A New Graft Technique For Rhinoplasty: Modified One-Piece Nasal Cap With Alar Strut Graft

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Objectives: This study was aimed to evaluate the effectiveness of the new graft technique-modified one-piece nasal cap with alar strut graft in rhinoplasty; both for aesthetical appearance and nasal functions.

Methods: Forty-two patients, who underwent primary rhinoplasty operation with the new graft technique, were evaluated visually by photographing and functionally by the Cottle test and rhinomanometry measurement.

Results: All of the patients had sufficient nasal vision; also nasal valve angles became wider and Cottle tests were negative in all patients after surgery. Postoperative nasal airflow values (both left and right) were significantly higher, and airway resistance (left, right, and total) values were significantly lower than preoperative values.

Conclusion: With the new graft technique, the authors obtained both satisfying aesthetic results and intended functional improvement. This technique may be an alternative to combination of multiple graft techniques; with advantages of practical performing and less complication risks.

Key Words: Graft, nasal tip, nasal valve, rhinoplasty

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In recent years, open rhinoplasty techniques became widely preferred by the surgeons, owing to noteworthy better visual results.[1] Various graft techniques are used for the reconstruction of irregularities in the nasal dorsum and nasal valve pathologies. According to the needs of the patient, it is possible to use the appropriate graft technique alone or in combination with another. The main purpose of most of the graft techniques is esthetically good results, but the surgeon should never neglect to preserve or improve nasal functions.[2]

Nasal tip is a conspicuous part of the nose, and its position is very important for aesthetic appearance of the face. The shape of nasal tip is basically formed by lower lateral cartilages. These cartilages are examined in 3 regions anatomically: medial crura, intermediate crura (domes) and lateral crura. Three-dimensional configuration of these cartilages creates aesthetic image of this region. Droppy nasal tip; which is not in harmony with surrounding facial structures, is one of the common causes of disturbing nasofacial appearance and also a common indication of nasal tip remodeling.[3] Nasal tip remodeling is one of the most complex procedures of rhinoplasty, there are various types of tip grafts used for remodeling, such as, cap graft, onlay tip graft, shield graft and septal extension graft.[4]

The rule of success in rhinoplasty is to provide a sufficient airflow besides an aesthetical appearance. Nasal valve is the narrowest point for airflow. It can be divided into 2 parts anatomically: internal nasal valve (INV) and external nasal valve (ENV). ENV is located in the nose rim and regulates the air flow through the nose. Studies with pre- and postoperative rhinomanometry concluded that proper breathing is not only related to the absence of septal deviation, but also the proper functioning of the nasal valves.[5] The position of the lower lateral cartilages plays an important role in the proper functioning of this valve, because these cartilages are the main structural elements of the lateral wall,[6–8] weakness of these cartilages lead to dysfunction of external nasal valves (ENVD), because ENV obstructs normal breathing.[9] This obstruction leads to symptoms of reduced airflow, such as alar collapse, pressure and fullness in the nose.[10] The alar contour grafts are also widely used alone or as combinations with tip grafts in primary and secondary rhinoplasty; to reinforce the external nasal valve,[11] as a result, to improve nasal functions.[11]

In the present study, a new approach: modified one-piece nasal cap and alar strut graft technique was used for the first time in place of nasal cap graft and lateral crural strut graft in primary rhinoplasty; the visual and functional results of the technique were evaluated in patients with droppy nasal tip and lateral collapse.

MATERIAL AND METHOD

Patients

This study was conducted with 42 patients (25 male and 17 female), with the age range of 18 to 49 (mean age: 29.5). None of the patients has a history of facial trauma, rhinoplasty or nasal abnormality, and all of them were suffered from droppy nasal tip, verified by surgeons. Cottle test was performed to assess nasal airway obstruction. Preoperative and postoperative photographic documentations of lateral view and nasal vestibule were recorded, also preoperative and postoperative nasal respiration was evaluated by rhinomanometry (RMM), in all cases. Approval of the Istanbul Yeni Yüzyil University Ethics Committee for Non-Invasive Health Sciences Research (Date: 11.05.2020 - Decision No: 2020/04–05) was obtained for the study.

