ORIGINAL ARTICLE

Endonasal Spreader Graft Placement as Treatment for Internal Nasal Valve Insufficiency

No Need to Divide the Upper Lateral Cartilages From the Septum

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Objective: To describe and evaluate results of a surgical procedure to treat internal nasal valve insufficiency with the use of spreader grafts placed via an endonasal approach without division of the upper lateral cartilages from the nasal septum.

Design: Eighty-nine patients with complaints of nasal obstruction, at least partially due to internal nasal valve insufficiency, underwent this operation on 120 sides in a private practice setting. Only autologous material was used, and 3 different techniques for fixating the grafts were evaluated. All patients were prospectively studied, and subjective self-assessment was used to quantify the result of the operation.

Results: On 53 sides (44%) nasal breathing was described as "optimal," and on 53 sides (44%) the result was deemed "improved." On 13 sides (11%) no change was noted, and on 1 side (1%) the postoperative situation was judged to be worse.

Conclusions: When opting for spreader grafts to treat internal nasal valve insufficiency, one does not necessarily need to perform an external approach, nor is separation of the upper lateral cartilages from the septum required. The endonasal technique presented herein is less invasive and can be used in conjunction with other procedures aimed at improving nasal patency.

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NASAL OBSTRUCTION CAN be due to a variety of mucosal and anatomic factors, and in many patients both play a role. Numerous conditions, diseases, and environmental factors are known to negatively influence nasal patency through their effects on the mucosal lining of the nose. On the whole, the treatment in such cases tends to be conservative and can involve decongestants, corticosteroids, antihistamines, and, if possible, avoidance of environmental pollutants or allergens.

The main anatomic causes of diminished nasal patency are deviations of the nasal septum and insufficiency of the internal or external nasal valves. In nasal obstruction caused by inferior or middle turbinate hypertrophy, both the mucosal and the bony parts of the turbinate may be involved, and medical as well as surgical treatment may be required.

In clinical practice, it is often difficult to make a clear distinction between mucosal and anatomic factors, let alone to assess the relative importance of individual anatomic variables. Nevertheless, numerous functional nasal operations have been developed and are in current use, all with the intent of improving nasal patency. Of these operations, septoplasty and inferior turbinate reduction are the most commonly performed.

It is generally accepted that the nasal valve area constitutes the narrowest part of the nose and also poses the greatest resistance to nasal airflow. In the most common definition, its boundaries are the nasal septum medially, the floor of the nose inferiorly, and the caudal margin of the upper lateral cartilage and the head of the inferior turbinate laterally.[1-5] The *internal nasal valve* describes that part of the nasal valve area that lies between the caudal border of the upper lateral cartilage and the nasal septum (**Figure 1**). Although the exact function of the nasal valve is unclear, its main purpose is thought to be to regulate the inspiratory airflow by varying the degree of swelling in the inferior turbinate and the angle of the internal nasal valve.

During the past 2 decades, increasing attention has been given to the role of the internal and, to a lesser degree, the external nasal valve in nasal obstruction. Some authors even state that in many cases

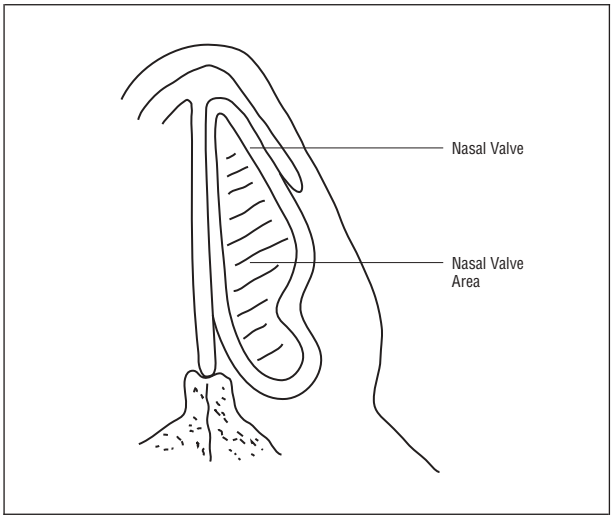

Figure 1. Nasal valve.

