

Restorative Rhinoplasty in the Aging Patient

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Objective: The objective of this study is to review our favorable experience in performing rhinoplasty in aging patients. **Methods:** All patients aged 65 years or greater who underwent rhinoplasty, either esthetic or functional, by the senior author (Y.D.) from August 1997 to July 2005 with a minimum follow up of 1 year were retrospectively reviewed. **Results:** A total of 51 patients met the inclusion criteria and had complete records available for review. The average age was 69.5 years (range, 65–82 years) with 24 female and 27 male patients. All but two patients underwent open rhinoplasty. Eighteen procedures represented secondary rhinoplasties. Seven patients required auricular cartilage grafts, and 11 patients required costal cartilage grafts. One costal cartilage graft was aborted as a result of excessive calcification. All patients underwent columellar strut placement, 92% underwent internal valve grafts, and 80.4% underwent grafting of the external nasal valves. Nasal osteotomies were performed in only 23.5% of patients, all with the percutaneous technique. Revision surgery was necessary in only three (5.8%) patients, all of whom required grafting of the external valve (not performed primarily). In each of these cases, no significant external valve collapse was noted preoperatively. Premaxillary augmentation with diced or crushed cartilage grafts was performed in 81.8% (n = 18) of patients with an edentulous maxillary arch. **Conclusions:** Aging patients present unique technical challenges in rhinoplasty that warrant a comprehensive approach to restore internal and external valve competency and tip support. Consideration of prophylactic external valve grafts in addition to the routine use of internal valve grafts and columellar struts may help decrease the need for revision surgery in this patient population. Reasonable functional and

esthetic outcomes can be expected in the aging patient. **Key Words:** Rhinoplasty, elderly, surgery, plastic surgery, airway obstruction.

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INTRODUCTION

Age-related changes of the face have been an area of intense interest and the focus of considerable research. The facial skeleton and overlying soft tissue undergo a gradual transformation throughout the aging process, and there are several consistent age-associated changes of the nose. These changes include thinning of the nasal skin, weakening of the nasal cartilages, separation of the fibrous attachments between the upper and lower lateral cartilages, and nasal tip ptosis.

These structural changes translate into functional deficits in the aging nose and manifest as nasal obstruction from internal valve collapse, external valve collapse, and loss of tip support. As a result, the aging nose poses unique technical challenges for the rhinoplasty surgeon. Previously, approaches to the aging nose have centered on reestablishing tip support through traditional rhinoplasty techniques.^{1,2} The purpose of this article is to offer the surgeon an approach to planning an anatomically based restorative sequence to rhinoplasty in the aging patient.

Structural and Functional Deficits in the Aged Nose

Esthetically, the aged nose has a relatively increased length and a ptotic tip. This often results in an apparent dorsal convexity or exaggeration of an existing hump. Equally important to the esthetic sequelae of aging are the functional changes that occur, namely in regard to nasal airflow. The impairment of nasal airflow seen in elderly patients rests on three crucial factors that restorative rhinoplasty seeks to overcome: 1) external valve collapse, 2) internal valve collapse, and 3) a drooping nasal tip.

External nasal valve collapse-related nasal obstruction is most often caused by deficiencies in the structural support of the lateral nasal wall. Alar collapse has been noted to occur frequently in the elderly patient,³ because weakening of the lateral crura causes the alae to become prone to collapse during even mild to moderate inspiration.⁴

Furthermore, internal valve collapse is a common finding in the aging nose. The internal nasal valve is the

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anatomic area defined by the caudal margin of the upper lateral cartilage, the nasal septum, and the inferior turbinate. Flaccidity of the upper lateral cartilage, muscular atrophy, and loss of support all contribute to internal valve dysfunction.^{1,2}

The drooping nasal tip often noted with the aging process is predominantly related to loss of fibroelastic support in the scroll area, which causes the lateral crura to migrate caudally.⁵ Additionally, alveolar and maxillary hypoplasia, especially in the edentulous patient, results in loss of support for the nasal base and relative shortening of the columella. Thus, extrinsic and intrinsic loss of support of the lower lateral cartilages results in a drooping, elongated tip complex that impedes airflow into the nasal passages.^{6,7}

Other factors associated with aging involve changes in the soft tissue envelope. Photoaging and intrinsic aging of the skin result in epidermal thinning and alterations in dermal collagen composition and organization.^{8,9} As a result, the nasal skin is less resilient, which makes postoperative redraping less efficacious and minor framework changes more apparent.