Surgical Procedure

All patients were operated under general anesthesia with open rhinoplasty technique. Columellar flap was created in the

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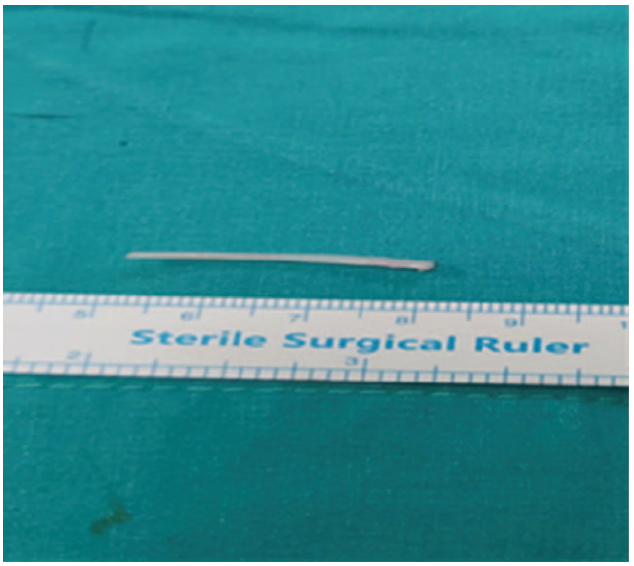

FIGURE 1. Cartilage obtained from nasal septum.

subcutaneous plane with a transcolumellar infracartilaginous incision. Subperichondrial and subperiosteal dissection was carried out from caudal to naso-frontal junction until nasal cartilage and bone structures appeared. The bone hump was resected with a chisel. Lateral osteotomy was performed by external way and percutaneously, with a 2 mm thick and sharp osteotome. After septal mucopericondrial elevation, cartilage graft approximately 3 mm width, 2 mm thickness and 35 mm long was obtained (Fig. 1).

Cephalic resection was performed on the medial face of the lower lateral cartilage (a width of 5–6 mm in women and 7–8 mm in men was left), and then the transdomal suturing technique was performed with 5/0 polypropylene. After the columellar strut graft was placed, the cartilage graft was fixed transversely to the domal point with 6/0 polypropylen (Fig. 2). Intra-nasal and transcolumellar incisions were sutured with 5/0 Vicryl. Intranasal splint buffer and external thermo-plastic nasal splint were performed to all patients.

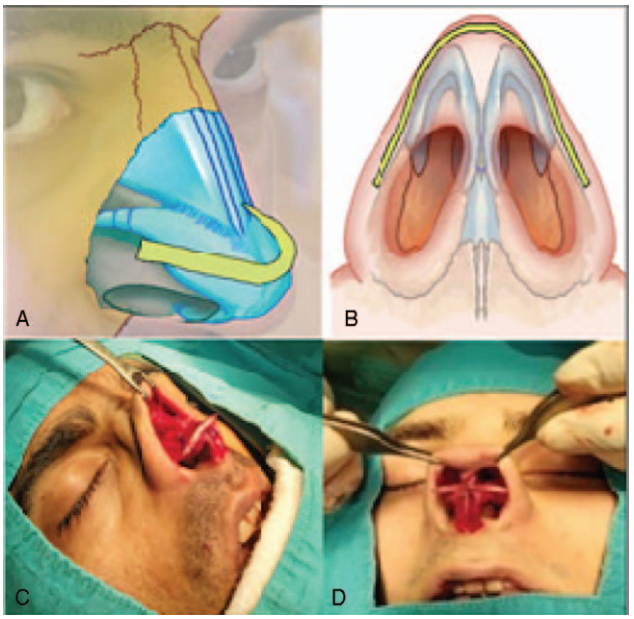

FIGURE 2. Surgical procedure: graft performing technique.

