Secondary RHINOPLASTY

by the Global Masters

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The External and Internal Nasal Valves

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Deformation of the nasal soft tissues or underlying osteocartilaginous framework after rhinoplasty can cause functional airway problems.[1,2] These structures must be reconstructed in secondary rhinoplasty to provide a patent nasal passage.[3]

DEFINITION AND ANALYSIS

The function of the nasal airway is not only influenced by the shape of the septum and inferior turbinates but also by the strength of the lateral nasal wall during the dynamic pressure changes of breathing.[4] Thus any acquired weakness of the upper or lower lateral cartilages or their associated soft tissues may profoundly affect airflow through the nose.[1,2,4]

The External Nasal Valve

The external nasal valve is responsible for approximately one third of airway resistance[1,2] (Fig. 21-1). The external nasal valve is formed by the alar rim, nasal sill, caudal septum, and medial crus.[1,2,5,6] Nasal airflow begins with movement through the nostril and into the vestibule. A weakened or malpositioned external nasal valve allows collapse and decreases the cross-sectional area of the valve with subsequent obstruction (Fig. 21-2). When cartilaginous support is insufficient, low pressures in the nasal vestibule during inspiration will collapse the nostril, ultimately increasing airway resistance and decreasing airflow.[4] This pattern is common when the lateral crura were overresected or weakened in previous rhinoplasty.[3]

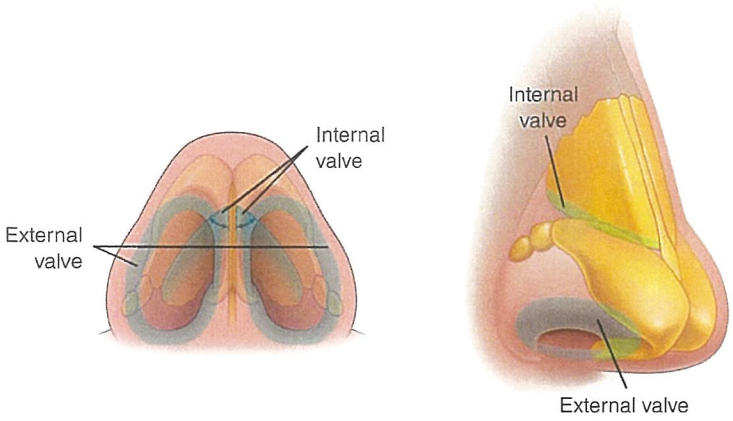

Fig. 21-1 The external and internal nasal valves.

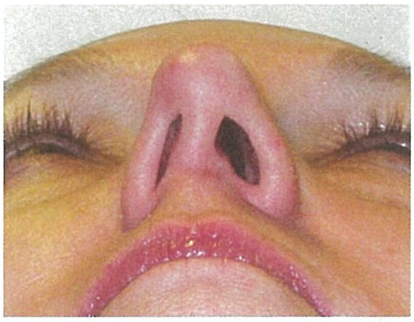

Fig. 21-2 Severe right external nasal valve collapse and caudal septal deviation after primary rhinoplasty.

Alar or vestibular stenosis, though much less common after primary rhinoplasty, can also decrease the cross-sectional area of the external nasal valve and can restrict airflow.[7]

Internal Nasal Valve

The intersection of the caudal edge of the upper lateral cartilage with the dorsal septum creates the internal nasal valve angle; a normal valve angle is approximately 10 to 15 degrees.[1,2]

The internal nasal valve accounts for most airway resistance in the nasal passage.[1,2]

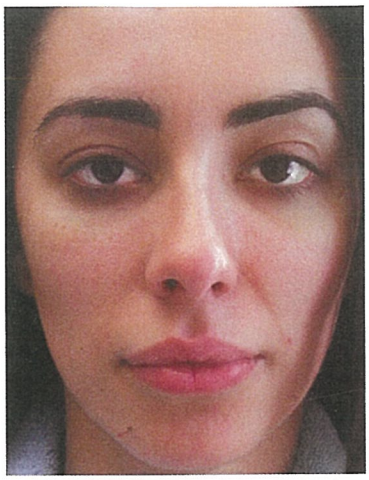

Fig. 21-3 A secondary rhinoplasty patient with right internal nasal valve collapse and dorsal septal deviation.

A deviated dorsal septum, overresected upper lateral cartilages, or scarring can compromise internal nasal valve function (Fig. 21-3). In addition, if the upper lateral cartilages lack adequate strength to withstand dynamic pressure changes during inspiration, the internal nasal valve can collapse.