Patient Selection and Preoperative Evaluation

A thorough medical history is requisite, and preoperative medical clearance is recommended given the increased incidence of medical comorbidities in elderly patients. Age alone should not preclude surgical intervention in appropriate surgical candidates with complaints of nasal airway obstruction because rhinoplasty can be performed safely in the elderly patient.^{10,11}

Like with any patient, the physical examination plays an important role in the preoperative evaluation of the aging patient. The patient should be observed during both quiet and active inspiration to observe for the presence of external valve collapse. Internal valve collapse can be assessed by performing the Cottle maneuver as well as direct visualization of the valve area. The degree of tip rotation and character of the skin and nasal mucosa should be noted.

Finally, special attention should be given to patient goals and expectations. Older patients represent a generation of individuals who may have apprehension regarding esthetic surgical procedures. In these patients, restoration of structural and functional integrity may be achieved while maintaining the patient's goals, even in patients who do not desire a significant alteration in their nasal appearance. The physician should also be sensitive to the patient's motivation for seeking rhinoplasty. Rees has commented that often patients with advancing age have had a lifelong desire to alter their nasal appearance and may have unrealistic expectations.¹² Other patients may have recent psychosocial stressors such as the death of a loved one that should be resolved before proceeding with surgery.^{13,14}

METHODS

All patients aged 65 years or greater who underwent rhinoplasty, either esthetic or functional, by the senior author (Y.D.) from August 1997 to July 2005 with a minimum follow up of 1 year were retrospectively reviewed.

RESULTS

A total of 51 patients met the inclusion criteria and had complete records available for review. The average age was

69.5 years (range, 65–82 years) with 24 female and 27 male patients. All but two patients underwent open rhinoplasty. Eighteen procedures represented secondary rhinoplasties. Seven patients required auricular cartilage grafts, and 11 patients required costal cartilage grafts. One costal cartilage graft was aborted as a result of excessive calcification. All patients underwent columellar strut placement, 92% underwent internal valve grafts, and 80.4% underwent grafting of the external nasal valves (Figs. 1–3). Only 23.5% of patients underwent osteotomies, all with the percutaneous technique. Revision surgery was necessary in only three (5.8%) patients, all of whom required grafting of the external valve (not performed primarily). In each of these cases, no significant external valve collapse was noted preoperatively. Pre-maxillary augmentation with spliced or crushed cartilage grafts was performed in 81.8% (n = 18) of patients with an edentulous maxillary arch.

Surgical Technique

Aging patients should generally be addressed with open rhinoplasty techniques because the open approach allows for complete visualization of all structures and