RMM Analysis

The patients were acclimatized to the hospital environment for 30 min, then they undergone to RMM measurements in a room maintained at a temperature of 25°C, with a low noise level. For decongestion, 0.001% xylometazoline hydrochloride was applied twice to both nostrils. A nasal probe was placed into one nostril, and the patients were asked to breathe through the other nostril while the mouth was closed. RMM recordings were performed by using a NR6 rhinomanometer (GM Instruments Ltd., Kilwinning, UK). All measurements were performed by the same otolaryngologist, at a steady pressure of 150 Pa, as recommended by the European Rhinomanometry Standardization Committee.[12,13]

Two RMM measurements were performed to all patients; the first one before the operation and the second one 5 months after the operation. Two parameters which are inversely proportional- the nasal airflow and airflow resistance were used.[5] The right, left, and total nasal airflow and airway resistances were evaluated comparatively. Nasal resistance was determined at a reference pressure of 150 Pa, which was below the maximal 5% coefficient of variation, based on 10 respiratory cycles (inspiration plusexpiration) for each nasal cavity. The average pressure differential (P), amount of airflow passing through the nasal cavity (V), and nasal resistance (R) were calculated automatically using the formula R 1/4 P=V in $Pa/cm^3/s$ for each cavity by a microprocessor. Total nasal resistance was determined according to Ohm law: Rtotal = (Rright × Rleft)/(Rright + Rleft).

RESULTS

No complications were occurred due to rhinoplasty operation. Cottle test was positive, and total (13 patients) or partial (29 patients) nasal collapse was present in all patients before the surgery. Nasal tip drop can be seen in lateral view of the noses that were recorded preoperatively.

All of the patients had sufficient nasal tip appearance (Fig. 3); also nasal valve angles became wider and Cottle tests were negative in all patients after surgery.

Figure 4 and Supplemental Table 1, http://links.lww.com/SCS/C108 present the RMM results of patients; preoperatively and

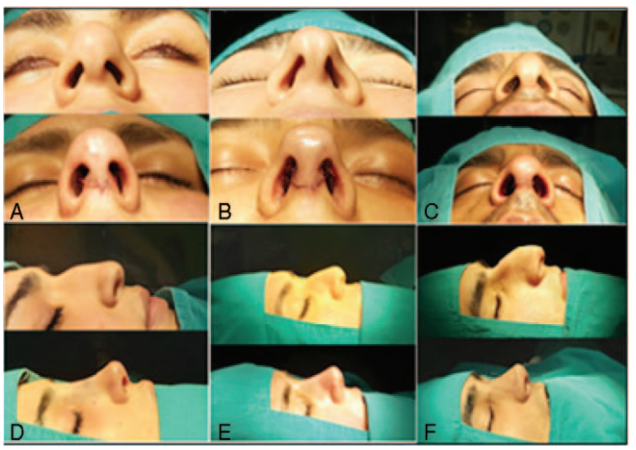

FIGURE 3. Samples from preoperative and postoperative nasal (lateral and vestibuler view).

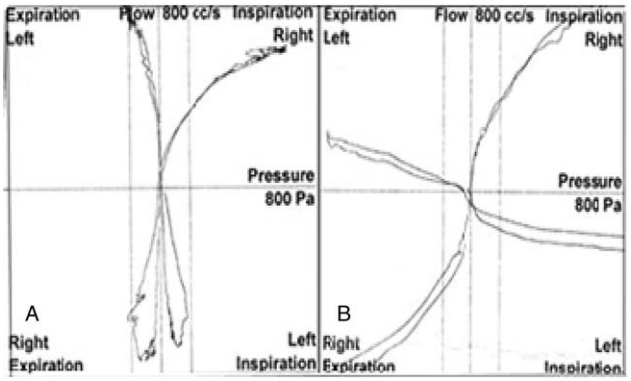

FIGURE 4. RMM results of patients (A: preoperative, B: postoperative).

postoperatively. There can be seen a statistically significant difference between preoperative and postoperative nasal airflow and airway resistance values both in right and lest nose. Postoperative nasal airflow values (both left and right) were significantly higher ($P < 0.001$), and airway resistance (left, right and total) values were significantly lower ($P < 0.001$) than preoperative values.