Internal nasal valve dysfunction is common if the dorsum and upper lateral cartilages have been overresected.[1,3,4]

The anterior head of the inferior turbinate forms the posterior border of the internal nasal valve; hypertrophy of the inferior turbinate can increase resistance at the internal nasal valve and negatively affect nasal airflow.[1,2,5,6]

Evaluation

Physical examination should begin with the evaluation of the external nose. The dorsal aesthetic lines should be smooth and symmetrical.

When the upper lateral cartilage has been overresected or the dorsum was not adequately reconstituted, the transition between the upper lateral cartilage and dorsal septum will be irregular.[1,5,6] A positive Cottle sign during the exam (lateral traction on the cheek causing subjective improvement in nasal airflow) can confirm a collapsed or dysfunctional internal nasal valve[1] (Fig. 21-4).

Fig. 21-4 A positive Cottle sign can confirm a collapsed or dysfunctional internal nasal valve.

Internal nasal valve collapse is associated with irregularity of the dorsal aesthetic lines.

Evaluation of the external nasal valve should take into consideration the position of the caudal septum and medial crura and the shape of the alar rim, as well as the overall shape of the nostril. Caudal septal deviation and medial crura footplate flaring can narrow the nostril.

Alar rim collapse, both static and dynamic, will also narrow the nostril and contribute to external nasal valve collapse.

The nose should be examined not only at rest but also during forced inspiration. The external nasal valve may function adequately during gentle inspiration but may collapse during deep or forced inspiration[8] (Fig. 21-5). Collapse of the nostril, which may be unilateral or bilateral, indicates a weakened lateral crus. Similarly, collapse of the lateral nasal wall may suggest inadequate upper lateral cartilage and possibly internal nasal valve dysfunction.[3]

In addition to evaluating the external nasal anatomy, the surgeon must examine the internal structures of the nose to assess pathology.[8] The intersection of the

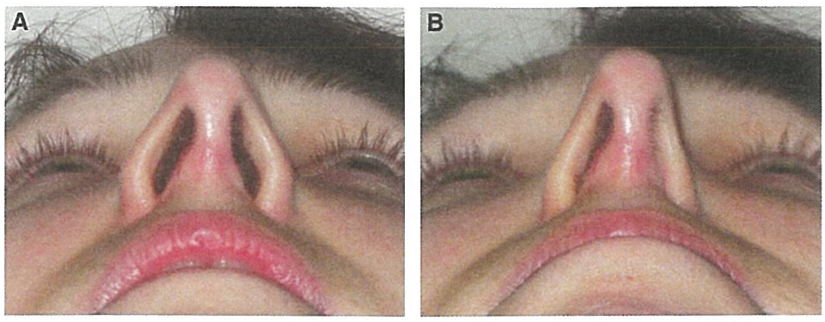

Fig. 21-5 Dynamic alar collapse with forced inspiration after rhinoplasty. A, Normal respiration. B, Forced inspiration.

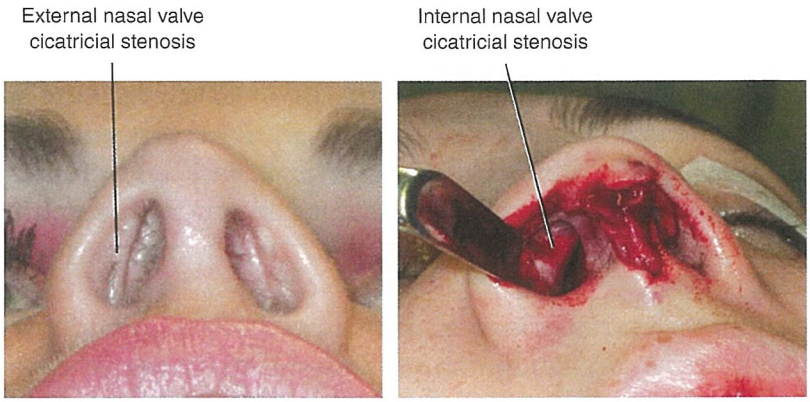

Fig. 21-6 Cicatricial stenosis of the external or internal nasal valves from prior surgery can cause nasal valve dysfunction.

upper lateral cartilage and the septum should be assessed; dynamic or static collapse of the internal nasal valve indicates dysfunction.[1,8] Cicatricial stenosis of the external or internal nasal valves from prior surgery may be appreciated as well (Fig. 21-6). The inferior turbinates should be evaluated. The availability of septal cartilage should be evaluated, because it is the preferred autologous graft material for surgery.[8]

Although the examination often provides the appropriate diagnosis, additional investigations (such as rhinomanometry, acoustic rhinometry, and radiographic imaging) may provide objective information to evaluate nasal airflow and aid clinical evaluation. These tests must be correlated with the surgeon's findings to determine the clinical significance.[2,4]

COMMON PROBLEMS AND THEIR CAUSES

Causes of External Nasal Valve Dysfunction

These maneuvers can allow postoperative soft tissue changes, including alar retraction, notching, and an abnormal shape of the alar rim.[9] These changes can weaken external nasal valve support and lead to external nasal valve collapse. In addition, caudal septal deviation can contribute to narrowing of the external valve.

