The Use of Spreader Grafts in Primary Rhinoplasty

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Abstract: Some candidates for primary rhinoplasty are at greater risk of postoperative complications due to the presence of certain very specific anatomic characteristics.

The authors describe their experience with spreader grafts in primary rhinoplasty and provide an analytic method of identifying the types of patient needing such grafts who present a high risk of complications.

Sixty patients were treated with spreader grafts during primary rhinoplasty. Bilateral spreader grafts were used in cases of "narrow nose syndrome" (short nasal bones, long and weak upper lateral cartilages, thin skin) and in cases of disproportionate nose with narrow middle vault and bulbous tip. Unilateral spreader grafts were placed on the concave side in cases of crooked nose. After an average follow-up of 17 months, all the patients reported improvement in functional and esthetic problems, with no complications related to the preoperative features.

Key Words: rhinoplasty, spreader graft, nasal vault collapse

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A great deal has been said in recent years about the use of spreader grafts in secondary rhinoplasty to correct the anatomy of the cartilaginous nasal vault and thus restore the functionality of the nasal valve. Overly aggressive surgery on the cartilaginous structures composing the middle nasal vault can in fact often cause the collapse of this structure and consequent insufficiency of the internal nasal valve. In esthetic terms, patients present a characteristic "inverted V" deformity of the nasal pyramid.

While descriptions of the middle nasal vault appeared very early in the literature,[1,2] the first to introduce the concept of spreader grafts was Sheen,[3] who focused attention on candidates for primary rhinoplasty presenting a combination of short nasal bones, long and weak upper lateral cartilages, and thin skin. Sheen labeled this anatomic condition the "narrow nose syndrome" and stressed the predisposition to collapse of the cartilaginous vault subsequent to hump excision. The solution he proposed involved the placement of 2 rectangular cartilaginous "spreader grafts" alongside the dorsal septum. Other authors have since discussed this particular nasal conformation exposing patients to greater risk of stenosis of the nasal valve, a situation that can exist both prior to primary rhinoplasty and subsequent to hump excision.[4–7] Case studies of patients with valvular incompetence, most of which show a 100% improvement in respiratory functionality after reconstruction of the nasal vault with dorsal and spreader grafts, were published by Costantian and Clardy[8] and Costantian et al.[9,10] It is also maintained that the resection of just 2 mm of cartilaginous vault during resection of the hump is sufficient to weaken the junction of the septum and the upper lateral cartilages, thus making the latter more liable to inferomedial collapse.[11] Toriumi[12] also claims that spreader grafts can be used to increase the width of the cartilaginous vault in cases characterized by a combination of unduly narrow cartilaginous vault and bulbous nasal tip.

Careful analysis of the literature shows that many authors also use spreader grafts in the treatment of crooked nose. They adopt the unilateral placement of spreader grafts, stressing their importance in the correction of high deviations of the septum.[13–17]

The purpose of this article is to describe 3 high-risk groups of patients potentially liable to postoperative complications after primary rhinoplasty. In these cases, the immediate use of spreader grafts prevents any problems from arising over time.

METHODS

Over the period from January 1, 1999, to January 1, 2002, the Maxillo-Facial Surgery Department of the San Camillo Hospital of Rome treated 60 patients with an average age of 32 years, 25 male and 35 female. All of these were candidates for primary rhinoplasty with a high risk of failure. The patients belonged to all of the 3 categories examined above and were distributed as follows: 22 cases of narrow-nose syndrome, 12 of narrow nasal vault and bulbous tip, and

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26 of crooked nose. Anatomic characteristics belonging to 2 and/or 3 categories were present simultaneously in 10 cases.

All the patients were subjected preoperatively to external inspection and anterior rhinoscopy, which made it possible to assess the anatomic and functional characteristics present and to assign the patients to the various risk categories. In some cases, collapse of the nasal valve was visible by watching the patients breathe during quiet and forced inspiratory effort (Fig. 1). In other cases, marked improvements in respiratory functionality during inhalation as a result of positive responses to Cottle test and to direct lateralization of the internal nasal valve by means of a cotton-tipped applicator made it possible to confirm the diagnosis of incompetence of the internal nasal valve with greater precision. Anterior active rhinomanometry after decongestion was performed using the method described by Costantian and Clardy.[8] Rhinomanometry is particular useful in the diagnosis of nasal valve collapse due to weak cartilaginous structures. The typical finding is an asymmetric nasal pressure-flow curve. Since collapse occurs only during inspiration, inspiratory resistance is higher than expiratory. The flow limitation can be revealed as a plateau of the pressure-flow curve. Despite increased efforts, inspiratory flow cannot rise above this value when collapse occurs.[18]