DISCUSSION

Various graft techniques are widely used in rhinoplasty; both in nasal tip remodeling for satisfying aesthetical appearance and in alar support for comfortable breathing. Bone, cartilage, and soft tissue destructions in rhinoplasty may cause weakening of the structural components of nasal tip; so this region must be supported by the cartilage grafts, most of the time. These graft techniques rely on the basic principle that preservation of the supporting structures of the nose is vital for aesthetically and functionally.[14] On the other hand; the rhinoplasty technique itself may cause contour irregularities in nasal dorsum and tip. Grafts of different origin are also used to cover up and eliminate these irregularities.[15]

When there are both aesthetically dissatisfying nose appearance and functional problems with alar pinch and retraction; usually, two different graft techniques are performed for the nasal tip support and reconstruction of disfunctional nasal valves. The commonly used tip grafts are cap graft, columellar strut graft, onlay tip graft, shield graft, septal extansion grafts etc., and alar support grafts are; alar batten graft, alar rim graft, lateral crurat strut graft, lateral crural onlay graft etc.[17]

In the present study, modified one-piece graft was used for both nasal tip revision and alar support, in place of classical graft techniques which require 2 different grafts for two regions. The advantages of this new graft technique, compared to combinations of 2 graft applications are: nasal tip revision, alar collapse refinement and external nasal valve widening procedures were carried out in one step. Results of this study demonstrate that this technique is more practical, time-saving, effective and easy to perform. It has many advantages; for example there is no need to create a pouch in the alar region as performed in the lateral strut graft, or no need to suture the alar region as in the alar rim graft.[16] The first-stage aesthetical results of nasal tip reconstruction with this new technique satisfied surgeons' and the patients' expectations with ideal tip symmetry, height, and length.

Some situations are the supporting evidences of external nasal valve insufficiency; just as boxy tip, bulbous tip, nasal alar retraction, deep alar groove, and alar collapse during deep inspiration.[6,7,17,18] Weak lower lateral cartilages are the main causes of the occurrence of external nasal valve insufficiency.[6,7] Surgical intervention of the external nasal valve insufficiency usually aims to structure the lateral and medial walls of this valve.[19,20] In 2017, Silva and Bittencourt concluded that structuring the nasal alar with the lateral crural strut graft and/or alar contour graft was shown efficient to correct external nasal valve insufficiency in 90% of the cases.[9] In the present study, postoperative results of RMM as an indicator of nasal valve functions were satisfying, compared to preoperative results; with no disadvantages from single alar graft techniques.

Best of our knowledge, there is only one study in the literature reported results of one-piece graft technique in rhinoplasty, similar to present study.[21] Bracaglia et al named this technique as 'rainbow graft' but unlike the present study, all of the patients were operated for revision rhinoplasty, with nasal shape distrosion, nasal tip asymmetry and other complex deformities. They reported that they used ear cartilage for the graft due to inadequate cartilage tissue in septal area. As a result, 2 of 21 patients showed persistent asymmetry, 1 persistent alar pinch and 2 alar retractions. The present study was conducted with 42 patients, who had no rhinoplasty or nasal abnormality history. Septal cartilages were used for the graft, and none of the patients had any complications or ongoing complaints after surgery.

CONCLUSION

The new graft technique "Modified One-Piece Nasal Cap With Alar Strut Graft" is a practical, time-saving and easy to perform technique in rhinoplasty. This technique can be preferred instead of classical multiple graft applications; not only in revision, but also in primary rhinoplasty.