External nasal valve dysfunction after rhinoplasty may be a result of overresected, weakened, or malpositioned lower lateral cartilages.

The alar rim may appear straight and strong, but recurvature of the lateral crus can still contribute to nasal airway obstruction. In some cases, weakness of the lateral crus allows the posterior aspect to recurve back into the nasal airway along the lateral wall of the vestibule, causing obstruction although the nostril appears patent.

Alar or vestibular stenosis is less common in secondary rhinoplasty patients. From a pathophysiologic standpoint, stenosis of the anterior nares can be secondary to overresection of the ala, injury to the soft tissues of the nostril, or loss of vestibular lining.[4] Postoperative changes can also lead to scar contracture, which inevitably distorts the ala and can narrow the external nasal valve.

Causes of Internal Nasal Valve Dysfunction

Internal nasal valve collapse may be caused by overresection or weakening of the upper lateral cartilages, soft tissue scarring, or failure to adequately reconstitute the midvault.

Overreduction of the dorsal hump can excessively reduce the upper lateral cartilages, allowing them to retract and the nasal sidewalls to collapse. This retraction of the upper lateral cartilages exaggerates the prominence of the nasal bones in the keystone area, producing an inverted-V deformity.[10]

PRINCIPLES AND APPROACH

When patients have nasal valve dysfunction after rhinoplasty, lack of treatment or inadequate treatment will result in refractory symptoms. However, patients should be educated on the limitations of surgical treatment before secondary surgery. Most secondary surgery focuses on the nasal framework, but soft tissue problems may need to be addressed.[9]

For secondary cases, the open approach should always be considered. This approach allows accurate assessment and direct manipulation of the underlying structures.[9] Grafts are almost always needed to reconstruct a functional nasal framework during secondary rhinoplasty.

Management of a Weakened or Collapsed External Nasal Valve

Correcting deformities of the external nasal valve requires correction of weakened or malpositioned lateral crura. In addition to strengthening the lateral crus, midline repositioning of the caudal septum will reestablish the structural integrity and aesthetics of the external nasal valve.[11]

Management of the external nasal valve may include the following depending on the nasal analysis and intraoperative findings.

Correction of Caudal Septal Deviation

Caudal septal deviation may involve displacement of the septum to one side of the anterior nasal spine, narrowing the external nasal valve. This should be released and centralized.[11] Vertical septal excess should be resected as well. In some cases, the caudal septal deviation involves intrinsic deformities of the septal cartilage that may correct with release of the extrinsic deforming forces from the soft tissues or may require manipulation of the cartilage and grafts to bolster and straighten the septal cartilage.

Lower Lateral Crural Turnover Flap

The lower lateral crural turnover flap provides additional support to a weakened or collapsed lower lateral crura[12] (Fig. 21-7). However, these flaps are uncommon in secondary rhinoplasty because any redundant lower lateral cartilage has usually been removed by cephalic trim during prior surgery. To perform this flap, the lower lateral cartilage must be wide enough to preserve at least a 5 mm alar rim strip after turnover of the flap.[9]

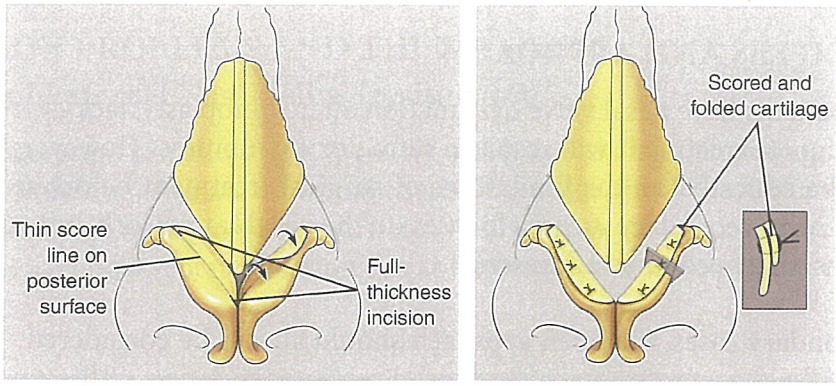

Fig. 21-7 Lower lateral crural turnover flap.