In the cases both of narrow-nose syndrome and of combined narrow nasal vault and large tip, 2 spreader grafts obtained from a segment of autologous cartilage taken from the middle septal region were attached in the dorsal region of the septum between this and the upper lateral cartilages. In these cases, hump resection and osteotomies were always performed. The spreader grafts were generally 1 to 3 mm in thickness, 3 to 6 mm in height, and 10 to 25 in length; they were attached to the septum by means of mattress sutures with Dexon 5.0 (Fig. 2). Additional sutures with Dexon 5.0 were placed to fix upper lateral cartilages to the grafts. A single unilateral spreader graft was attached on the concave side in the cases involving crooked nose alone. In all patients, medial and lateral osteotomies were performed before the placement of the grafts.

Closed access was used with 15 patients and open access with all the others. The follow-up ranged from 12 to 24 months (median: 17 months).

FIGURE 1. Collapse of the nasal valve during forced inspiratory effort.

RESULTS

None of the patients with narrow-nose syndrome registered either the onset of deformity of the middle nasal vault or incompetence of the internal nasal valve (Fig. 3A–D). In the cases of combined narrow nasal vault and bulbous nasal tip, the use of spreader graft made it possible to adopt extremely conservative techniques in reshaping the tip (minimal cephalic resection of the lateral crura and interdomal suture) with satisfactory esthetic results (Fig. 4A–D). Complications resulting from collapse of the external nasal valve

FIGURE 2. Spreader grafts sutured onto both sides of the dorsal septum.

FIGURE 3. Patient with narrow nose syndrome. Preoperative (A, C) and postoperative (B, D) views.

FIGURE 4. Patient with narrow middle vault and bulbous tip. Preoperative (A, C) and postoperative (B, D) views.

were therefore registered in none of the cases in this group. Seeking to obtain a narrower tip and being dissatisfied with the esthetic results achieved, 1 patient in this group did ask for a further corrective operation. In the third group (ie, the patients with crooked nose), there were no cases of reappearance of the nasal deformity or of collapse of the middle nasal vault due to excessive weakening of the "L" structure of septal support reshaped during the operation (Fig. 5A–D).

The comparison of preoperative and postoperative rhynomanometric measurements showed substantial and objective improvement in nasal airflow for patients with preoperative airway obstruction. Interest attaches in particular to the results obtained in the group exhibiting preoperative collapse of the nasal valve, where mean nasal flow was practically doubled, thus bearing out the findings of other studies.[8] The results obtained with crooked-nose patients were not so significant because the improvement registered may also be due to the correction of septal deviation. No impairment of nasal airflow was registered in the cases of preoperative normal breathing. One patient with serious crooked nose presented a slight posterior upward dislocation of the graft. The patient expressed no wish for further corrective surgery, as the dislocation was perceived through touch rather than visibly evident. The use of the closed technique in this case probably prevented sufficiently strong posterior attachment of the spreader graft, which subsequently shifted its position.

DISCUSSION

While most surgeons are able to identify patients suffering from collapse of the nasal valve during inhalation, it proves far more difficult to identify patients liable to subsequent collapse after hump excision. It is therefore important to undertake careful observation of candidates for primary rhinoplasty who may present the characteristics of narrow-nose syndrome. Patients with short nasal bones, long and weak upper lateral cartilages and thin skin, or some combination of these anatomic variables are in fact susceptible to excessive narrowing of the middle nasal vault and collapse of the internal nasal valve. The narrow projecting nose also

FIGURE 5. Patient with crooked nose. Preoperative (A, C) and postoperative (B, D) views.

appears to play a particular role in leading to complications in primary rhinoplasty after hump excision.

The only way to avoid certain surgical failure is to identify high-risk patients during initial preoperative examination. Preventive reconstruction of the middle nasal vault immediately after hump excision is essential in these cases. In fact, an interesting anatomic study with cross-sectional specimens has showed that dorsal septum has a very widened "Y" shape in the physiological situation.[11] Normally, this flare of the septum acts as a spreader graft with the upper lateral cartilages and secures a perfect airflow.

In cases where no preventive use is made of spreader grafts, the physiological value of the angle between the upper lateral cartilages and the nasal septum, which should be between 10° and 20°, decreases drastically after the operation to values of below 10°.[19] The inverted "V" deformity develops at the same time as a result of the collapse of the middle nasal vault combined with delineation of the caudal end of the nasal bones. This deformity is far more evident in patients with thin nasal skin because this is unable to support the upper lateral cartilages or even to conceal minimal irregularities of the nasal dorsum. Now lacking support both from the septum below and from the extremely short nasal bones, the long and narrow upper lateral cartilages undergo an inferomedial shift resulting in the collapse of the middle nasal vault and incompetence of the internal nasal valve. Placed between the upper lateral cartilages and the septum, the spreader grafts perform the function of expanding the middle nasal vault, thus preventing any excessive narrowing thereof.