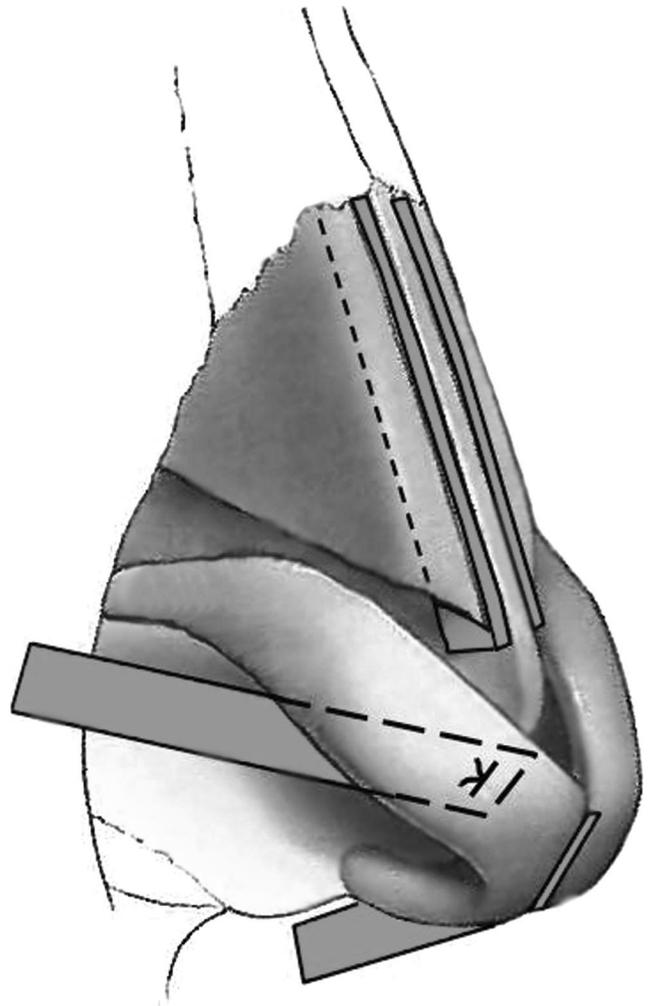


Fig. 1. Diagrammatic representation of the key components of the restorative rhinoplasty technique: dorsal spreader grafts, lateral crural strut grafts, and columellar strut.

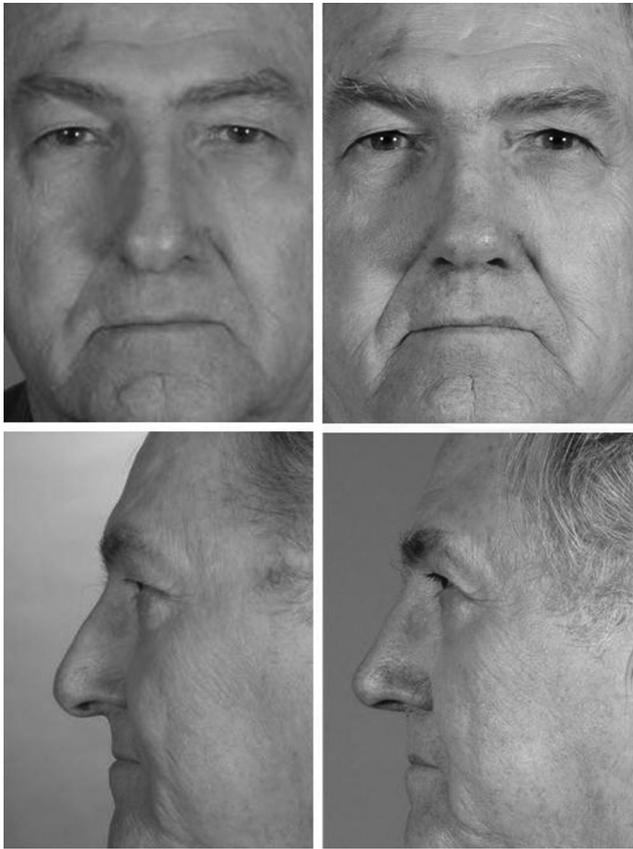


Fig. 2. (Left) Preoperative frontal and lateral views of a 69-year-old man with the typical age-related changes in nasal structure, including internal valve collapse, external valve collapse, and a ptotic nasal tip. (Right) One-year postoperative frontal and lateral views after undergoing open rhinoplasty with the restorative rhinoplasty technique.

allows for the wide soft tissue undermining needed for appropriate redraping of the skin envelope.

Septoplasty and septal cartilage harvesting should proceed with caution, because the mucoperichondrium is often attenuated and prone to tearing. If sufficient septal cartilage is unavailable, auricular or costal cartilage may serve as an additional source of grafting material. However, costal cartilage in older individuals is often calcified making it an unpredictable source of cartilage.