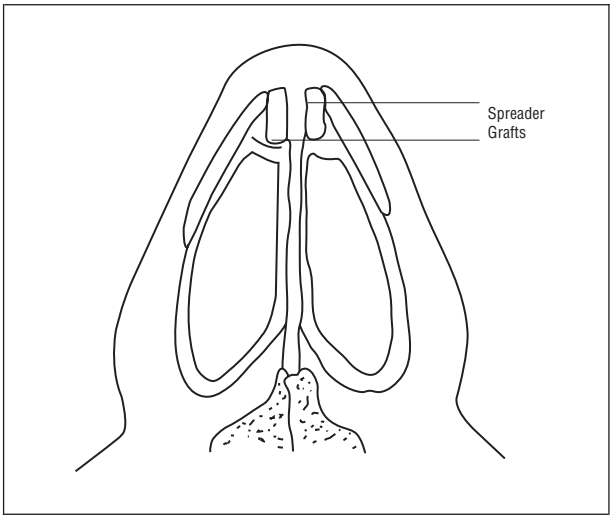

Figure 2. Spreader grafts.

an incompetent nasal valve may be the largest contributing factor to diminished nasal patency,[6,7] and it seems likely that many good results after septal corrections or turbinate reductions are largely due to an increased nasal valve area. There are numerous causes, both mucosal and anatomic, of obstruction in the nasal valve area. An example is nasal valve collapse due to previous surgery in which the cephalic edges of the lower lateral cartilages were overresected; a good way to correct this is with alar batten grafts. The term *internal nasal valve insufficiency* is usually reserved for cases in which reduction of the nasal valve area is caused by a narrowing of the angle between the nasal septum and the upper lateral cartilage and therefore can be due to the positioning of either.

Several operations have been developed to address this problem and aim at widening the nasal valve angle and/or preventing it from narrowing during inspiration.[6,8-19] The most widely used of these operations involves placing rectangular cartilage grafts, so called spreader grafts, subperichondrally between the septum and the upper lateral cartilage as described by Sheen in 1984[20] (**Figure 2**). Although originally conceived to bridge the long middle vault in patients with short nasal bones, he soon found that the main advantage of spreader grafts lay in their ability to correct the lack of dorsal support to the lateral walls. More specifically, he used this technique after hump resection to prevent the upper lateral cartilages from collapsing against the septum, thereby reducing the nasal valve angle and compromising nasal breathing. Since Sheen's original article, spreader grafts have become widely used for both functional and cosmetic purposes, in which the aim is to widen the middle third of the nose. Several variations of his original endonasal technique have been developed, and in most cases an external-approach rhinoplasty is used. The advantage of this approach is that it allows direct visualization of the middle third of the nose, so that after division of the upper lateral cartilages from the septum, the grafts can be precisely positioned and secured in the apex of the nasal valve angle. The main disadvantage of this technique, apart from the relative invasiveness and the small postoperative collumellar scar, is the possibility of compromising the integrity of the middle nasal vault when the upper lateral cartilages are divided from the septum. It is interesting that currently, even when an endonasal approach is used, in most cases the upper lateral cartilages are still divided from the septum before the grafts are placed. This is intriguing when one considers that, when Sheen originally started to use spreader grafts, it was precisely to avoid the sequelae caused by the loss of the connection between the upper lateral cartilages and the septum, as a consequence of the hump reduction.

Overall, the results of the above-mentioned procedures, with regard both to functional and cosmetic considerations, tend to be very good and complications are rare. Nevertheless, while surgeons strive to achieve satisfactory results, minimizing the risks of compromising the integrity of the middle third of the nose is important. With this in mind, we present herein a technique in which the spreader grafts are inserted endonasally and the upper lateral cartilages are not divided from the septum.

METHODS

This series comprised a total of 111 patients who underwent functional nasal surgery including endonasal placement of subperichondral spreader grafts in the internal nasal valve. All were operated on by the same surgeon (H.D.V.) between February 1994 and January 2001. Of these 111 patients, 22 had a follow-up of less than 3 months and were excluded from the study, leaving 89 patients (60 men and 29 women) and 120 sides available for evaluation. The average age at operation was 38.6 years (range, 21-65 years), and the average follow-up was 12.2 months (range, 3-43 months).