While hump excision is the predominant cause of collapse of the upper lateral cartilages in this category of patients, there are, however, also other surgical maneuvers that result in further weakening of the middle nasal vault and increase its liability to subsequent collapse. In actual fact, cephalic resection of the lateral crura of the alar cartilages, which is a habitual maneuver for many surgeons, eliminates the area of linkage between these and the caudal portion of the upper lateral cartilages, thus depriving them of their physiological caudal support. Moreover, the lateral osteotomies themselves can result in further medialization of the upper lateral cartilages, which are no longer supported by the nasal bones.[20–22]

Spreader grafts can also be used during primary rhinoplasty with patients displaying a marked disproportion in width between the middle nasal vault and the nasal tip.[12] There is in fact disharmony of the line from brow to nasal tip in cases where a narrow nasal vault is combined with a wide and bulbous tip. This slightly divergent imaginary line starts from the medial end of the eyebrow and extends along the lateral margin of the nasal dorsum as far as the point of definition of the nasal tip.[7] This disharmony can lead surgeons to narrow the tip excessively to make it proportional to the narrow middle nasal vault, thus weakening the supporting cartilaginous structures. Abundant removal of the cephalic region of the lateral crura, morselization, or complete interruption of the domus for this purpose can all prove risky. These unduly aggressive procedures can in fact produce unsatisfactory esthetic results by causing the nasal tip to assume the typical "pinched" appearance combined with inevitable impairment of the external nasal valve. The end result can in any case prove unsatisfactory in esthetic terms, even in cases where the above complications do not appear in connection with the nasal tip. Adaptation of the nasal tip to a particularly narrow middle vault can in fact lead to an extremely narrow nose that is out of harmony with the rest of the face and therefore unnatural in appearance. The bilateral placement of spreader grafts makes it possible to harmonize the line from eyebrow to nasal tip and to use less aggressive surgical procedures on the tip itself. All this also makes it possible to preserve the anatomic and functional integrity of the external nasal valve.

Patients with crooked nose are the third category of high-risk patients for whom spreader grafts prove useful. The correction of crooked nose is one of the most difficult problems to solve in the field of nasal surgery. A certain risk of reoccurrence is always present, despite the numerous surgical techniques described in the literature to correct the nasal structures involved in this deformity.[17] This complication derives from the intrinsic and extrinsic dislocating forces of traction, which will tend to deviate the middle and lower third of the nasal pyramid again. The intrinsic force consists of the cartilage memory of the nasal septum, which will tend to bring the septum back to its original position. The extrinsic forces are instead primarily determined by the upper lateral cartilages, which are deformed and asymmetric, arching outward on the convex side and inward on the concave side. In addition to the risk of the problem reappearing, there is also a risk of collapse of the middle nasal vault due to excessive weakening of the "L" structure after septoplasty. Incisions and morselization of the residual cartilage are in fact often carried out to straighten it as much as possible. The use of a unilateral spreader grafts performs the dual function of strengthening and guiding the supporting "L" structure while countering cartilage memory over time. Moreover, unilateral placement on the concave side not only serves to lateralize the upper lateral cartilage and restore a suitable angle with the septum but also enhances symmetry with respect to the contralateral. The 2 eyebrow-tip lines are thus ultimately harmonized.

The open and closed techniques can both be used for the insertion of spreader grafts. The open technique obviously provides a clearer view of the nasal structures while making the placement and attachment of the spreader grafts easier and more precise. This type of approach also facilitates the suturing of spreader grafts between the upper lateral cartilages and the septum, especially as regards the posteriormost section.

CONCLUSIONS

In the patients with "narrow-nose syndrome," spreader grafts make it possible to prevent collapse of the middle nasal vault and to maintain and/or restore the internal nasal valve. The use of these grafts with such "high-risk" patients makes it possible to prevent the onset of this postoperative complication while correcting the respiratory function, which often proves to be impaired already at the preoperative stage due to insufficiency of the internal nasal valve. A further element in primary rhinoplasty is the treatment of crooked nose. In such cases, spreader grafts act as splints and provide reinforcement for the residual septum so as to counter the effects of "cartilage memory" and prevent reoccurrence. Finally, spreader grafts can also prove useful with patients presenting a disproportionate combination of narrow nasal vault and bulbous nasal tip. The grafts serve in such situations to harmonize the 2 anatomic regions of the nose and permit the use of more conservative surgery on the tip itself.

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