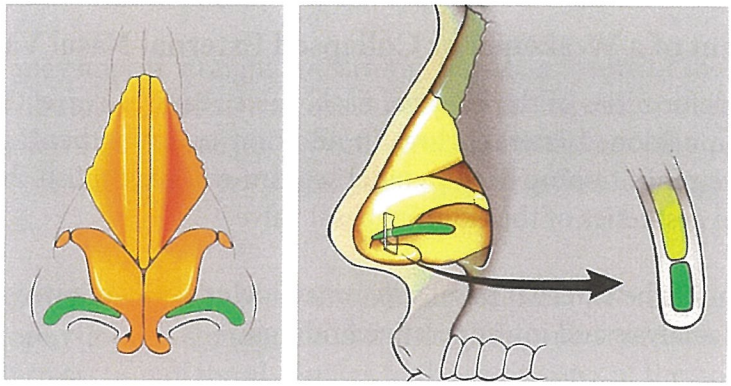

Fig. 21-8 Alar contour graft.

Alar Contour Graft

Alar contour grafts are very effective for mild to moderate alar retraction or alar rim collapse[5,6,13,14] (Fig. 21-8). The alar contour graft involves the creation of a nonanatomic pocket along the alar rim inferior to the infracartilaginous incision and subsequent insertion of a cartilage graft. The graft should span the entire alar notching or depression.[14] The anterior edge of the graft should be cut obliquely to juxtapose with the caudal edge of the lateral crus. Placement of the alar contour graft can help stent the lateral crus laterally, increasing the resilience of the external nasal valves.

An extended alar contour graft can add additional support in the soft triangle[14] (Fig. 21-9). It is longer than an alar contour graft, and the anterior end of the graft crosses the infracartilaginous incision and is inserted into a pocket between the deep surface of the lateral crus and the vestibular lining.

Fig. 21-9 Extended alar contour graft.

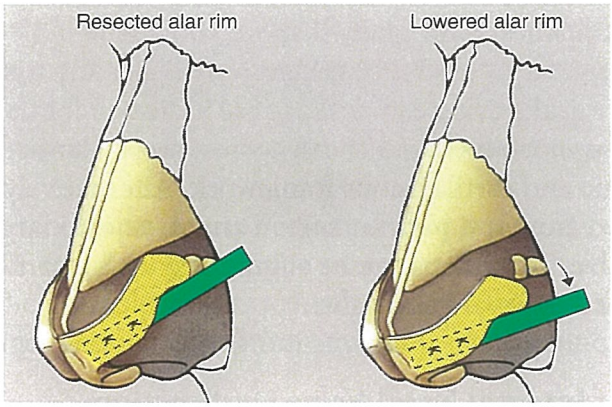

Fig. 21-10 Lateral crural strut graft.

Contraindications to alar contour grafts include alar rim retraction caused by significant vestibular lining loss, severe alar scarring or retraction, and a lack of residual lower lateral cartilage with alar rim collapse.[13]

Alar Batten Graft

An alar batten graft is placed superficial to the lateral crus at the junction of the caudal aspect of the upper lateral cartilage and the lateral crus of the lower lateral cartilage. Although alar batten grafts can help to support the external nasal valve and prevent collapse, they are placed cephalad to the alar rim and thus have limited use in correcting alar rim retraction.

Lateral Crural Strut Graft

Lateral crural strut grafts are appropriate for moderate to severe alar retraction or collapse[15,16] (Fig. 21-10). The lateral crural strut graft is sutured to the deep

surface of the lateral crus just deep to the vestibular lining. The strut should be rigid; the lateral end of the strut extends to the piriform rim and should be placed caudal to the alar groove and accessory cartilages. In some cases, the lateral crus must be divided and repositioned caudally with the lateral crural strut graft to correct alar retraction.[17]

Management of External Nasal Valve Stenosis

Alar or vestibular stenosis has various treatment options depending on the anatomy of the defect. The sequence for stenosis correction includes excising the obstructing defect; replacing the scar tissue with new, healthy tissue; and stenting the nostril postoperatively to prevent restenosis.[7] The simplest technique is to excise the scarred tissue from within the nares and replace the lining with a split-thickness skin graft. If more soft tissue bulk is needed in the vestibule or nasal sill, a Z- or W-plasty can transfer healthy tissue into the nasal lining. Composite grafts using ear cartilage are indicated for defects that require more structural support; these grafts can correct small alar deformities missing both the soft tissue and cartilaginous framework. Alternatively, alar-based flaps can be transposed from the perialar region and inset into larger defects of the external nasal valve. These flaps can be augmented with a cartilage graft to provide support to the external nasal valve.[7]

Management of Internal Nasal Valve Dysfunction

Reconstruction of the internal nasal valve is often necessary when the midvault has not been preserved or reconstituted during previous nasal surgery.