All patients had complaints of nasal obstruction due, in part at least, to an incompetent internal nasal valve. This was demonstrated by improvement in nasal patency with the use of a modified Cottle test in which an instrument with a diameter of 2 mm, such as a cotton gauze holder, was placed in the internal nasal valve, mimicking the desired postoperative situation (**Figure 3**). The further indication for surgery was determined after examination during quiet breathing in which patients were asked to indicate in which part of the nose (anterior, middle, or posterior third) they subjectively felt the most ob-

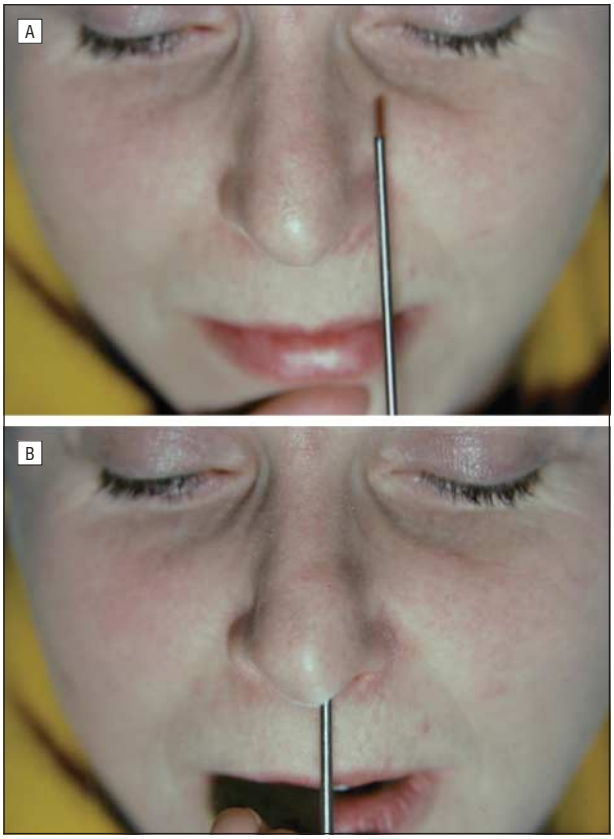

Figure 3. A, The blunt side of a cotton gauze holder, approximating the diameter of a spreader graft. B, Modified Cottle test, with the instrument placed in the apex of the internal nasal valve.

struction and after nasal endoscopy and computed tomographic scanning of the nasal passages.

Thirty-four patients had previously undergone nasal surgery. Of these, 22 had had a septum correction, 7 had inferior turbinate reduction, 6 had ethmoid surgery, and 6 had a rhinoplasty; 7 had undergone more than one previous operation. This series did not include patients undergoing concomitant rhinoplastic procedures such as osteotomies or external nasal valve surgery.

Of the 84 patients who underwent concomitant functional nasal surgery, 61 underwent a septum correction, 32 had inferior turbinate reduction, and 49 had an ethmoidectomy. In cases in which the only septal work consisted of cartilage harvesting, this was classified as a septum correction. Forty-seven patients had a combination of these procedures. In 5 cases (8 sides) no additional procedure was performed.

Only autogenous materials were used for grafting. Of the total of 120 spreader grafts used, 81 were harvested from the nasal septum and 39 from ear cartilage. All grafts were placed subperichondrally, as high as possible between the nasal septum and the upper lateral cartilage(s) in the middle third of the nose, ie, the apex of the internal nasal valve. In no case were the upper lateral cartilages divided from the septum. Three different methods were used for fixation of the grafts (**Figure 4**): 59 grafts were secured in a tight-fitting tunnel, 12 were fixated with 2-cyanobutylacrylate tissue glue (Histo-Acryl; B. Braun Medical BV, Oss, the Netherlands), and 49 were fixated with transcutaneous and transseptal sutures.

RESULTS

All patients included in this study had a follow-up of at least 3 months and were reexamined several times within this period. They were asked to compare their nasal passage with their preoperative situation and rate each side as worse, equal, better, or optimal. Therefore, the main criterion on which the result of the operation was judged was the patients' subjective sense of change in nasal patency.

Of a total of 120 sides operated on, 53 sides (44%) were judged as optimal and 53 (44%), as improved. On 13 sides (11%) no change was noted. On 1 side (1%) the postoperative situation was judged as worse. In the 5 patients (8 sides) in whom no additional procedure was performed apart from endonasal spreader graft placement, 3 sides were rated as optimal, 4 as improved, and 1 as equal. Although these patients constitute a small subgroup, their outcomes are comparable with those of the entire study population in which the majority underwent 1 or several additional procedures. Overall, 106 sides (88%) had an outcome of improved or optimal. In the 1 patient in whom the postoperative result was deemed worse, this turned out to be due to a recurring septal deviation.

