity correctly requires an accurate preoperative diagnosis and choosing the right surgical method. There are several techniques to improve this problem (23). Usually, correction of alar deformity requires cartilage grafting with a free graft using autologous septal cartilage, rib cartilage, and ear cartilage. Effectiveness, speed, no need for follow-up surgery, and high ability to create a natural contour of the nasal margin have made this surgery one of the most popular methods of nasal contour reconstruction in recent years (24).

In the present study, all patients underwent rhinoplasty for the first time. Unger's study was performed on patients with a primary alar deformity, and Negm's study was also performed on patients in whom nasal wing collapse or external nasal valve collapse was the primary cause of nasal airway obstruction, but Boahene's study was performed on 26 patients who underwent primary rhinoplasty and 5 patients who underwent multiple rhinoplasties and In Alexander's study, 47% of the 45 patients had previously undergone rhinoplasty. The Orlando study (34) involved 102 patients, all of whom underwent a second rhinoplasty. The study by Rohrich was performed on patients with a primary alar deformity or a deformity resulting from previous rhinoplasty too.

In the present study, rhinoplasty was performed in patients using the free cartilage grafting method.

In the current study, patients were followed up by photography in caudal view at intervals of 1, 3, and 6 months after surgery; in Rohrich's study, follow-up was at intervals of 7 months to 5.5 years after surgery (mean 18 months) Completed. In Unger's study, postoperative images were taken at follow-up visits between 12 and 34 months after surgery. In Negm's study, each patient underwent a six-month follow-up between 12 and 24 postoperative days. In the Marianetti study, preoperative photos were compared with postoperative photos at 12 months. In Suh's study, a 2-year follow-up of patients after surgery was performed. In Elshazly's study, follow-up was performed between 12 and 24 months after surgery. In Rohrich's study (35), the mean follow-up time was 53.6 weeks (range: 52 to 60 weeks).

In the present study, the rate of reduction of alar rim curvature at one month after surgery was 5.42±0.83, at three months after surgery (6.02±1.15), and at follow-up at the sixth month after surgery, the mean values for rim-alar concavity showed a greater increase in all cases (7.38±0.87) (P=0.000). In the study by Marianetti (2020), based on the VAS scale, 32 of 47 patients (68%) were very satisfied with the outcome, 9 (19%) were satisfied, and 6 (12%) were not very satisfied. In the study by Kim (2019), concavity of the basal view was noted in 16 patients, of whom 15 (93.8%) had a partial or almost complete correction. In Choi's study of 20 young Asian men, the nostril axis ratio was significantly reduced after surgery in all but one patient, averaging 11.08 ± 6.52% in the anterior-posterior view and 17.74 ± 8.94% in the lateral view ($p > 0.01$).

CONCLUSIONS:

Transplantation of alar cartilage with free margin is effective in stabilizing the contour of the nostril, but this curve gradually returns in more than half of the patients at follow-up, but it still has lower values than the preoperative curve, and this shows the beneficial effect of using this type of graft.

Acknowledgments
None.

Conflict of interest
None.

Financial support
None.

Ethics statement
None

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