These patients may have an inverted-V deformity, lateral wall weakness, or distortion of the dorsal aesthetic lines.[5,6,9] Management of internal nasal valve dysfunction may include the following depending on the nasal examination and symptoms.

Component Approach to the Dorsum

Iatrogenic internal nasal obstruction commonly results from collapse of the midvault after composite dorsal hump reduction. Component, rather than composite, dorsal hump reduction allows incremental control and greater precision (Fig. 21-11).

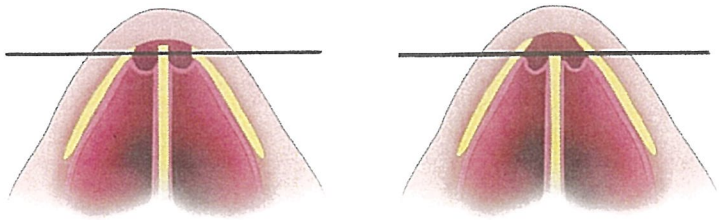

Fig. 21-11 The component dorsal approach prevents overresection of the upper lateral cartilages.

This technique allows preservation of the upper lateral cartilages during hump resection and reconstruction of the midvault, restoration of the dorsal aesthetic lines, and preservation of the internal nasal valve.[18-20]

Although component dorsal hump reduction may not be necessary if the dorsum has been reduced during the prior surgery, a component approach to the dorsum can still be valuable to release inadequate connections between the upper lateral cartilages and dorsal septum and allow placement of spreader grafts, if required.[3]

Upper Lateral Tension-Spanning Suture

Reconstitution of the upper lateral cartilage–dorsal septal relationship with upper lateral tension-spanning sutures after dorsal hump reduction or upper lateral cartilage manipulation will preserve internal nasal valve function and restore dorsal aesthetic lines. These sutures will ensure that the relationship of the midvault structures created during surgery will be maintained postoperatively.[19]

Autospreader Flap

Autospreader flaps function to preserve or increase the angle of the internal nasal valve. These grafts are an alternative when excess upper lateral cartilage remains after reduction of the dorsal septum. The dorsal portion of the upper lateral cartilage is folded medially to function as an autospreader flap while reducing the profile of the dorsum and preserving the dorsal aesthetic lines[1,18] (Fig. 21-12). However, this surgical technique may not be an option in secondary rhinoplasty if the dorsum has been adequately reduced during previous surgery.[5]

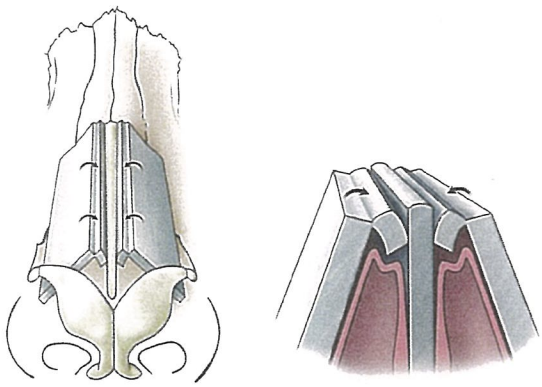

Fig. 21-12 An autospreader flap.

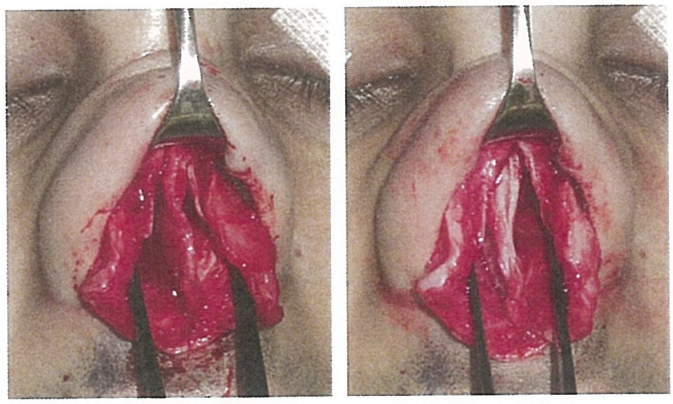

Fig. 21-13 A dorsal spreader flap.

Dorsal Spreader Flap

The dorsal spreader flap is useful in secondary rhinoplasty when dorsal hump reduction is required after previous septal surgery.[1] It helps preserve some intrinsic forces within the septum and use these forces to counteract each other and correct deviation of the septum. The cartilaginous dorsal septal reduction is planned, and instead of excising the excess dorsal septum, the excess cartilage is turned over as a flap into the concave side of the septum (Fig. 21-13). The flap is scored on the contralateral side, to which it will be turned over and secured in place.[3]

Spreader Graft

Spreader graft placement has been proven to be a reliable surgical approach to correct internal nasal valve collapse in secondary rhinoplasty.[3]

Spreader grafts are placed between the dorsal septum and upper lateral cartilage[1,5,6,20,21] (Fig. 21-14). The superior aspect of the graft is placed deep to the bony dorsum. By increasing the angle between the upper lateral cartilage and dorsal septum, the internal nasal valve angle is widened. In addition to reconstructing the internal nasal valves, spreader grafts can help to restore the dorsal aesthetic lines.[3,7] Spreader grafts are used either unilaterally or bilaterally to reestablish overall symmetry and congruency in secondary rhinoplasty.