When we considered the many possible confounding factors, eg, the concomitant operations, and the relatively small numbers and differences in outcome between the various techniques and graft materials, no realistic statistical analysis could be performed. Bearing these limitations in mind, we differentiated the results according to origin of donor material and fixation method and found no obvious differences (**Figure 5** and **Figure 6**). In 5 patients a postoperative infection occurred that subsided after antibiotic treatment and left no permanent sequelae. In 3 of these 5 patients 2-cyanobutylacrylate glue had been used; in the other 2 patients a tunnel had been formed. No other complications were noted.

COMMENT

In this study, we present the results of a modification and, we believe, a simplification of a procedure to treat nasal obstruction caused by an incompetent internal nasal valve. The most widely recommended solution for this problem is strengthening the nasal valve and widening the nasal valve angle by placing spreader grafts between the upper lateral cartilages and the septum. This has proved to be especially useful after hump reduction, which may otherwise lead to a collapsed middle vault, causing both functional and aesthetic problems. This is particularly true if the hump reduction was not restricted to the midline septum and bony dorsum but included dorsal resection of the upper lateral cartilages.

On the whole, the techniques as usually applied give very good results. The use of an external-approach rhinoplasty provides good visualization of the middle nasal vault and therefore allows secure fixation of the grafts in the appropriate place. In cases of internal valve incompetence in which the upper lateral cartilages are still attached to the septum, the necessity of separating them before the spreader grafts are placed may be questioned. When spreader grafts are used purely for functional reasons, ie, because of internal nasal valve insufficiency and not because of cosmetic considerations, an external approach can be avoided by placing the grafts endona-

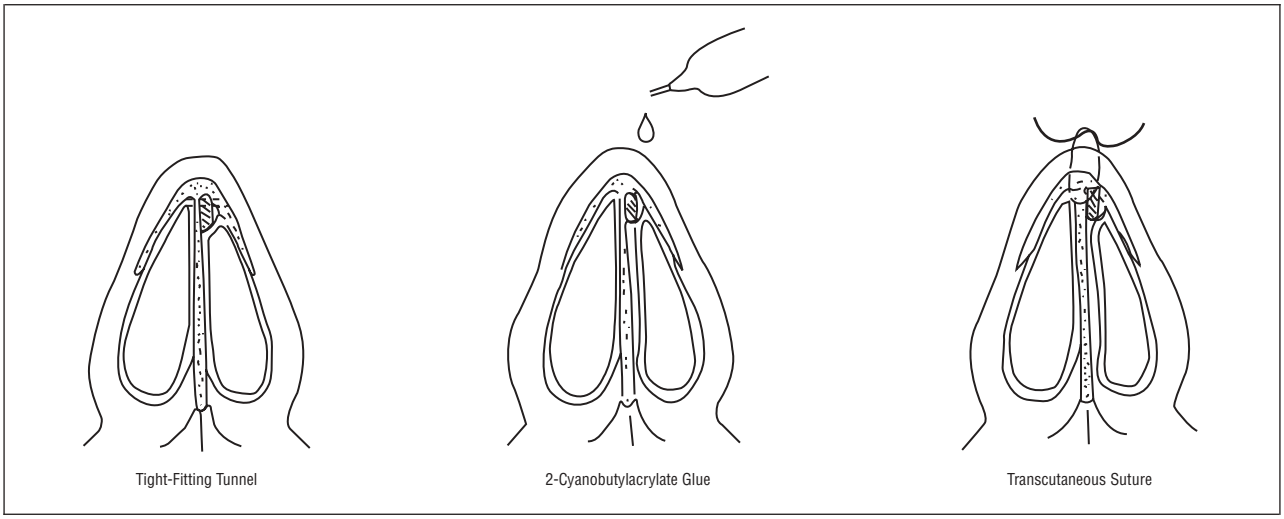

Figure 4. Fixation methods.

sally. In our view, a big advantage of the endonasal route, besides its relative noninvasiveness, lies in its ease of use in combination with other functional nasal operations such as septum correction. The main reason for dividing the upper lateral cartilages from the septum in an open approach—namely, so that one can place and fixate the spreader grafts between them from above—loses its relevance in an endonasal approach. Leaving the connection intact minimizes the disruption of the integrity of the middle third of the nose and is less likely to result in loss of smoothness of the dorsum.