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REFERENCES

1. Momeni A, Gruber RP. Primary open rhinoplasty. *Aesthet Surg J* 2016;36:983–992
2. Daniel RK, Calvert JW. Diced cartilage grafts in rhinoplasty surgery. *Plast Reconstr Surg* 2004;113:2156–2171
3. Oren, Timur A, Ted C. Reconstructive rhinoplasty the 3-dimensional nasal tip. *Arch Facial Plast Surg* 2006;8:195–201
4. Foda T. External rhinoplasty for the over projected nasal tip. English version of "Externe Rhinoplastik bei Nasenspitzenüberprojektion". *J Ästhet Chir* 2013;6:26–32
5. Constantian MB, Clardy RB. The relative importance of septal and nasal valvular surgery in correcting airway obstruction in primary and secondary rhinoplasty. *Plast Reconstr Surg* 1996;98:38–54
6. Constantian MB. The two essential elements for planning tip surgery in primary and secondary rhinoplasty: observations based on review of 100 consecutive patients. *Plast Reconstr Surg* 2004;114:1571–1581
7. Constantian MB. The boxy nasal tip, the ball tip, and alar cartilage malposition: variations on a theme—a study in 200 consecutive primary and secondary rhinoplasty patients. *Plast Reconstr Surg* 2005;116:268–281
8. Silva EN, Bittencourt RC. Preoperative and postoperative assessment of external nasal valve in rhinoplasty. *Rev Bras Cir Pla 'st* 2017;32:17–27
9. Tabbal N. The alar sliding graft for correcting alar collapse and expanding the nasal tip. *Aesth Surg J* 2000;20:244–252
10. Lee J, White WM, Constantinides M. Surgical and nonsurgical treatments of the nasal valves. *Otolaryngolv Clin North Am J* 2009;42:495–511
11. Rohrich RJ, Raniere J Jr, Ha RY. The alar contour graft: correction and prevention of alar rim deformities in rhinoplasty. *Plast Reconstr Surg* 2002;109:2495–2505

12. Clement P, Gordts F. Consensus report on acoustic rhinometry and rhinomanometry. *Rhinology* 2005;43:169–179
13. Chen I-C, Lin Y-T, Hsu J-H, et al. Nasal airflow measured by rhinomanometry correlates with FeNO in children with asthma. *PLoS One* 2016;11:e0165440
14. Quatela VC, Jacono AA. Structural grafting in rhinoplasty. *Facial Plast Surg* 2002;18:223–232
15. Gryskiewicz JM, Rohrich RJ, Reagan BJ. The use of Alloderm for correction of nasal contour deformities. *Plast Reconstr Surg* 2001;107:561Y570
16. Gunter PJ, Landecker A, Cochran SC. Basic nasal tip surgery: freqently used grafts in rhinoplasty: nomenclature and analysis. In: Gunter JP, Rohrich RJ, Adams WP (eds). Dallas Rhinoplasty. Vol. 1. 2nd ed. St. Louis: Quality Medical Publishing Inc.; 2007:159–171.
17. Toriumi DM, Asher SA. Lateral crural repositioning for treatment of cephalic malposition. *Facial Plast Surg Clin N Am* 2015;23:55–71
18. Gubisch W, Eichhorn-Sens J. Overresection of the lower lateral cartilages: a common conceptual mistake with functional and aesthetic consequences. *Aesthetic Plast Surg* 2009;33:6–13
19. Ponsky D, Eshraghi Y, Guyuron B. The frequency of surgical maneuvers during open rhinoplasty. *Plast Reconstr Surg* 2010;126: 240–244
20. Silva EN, Ribas-Filho JM. External nasal valve insufficiency: planning and performing. *Rev Me 'd Parana* 2014;72:20–23
21. Bracaglia R, Servilloa M, Fortunatoa R, et al. Rainbow graft for tip reconstruction in revision rhinoplasty. *J Plast Reconstr Aesth Surg* 2019;000:1–7

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