Correction of external valve incompetence is accomplished with the placement of lateral crural strut grafts. Lateral crural strut grafts restore external valve competency because they strengthen the lateral crura and facilitate lateral movement of the alar wall.¹⁵ Open rhinoplasty inherently weakens the support structures of the nose and can potentially exacerbate external valve collapse. Thus, prophylactic lateral crural strut grafts should be considered in these patients even if they do not exhibit external valve collapse preoperatively. Alternatively, alar batten grafts, although not anatomic, may be used in lieu of lateral crural strut grafts. Alar batten grafts are nonanatomic grafts placed in a pocket extending from the piriform aperture to a paramedian position in the alar sidewall at the site of maximal lateral nasal wall collapse during inspiration.¹⁶

Internal nasal valve competency may be restored or maintained with bilateral spreader grafts.¹⁷ The grafts

are longitudinal grafts sutured in a submucoperichondrial pocket between the dorsal septum and the upper lateral cartilages usually from the keystone area to the septal angle. Spreader grafts may also add strength and stability to a weakened or deviated septum.

For restoration of tip support, placement of a columellar strut will help support weakened medial crura and act to stabilize the base of the nose. Additionally, a “medial crura–septal suture” may be used to allow for more controlled tip projection and preservation of tip rotation over the long term. This suture is placed through the medial crural footplates or columellar strut and anchored to the caudal septum. A premaxillary graft may be required in the edentulous patient to augment the base of the piriform aperture and provide the columellar strut with additional support.

Because the nasal bones in patients with advancing age are often brittle, osteotomies are generally discouraged. However, we feel that percutaneous “postage stamp” osteotomies are appropriate when required for airway optimization. Advantages of the percutaneous approach include preservation of periosteal attachments of the osseous framework that aid in stabilizing the osteotomized nasal bones, less intranasal injury, and lessened airway compromise.¹⁸ Furthermore, the perforating osteotomies maintain periosteal support and may help decrease the risk of comminution of fragile nasal bones.

Dorsal hump reduction should be addressed only after determining the appropriate tip projection and rotation because the appearance of a “pseudohump” may be alleviated and thus prevent unnecessary dorsal reduction. Dorsal reduction through rasping, as opposed to using an osteotome, is a viable means of lowering the dorsal height in elderly patients with a true dorsal hump.

Excessive cartilaginous resection should be avoided to prevent additional destabilization. Although reductive rhinoplasty may create an esthetically pleasing nose, the postoperative result may not be in harmony with the patient’s other facial features such as elongated pinnae. Furthermore, excessive reduction may preclude appropriate soft tissue redraping as seen in younger patients.

DISCUSSION

Demographically, our society is changing, and elderly persons represent one of the fastest growing segments of our population. It is estimated that by 2030, approximately 19.6% of the U.S. population will be 65 years or older.¹⁹ As a result, a larger segment of the population may be considering facial plastic surgery procedures.

With this increase in the age of our population, the surgeon must be cognizant of the effects of aging on the nose and be prepared for the necessary maneuvers to optimize results in rhinoplasty in the aging patient. Whether aging patients seek rhinoplasty out of functional or esthetic concerns, the goals of restorative rhinoplasty include:

- Correction of internal valve collapse with spreader grafts;
- Preservation of external valve competency with lateral crural strut grafts or alar batten grafts;