As mentioned earlier, nasal obstruction that is bothersome enough for a patient to seek medical attention is often due to a combination of factors. It can be difficult to assess the relative importance of each contributing factor, and multiple procedures may be required. The most frequently performed example of this is the combination of a septum correction with some form of inferior turbinate reduction. For reasons of scientific clarity it would be preferable to carry out only one procedure at a time, but in clinical practice this would often increase the chance of a reoperation. In our series of 89 patients, 34 (38%) had previously undergone nasal surgery and 84 (94%) underwent 1 or several concomitant procedures aimed at improving nasal patency. The aforementioned considerations make it difficult to assess the value of the placement of spreader grafts alone. However, in a small subgroup of 5 patients (8 sides), no other reason for nasal obstruction was found and no other procedure was carried out. In these patients, the results (3 sides optimal, 4 improved, and 1 equal) were comparable with those of the group as a whole.

Although no significant differences in outcomes could be measured concerning graft material, we would advise the use of nasal cartilage, when available, for reasons of practicality and avoidance of unnecessary ear trauma. Likewise, although no conclusions can be made regarding which fixating technique gives the best outcome, transcutaneous suturing is the easiest technique to perform, especially in combination with a septum correction in which a submucoperichondral tunnel has already been formed. Considering that 2-cyanobutylacrylate glue was used in only 8 patients and that 3 of a total of 5 postoperative infections occurred in this group, we strongly recommend against the use of this fixation technique.

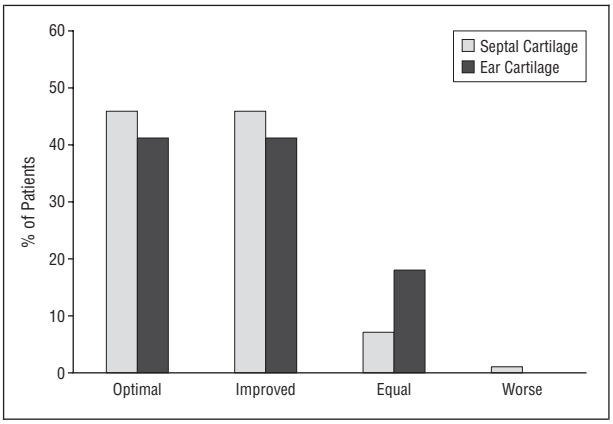

Figure 5. Outcome by material used.

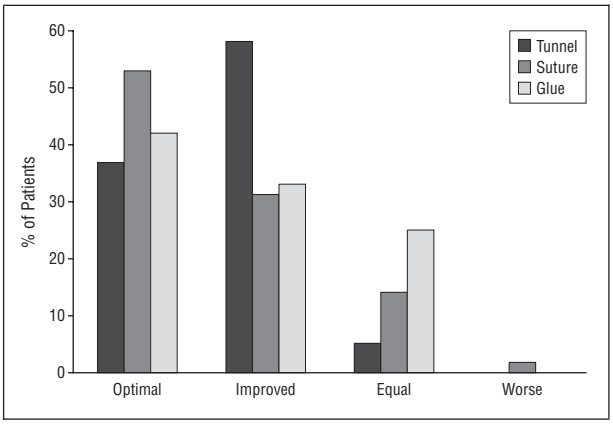

Figure 6. Outcome by fixation method.

There remains considerable controversy in the literature as to the value of objective testing of nasal patency for clinical purposes, especially in the region of the nasal valve.[21-25] In our previous experience there has been little correlation between a patient's subjective sense of nasal patency and the findings at rhinomanometry and

acoustic rhinometry, and therefore these tests were not used in this study.

CONCLUSIONS

It is becoming increasingly clear that nasal obstruction is often partially caused at the internal nasal valve. Placement of spreader grafts between the septum and the upper lateral cartilages after division in the apex, using an external-approach rhinoplasty, gives good results but may be more invasive than necessary. When patients with nasal obstruction are treated in whom internal nasal valve insufficiency is a major or contributing factor, one may consider the use of endonasal spreader grafts, alone or in conjunction with other procedures aimed at improving nasal patency. With this technique, the upper lateral cartilages need not be divided from the nasal septum, so that the risk of compromising the stability and integrity of the middle third of the nose is minimized.

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Quotable

It is more important not to operate badly than it is to operate exceptionally well.

Jack Anderson