Nasal Valve Reconstruction

Experience in 53 Consecutive Patients

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Objectives: To determine the cause of nasal valve obstruction in a series of patients requiring surgical correction, to evaluate the efficacy of our surgical techniques, and to assess the cosmetic effect of nasal valve repair.

Methods: Retrospective review of 53 consecutive cases involving adult patients who underwent nasal valve reconstruction over an 8-year period. The preoperative symptom severity, cause of nasal valve obstruction, preoperative photographs, anatomical findings at the time of surgery, and reconstructive techniques were reviewed. Postoperative photographs and resolution of symptoms were analyzed.

Results: The most common cause of nasal valve obstruction was previous rhinoplasty (79%), followed by nasal trauma (15%) and congenital anomaly (6%). Spreader grafts were used in 42 patients (79%), and alar batten grafts were used in 19 patients (36%). The patients received a minimum of 1 year of follow-up. All 12 patients with external valve dysfunction showed improvement after surgery. Thirteen (93%) of the 14 patients with concomitant external and internal valve dysfunction had improvement in nasal obstruction after treatment. Twenty-four (89%) of 27 patients with internal nasal valve dysfunction reported improvement in nasal obstruction. Spreader grafts caused a widening of the middle third of the nose. Alar batten grafts resulted in effacement of deep alar creases and a widening of the nasal tip.

Conclusions: We have found that surgical correction of nasal valve obstruction is extremely effective in improving subjective nasal obstruction. Success of this procedure is predicated by correct diagnosis and appropriate surgical technique.

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Nasal valve obstruction is regarded as an uncommon cause of nasal airway blockage. In a series of 500 patients with chronic nasal obstruction, Elwany and Thabet1 found that the nasal valve was the cause of obstruction in 13% of cases. Reduction rhinoplasty has been identified as the most frequent cause of nasal valve obstruction. Constantian,2 in a series of 100 consecutive secondary rhinoplasty cases, found that up to 50% of the patients complained of obstruction at the external nasal valve and that up to 64% of patients complained of nasal obstruction at the internal valve.

The nasal valve forms the bridge between the bony skeleton and the nasal tip, imparting the greatest resistance to airflow in the nose. The nasal valve is subdivided into the internal and the external components. The internal nasal valve is formed by the articulation of the upper lateral cartilages with the cartilaginous septum. The angle of articulation at this site is normally 10° to 15°.3 The external nasal valve is bounded superolaterally by the caudal edge of the upper lateral cartilages. The lateral border is the bony pyriform aperture of the maxilla and fibrofatty tissue of the ala (Figure 1). Support for this lateral border area is provided by the ligamentous attachment of the lateral crus to the bony maxilla. Inferiorly, the external valve is limited by the nasal floor and posteriorly by the head of the inferior turbinate. The measured area of the nasal valve ranges from 55 to 64 mm². The primary muscles that are responsible for keeping the nasal valve patent are the nasal and dilator naris muscles. These muscles act directly on the upper lateral cartilages and alar soft tissue to prevent their collapse on deep inspiration.4,5

Although recent literature has included several reports regarding nasal valve obstruction, the rarity of this condition as a cause of nasal blockage makes it a diagnostic and treatment challenge.1-3 The objectives of our study were to determine the...
cause of nasal valve obstruction in a series of patients requiring surgical correction, to evaluate the efficacy of our surgical techniques, and to determine the cosmetic effect of nasal valve repair.

**METHODS**

We retrospectively reviewed the charts of 53 consecutive patients who underwent nasal valve reconstruction during an 8-year period (1983-2001). All surgical procedures were performed by the senior authors (M.M.K. and S.J.P.). Preoperative severity of nasal obstruction, surgical or trauma history, and preoperative photographs were reviewed in all cases. Anatomical findings at the time of surgery and reconstructive techniques were noted in each case. Postoperative resolution of nasal obstruction based on each patient’s subjective assessment and photographs was analyzed more than 1 year after surgery.

**RESULTS**

Our study included 29 women and 24 men ranging in age from 17 to 73 years (mean age, 38 years). Forty-six (87%) of the patients were white, 6 (11%) were Hispanic, and 1 (2%) was Asian. Forty-two patients (79%) had previously undergone rhinoplasty (Table 1). The number of prior rhinoplasties ranged from 1 to 4, with a mean of 2 procedures. Eight patients (15%) had a history of nasal trauma, while the remaining 3 (6%) had no trauma or surgical history.