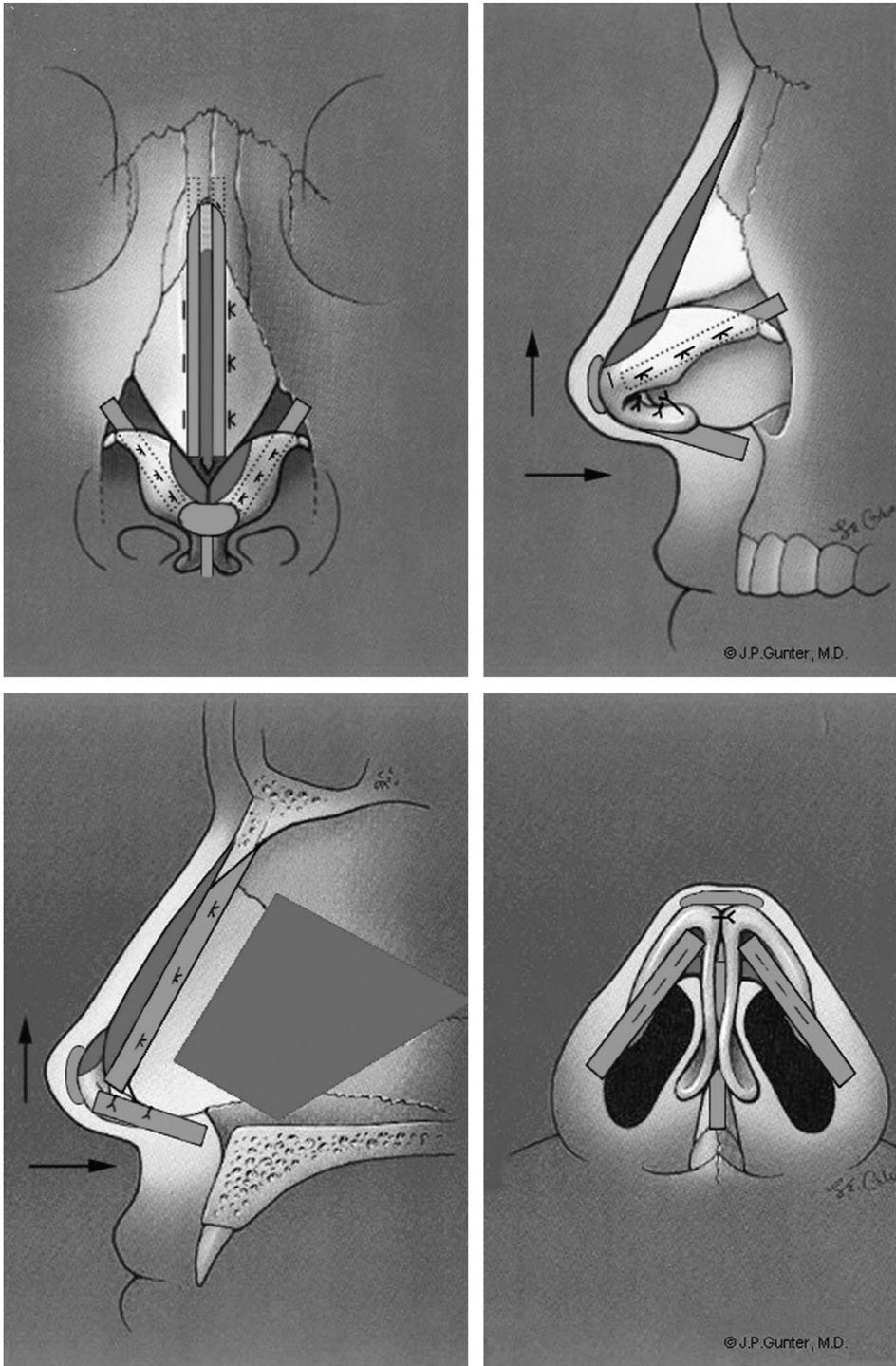


Fig. 3. Gunter Diagram (Canfield Scientific, Inc.) of the intraoperative maneuvers used in the restorative rhinoplasty of the patient in Figure 2, including dorsal spreader grafts, lateral crural strut grafts, columellar strut, tip onlay graft, medial crura-septal suture, and dorsal rasping.

- Control of tip rotation and projection with a columellar strut and a “medial crura-septal suture”;
- Conservative osseocartilaginous reduction when necessary. The emphasis is on increased use of cartilage grafts, i.e., augmentation rhinoplasty; and
- Precise nasal bone osteotomies, if absolutely required.