Inferior Turbinate Surgery

Inferior turbinate hypertrophy may be limited to the mucosa or have bony hypertrophy as well.[1,5,6] In many cases, outfracture of the inferior turbinate with microfracture and septal reconstruction will adequately treat mucosal hypertrophy. If the patient has bony hypertrophy, morselization, resection, or cauterization may be required.[3] This is described in detail in Chapter 23.

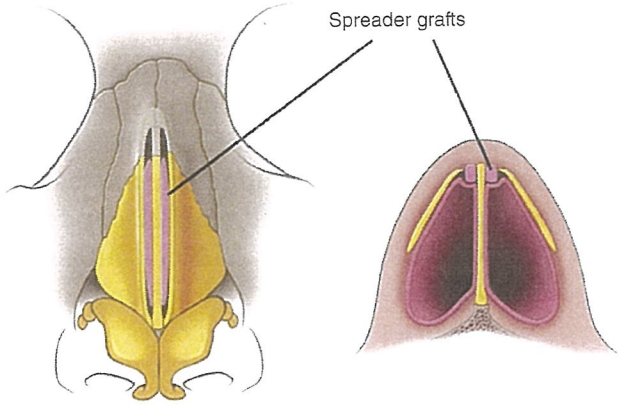

Fig. 21-14 Spreader grafts.

CASE ANALYSES

Fig. 21-15

This patient who was seeking secondary rhinoplasty has Fitzpatrick type 2, thin skin. She had asymmetrical dorsal aesthetic lines, S-shaped dorsal deviation, mild right alar retraction, and an asymmetrical tip. She also had fullness of the dorsum and supratip, alar and columellar retraction, caudal septal deviation obstructing the right nostril, right periapical hypoplasia, and right external nasal valve collapse. She was experiencing severe bilateral nasal airway obstruction and left internal nasal valve collapse.

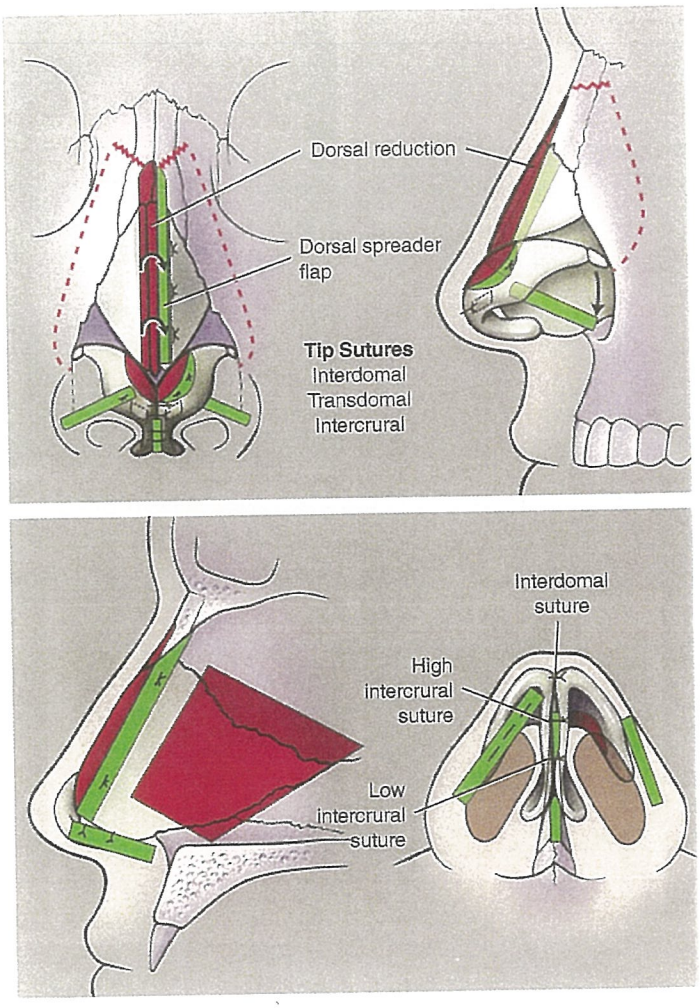

Fig. 21-15, cont'd

The operative technique consisted of the following:

1. Open rhinoplasty
2. Component dorsal hump reduction
3. Septal reconstruction and septal graft harvest with preservation of a 10 mm–wide L-strut
4. A left dorsal spreader flap
5. A septal bone graft to buttress the L-strut
6. Unification of tip complex with a columellar strut graft secured with medial crural–columellar strut sutures
7. Interdomal and transdomal sutures to shape the lower lateral cartilages at the tip
8. A right extended alar contour graft
9. A left alar contour graft
10. Bilateral percutaneous perforated lateral osteotomies

Fig. 21-15, cont'd

One year postoperatively she has a much straighter appearance with smooth symmetrical dorsal aesthetic lines. She has a more appropriate and feminine profile with a straight dorsum and slight supratip break, as well as improved tip rotation and correction of alar and columellar retraction. Improved symmetry of the tip and alar rims is visible on the basal view.

Fig. 21-16

This patient who was seeking secondary rhinoplasty has Fitzpatrick type 3, thin skin. She had asymmetrical dorsal aesthetic lines with right internal nasal valve collapse, a reverse C-shaped dorsal deviation, and a mildly underrotated and bulbous tip. She also had fullness of the dorsum and supratip. She experienced significant right nasal airway obstruction and had right internal nasal valve collapse along with septal deviation.

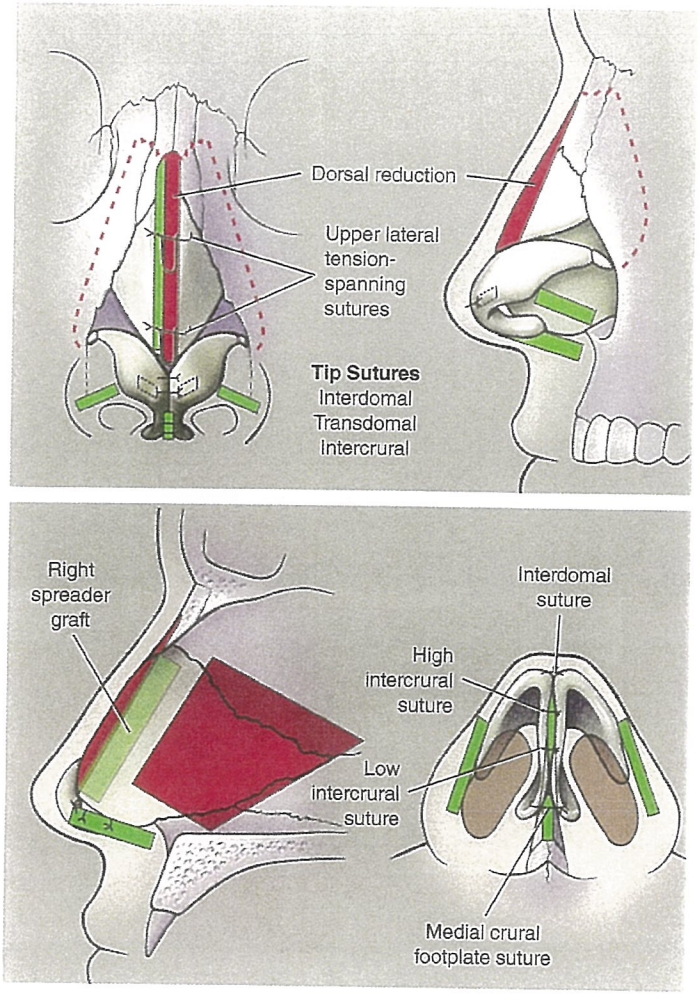

Fig. 21-16, cont'd

The operative technique consisted of the following:

1. Open rhinoplasty
2. Component dorsal hump reduction
3. Septal reconstruction and septal graft harvest with preservation of a 10 mm–wide L-strut
4. A right spreader graft
5. Upper lateral tension-spanning sutures
6. Unification of the tip complex with a columellar strut graft secured with medial crural–columellar strut sutures
7. Interdomal and transdomal sutures to shape the lower lateral cartilages at the tip
8. Bilateral alar contour grafts
9. Bilateral percutaneous perforated lateral osteotomies