The cause of nasal valve obstruction was established based on history and clinical examination findings. Internal valve obstruction was suspected when patients had an hourglass or a pinched appearance of the middle vault of the nose. External valve obstruction was suspected in the presence of tip bossae, deep alar grooves, and exaggerated medial movement of alar cartilages on deep inspiration. We did not rely on the Cottle maneuver as a diagnostic test for the cause of nasal valve blockage. The Cottle maneuver, in which lateral distraction of the cheek improves the airway, is actually a nonspecific test that enhances breathing even when nasal obstruction is a consequence of septum deviation or turbinate enlargement. We used internal tenting of the valve area as a more specific diagnostic test. A cotton tip applicator or an ear curette was used to manually elevate and distract the upper lateral cartilage or the alar cartilages sequentially. The exact site of obstruction was thus more reliably determined.

Among our group of 53 patients, 27 (51%) were determined to have internal nasal valve dysfunction, 12 (23%) had external nasal valve dysfunction, and 14 (26%) had concomitant internal and external nasal valve dysfunction (Table 1). Reconstruction was performed via an external approach in 29 cases (55%) and via an endonasal approach in the rest of the cases. Spreader grafts were used in 42 patients (79%), and alar batten grafts were used in 19 patients (36%).
Cartilage grafts were used in 31 patients (58%), while auricular cartilage grafts were used in 22 patients (42%). Columellar struts were placed in 33 patients (65%) to provide adequate tip support following the external approach. In 1 patient, external valve obstruction was due to primary paradoxical curvature of the lateral crura. This deformity was corrected by reversing the lateral crura.

Nasal valve reconstruction was combined with dorsal augmentation in 26 patients, and dorsal reduction in 2 patients. Dorsal nasal augmentation was achieved with cartilage grafts in 10 patients and alloplastic materials in 16 patients. Thirteen patients (25%) underwent simultaneous turbinate reduction.

All patients received a minimum of 1 year of follow-up. Forty-seven patients (89%) reported significant improvement in nasal obstruction. Six patients (11%) reported no improvement, and no patient reported worsening of symptoms after surgery. Of the patients who reported no improvement, 2 presented with obstructions in the valve area due to intranasal synechiae, which were treated with carbon dioxide laser lysis and stenting. These 2 patients subsequently responded to intranasal Z-plasty. When surgical efficacy was evaluated based on site of obstruction, all 12 patients with isolated external valve dysfunction showed improvement after surgery; 24 (89%) of the 27 patients with internal nasal valve dysfunction reported improvement in nasal obstruction; and 13 (93%) of the 14 patients with concomitant external and internal valve dysfunction had improvement in nasal obstruction after treatment (Table 2). The success rate for nasal valve reconstruction was not affected by turbinate reduction. Surgical efficacy was higher than 84% when the 13 patients with turbinate reduction were excluded from the data.

Cosmetic changes in the external nose varied according to the surgical technique used. Spreader grafts caused a widening of the middle third of the nose and helped to efface inverted V deformities. Alar batten grafts resulted in the effacement of deep alar creases and a widening of the nasal tip (Figure 2 and Figure 3). The nasal dorsal profile was changed in those patients who underwent augmentation or reduction. The nasal tip showed increased projection in patients who had batten grafts and columellar struts. These cosmetic changes were discussed with the patients before surgery. The patients noted a closer approximation to their prerhinoplasty appearance after nasal valve reconstruction.

**COMMENT**

Elwany and Thabet, in their study of nasal valve obstruction, reported rhinoplasty as the cause of obstruc-
tion in 72% of their patients. Pontell et al\textsuperscript{6} reported that 10% of their rhinoplasty patients complained of nasal obstruction, which was attributed to the nasal valve region. Grymer\textsuperscript{7} and Sheen\textsuperscript{8} have shown that rhinoplasty causes internal valve narrowing in 25% of patients and external valve narrowing in 85% of patients.\textsuperscript{7,8} Our study confirms that rhinoplasty is the most common cause of nasal valve dysfunction. Our clinical findings indicate that aggressive narrowing of the nasal tip, overresection of the lateral crus, or displacement of weak alar cartilages can result in external valve dysfunction. Excessive narrowing of the dorsum, overresection of upper lateral cartilages, or displacement of short nasal bones or weak upper lateral cartilages correlates with internal valve obstruction (Table 3). Aesthetically, both internal and external nasal valve collapse can create stigmata of an "overdone" rhinoplasty. Although such findings as an inverted V deformity, pinched middle vault, pinched nasal tip with bossae, and deepened alar creases were present in patients with severe obstruction, other patients with mild to moderate obstruction did not demonstrate such classic aesthetic findings.