Analysis of our case series yielded interesting results. Although the use of a columellar strut and spreader grafts

has become routine and commonplace in open rhinoplasty to help maintain tip support and improve both the dorsal esthetic lines and nasal airflow, our data indicate that additional grafting of the external nasal valve is warranted in aging patients. Thus, prophylactic placement of lateral crural strut grafts or other grafts of the external valve area should be considered even if there is no external valve collapse noted preoperatively.

Many of our patients were noted to have had excessively ossified septal cartilage resulting in the need for

cartilage from other donor sites. The surgeon should anticipate the significant amount of grafting material required in the aging patient and be prepared to obtain auricular or costal cartilage to fulfill all the grafting requirements as outlined here.

CONCLUSIONS

Aging patients present unique technical challenges in rhinoplasty that warrant a comprehensive approach to restore internal and external valve competency in addition to preserving tip support. Reasonable functional and esthetic outcomes can be expected in the aging patient. Realistic expectations should be reinforced preoperatively like with all patients, particularly in view of the thin skin and generally drawn-out appearance of the rest of these patients' facial features.

BIBLIOGRAPHY

1. Rohrich RJ, Hollier LH. Rhinoplasty with advancing age: characteristics and management. *Clin Plast Surg* 1996;23:281-296.
2. Guyuron B. The aging nose. *Dermatol Clin* 1997;15:659-664.
3. Bridger GP. Split rib graft for alar collapse. *Arch Otolaryngol* 1981;107:110-113.
4. Constantian MB. The incompetent external nasal valve: pathophysiology and treatment in primary and secondary rhinoplasty. *Plast Reconstr Surg* 1994;93:919-931.
5. Parkes ML, Kamer FM. The mature nose. *Laryngoscope* 1973;83:157.
6. Patterson C. The aging nose: characteristics and correction. *Otolaryngol Clin North Am* 1980;13:275.
7. Bridger GP. Physiology of the nasal valve. *Arch Otolaryngol* 1970;92:543.
8. Fenske NA, Lober CW. Structural and functional changes of normal aging skin. *J Am Acad Dermatol* 1986;15:571-585.
9. Weiss RA, Weiss MA, Beasley KL. Rejuvenation of photoaged skin: 5 year results with intense pulsed light of the face, neck, and chest. *Dermatol Surg* 2002;28:1115-1119.
10. Shumrick KA, Campbell A, Becker F. Nasal reconstruction in the elderly patient. The case for not letting age determine method. *Arch Facial Plast Surg* 1999;1:297-301.
11. Solomon MP, Granick MS. Plastic surgery in the elderly. *Clin Geriatr Med* 1990;6:633-657.
12. Rees TD. Rhinoplasty in the older patient. *Ann Plast Surg* 1978;1:27.
13. Goin MK. Psychological understanding and management of rhinoplasty patients. *Clin Plast Surg* 1977;4:3.
14. Thomson HS. Preoperative selection and counseling of patients for rhinoplasty. *Plast Reconstr Surg* 1972;50:174.
15. Gunter JP, Friedman RM, Hackney FL. Lateral crural strut graft: technique and clinical applications in rhinoplasty. *Plast Reconstr Surg* 1997;99:943.
16. Toriumi DM, Josen J, Weinberger M, Tardy ME. Use of alar batten grafts for correction of nasal valve collapse. *Arch Otolaryngol Head Neck Surg* 1997;123:802-808.
17. Sheen JH. Spreader grafts: a method of reconstructing the root of the middle nasal vault following rhinoplasty. *Plast Reconstr Surg* 1984;73:230.
18. Tardy ME, Denney JC. Micro-osteotomies in rhinoplasty. *Facial Plast Surg* 1984;1:137-145.
19. Trends in aging—United States and worldwide. *MMWR Morb Mortal Wkly Rep* 2003;52:101-104.