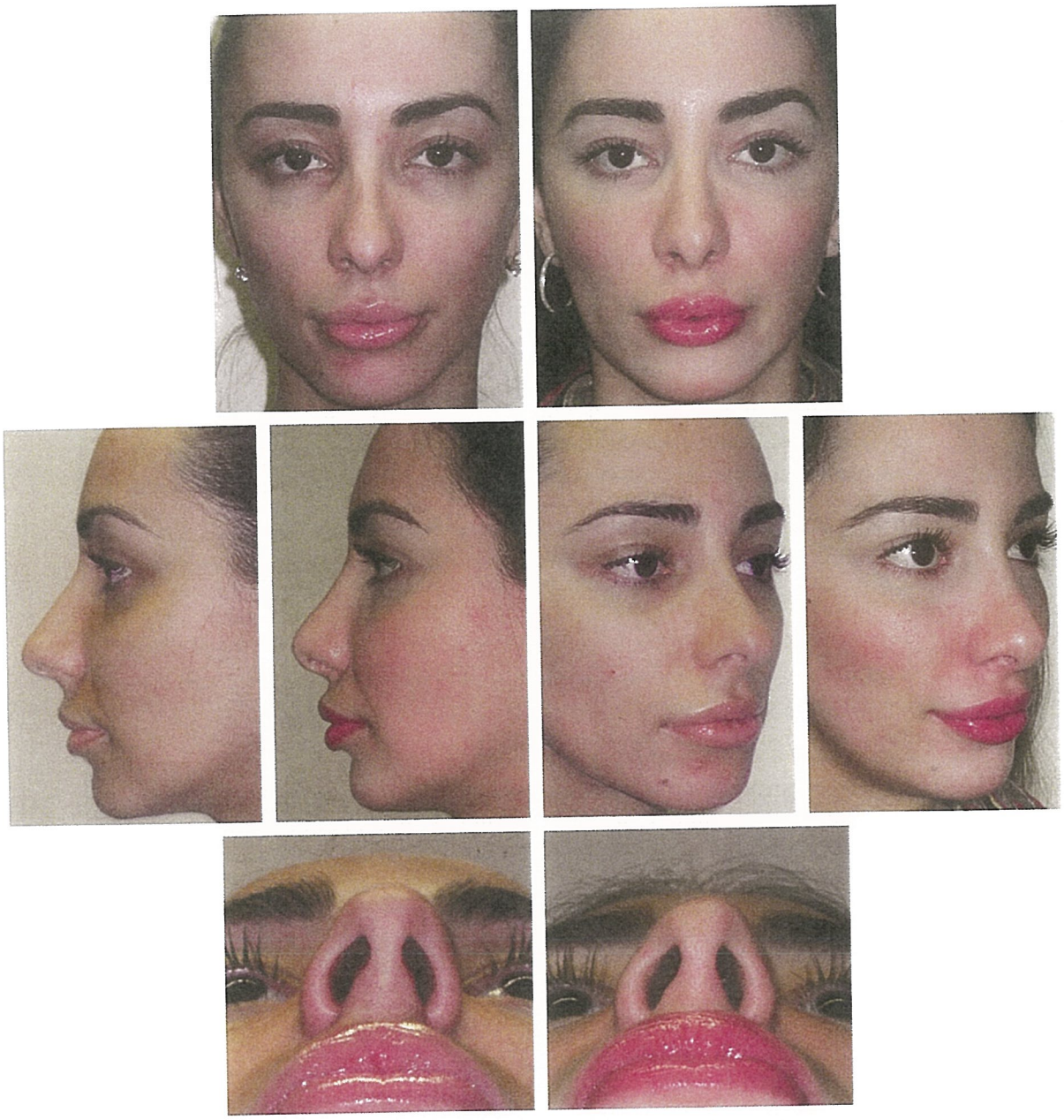

Fig. 21-16, cont'd

One year postoperatively she has straight, smooth, and symmetrical dorsal aesthetic lines. She has a more appropriate and feminine profile with a slight supratip break, as well as improved tip rotation. Improved symmetry of the tip and alar rims is apparent in the basal view.

Key Concepts

- The internal nasal valve accounts for most airway resistance in the nasal passage.
- Internal nasal valve dysfunction is common in rhinoplasty patients in whom the dorsum and upper lateral cartilages have been overresected.
- Internal nasal valve collapse is associated with irregularity of the dorsal aesthetic lines.
- Alar rim collapse, both static and dynamic, will also narrow the nostril and contribute to external nasal valve collapse.
- External nasal valve dysfunction may result from overresection, weakening of, or malpositioned lower lateral cartilages during the initial operation.
- The causes of internal nasal valve collapse may include overresection or weakening of the upper lateral cartilages, soft tissue scarring, or failure to adequately reconstitute the midvault.
- Secondary rhinoplasty commonly requires reconstruction of the internal nasal valve when the midvault has not been preserved or reconstituted during previous nasal surgery.
- Component dorsal hump reduction allows preservation of the upper lateral cartilages during hump resection and reconstruction of the midvault, restoration of the dorsal aesthetic lines, and preservation of the internal nasal valve.
- Spreader grafts have been proven to be reliable for correcting internal nasal valve collapse in secondary rhinoplasty.

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