Various surgical techniques have been described in the literature to address the nasal valve, including alar batten grafts, spreader grafts, flaring sutures, overlay grafts, and lateral suture suspensions.\textsuperscript{3,9} Zijlker and Quaedvlieg\textsuperscript{10} noted an improvement of 81% in the nasal patency of their patients who were treated with spreader grafts. Schlosser and Park,\textsuperscript{11} in a cadaveric study, demonstrated a statistical improvement in the cross-sectional area of the nasal valve when using a combination of spreader grafts and flaring sutures. They reported an 82% clinical success rate in improving nasal valve obstruction in a group of 34 patients who were treated with spreader grafts and flaring sutures. Stucker et al\textsuperscript{12} noted improvement in internal valve obstruction in all 47 patients who were treated with conchal cartilage overlay grafts. The technique of alar batten grafting has similarly been found to be very effective in prior studies. Toriumi et al\textsuperscript{13} reported an improvement in nasal airway obstruction in 45 of 46 patients who were treated with alar batten grafts, and Millman\textsuperscript{14} noted an improvement in airway obstruction in all 21 patients in his study of alar batten grafts. Our findings confirm the high success rate of nasal valve surgery in eliminating airway obstruction. These studies also emphasize the importance of correct preoperative diagnosis, which we believe is the key to treating nasal valve dysfunction. We further emphasize that differentiating between external and internal valve narrowing is a crucial step in achieving success in reconstruction. However, the most important step is that of prevention: to recognize the conditions that predispose a patient to nasal valve dysfunction as well as the surgical techniques that cause it (Table 3).

Although objective measures for nasal valve patency would be ideal, such measurements are not yet reliably available. Radiographic examinations, such as computed tomography or magnetic resonance imaging, do not provide a dynamic picture of the problem area, and the static pictures may miss the area of interest owing to inadequate orientation or small size of the valve region. Acoustic rhinometry has received attention as a valuable instrument in measuring dynamic airflow in the nose. Application of the probe to the nose, however, can affect the position of the lower lateral cartilages, and we have found the results to be inconsistent. To improve the reliability of our subjective data, we are now using the visual analog scale to assess nasal obstruction.

**CONCLUSIONS**

Surgical correction of nasal valve obstruction is extremely effective in improving subjective nasal obstruction. Success of this procedure is predicated by correct diagnosis and appropriate surgical technique. In cases involving individuals who have previously undergone reduction rhinoplasty, there should be a high index of sus-

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**Table 3. Causes of Nasal Valve Dysfunction**

<table>
<thead>
<tr>
<th>Predisposing conditions</th>
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<tr>
<td>Short nasal bones</td>
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<td>Weak nasal cartilages</td>
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<tr>
<td>Tension nose with hump reduction</td>
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<tr>
<td>Rhinologic surgery</td>
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<tr>
<td>Upper lateral cartilage (ULC) displacement, overresection</td>
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<td>Lateral crus displacement, overresection</td>
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<tr>
<td>Scarring at ULC/septal junction</td>
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<td>Large hump removal (tension nose)</td>
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<td>Excess narrowing of nasal tip or nasal bones</td>
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**Figure 3.** Diagram showing placement of bilateral spreader grafts, dorsal onlay graft, alar batten graft, and columellar strut.
picion for nasal valve obstruction. In rhinoplasty, reduction of a high cartilaginous dorsum can lead to internal valve collapse, while tip reduction and aggressive cephalic trimming of lateral crura can result in external valve collapse. Cartilage grafts used as spreader and alar batten grafts allow restoration of the nasal valve to a more normal anatomical shape. The cosmetic effect of such reconstruction is widening of the middle third of the nose, thereby achieving a wider appearance of the nasal tip.

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REFERENCES


Quotable
Man can learn nothing unless he proceeds from the known to the unknown.
Claude Bernard (1813-1878)
French Physiologist