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REVIEW

Nasal Valve Management in Rhinoseptoplasty

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ABSTRACT

Objective: *To provide a detailed description and evaluation of therapeutic techniques for the management of nasal valve in rhinoseptoplasty.*

Methods: *An extensive review of the international bibliography has been conducted to highlight published articles on nasal valve pathology and therapeutic measures to address it.*

Results: *To date, many techniques have been described for increasing the cross-sectional area of the nasal valve. Selection of the appropriate technique poses a significant challenge to the nasal valve surgeon. Long-term correction of NVD requires surgical intervention. Correction typically involves the use of various grafts or suture techniques to enlarge and/or support the nasal valve. Selection of the appropriate technique depends on the location and type of dysfunction (dynamic/static).*

Conclusion: *The nasal valve plays an important role in nasal airflow. It is important for the otolaryngologist not only consider, but also fully evaluate the nasal valve when seeing a patient with nasal obstruction. If it is not the primary cause of obstruction, it is often a contributing factor. If NVD is discovered, it should be addressed during surgical intervention (functional rhinoplasty) to avoid a suboptimal outcome.*

Keywords: nasal obstruction, functional rhinoplasty, internal nasal valve, external nasal valve, grafts.

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INTRODUCTION

Traditionally, treatment of nasal obstruction focused on septoplasty. Removal of the deviated portion of the septum with preservation of a dorsal and a caudal strut (L-strut) was popularized by Killian (1) and Freer (2) in 1900. However, this technique failed to address caudal and dorsal portions of the septum. In 1948, Cottle and Loring (3) used an incision at the mucocutaneous junction, instead of the Killian incision, to treat all deviated portions of the bony and cartilaginous septum. Since then, many techniques have been developed to deal with various types of septal deviation while maintaining structural support (4). Unfortunately, the literature and our experience have shown that septoplasty alone is often insufficient to treat nasal obstruction. Its success ranged from 43% to 85%, depending on the assessment tool (5-8).

The nasal valve is an anatomically complex concept and is nonspecific in its original description. It was first described by Mink, in 1903, as the region of maximal nasal resistance (9). According to the international literature, nasal valve dysfunction (NVD) is relatively common, with a prevalence of up to 13%. Moreover, the nasal valve has been implicated as the cause of persistent nasal obstruction after septoplasty in up to 95% of cases. Etiologies include prior rhinoplasty, which is the most commonly encountered, other surgical procedures, facial paralysis, congenital defects, trauma and aging. Nasal valve collapse leads to impairment of nasal breathing, which significantly disturbs the quality of life.

The need to address the nasal valve as a contributor factor to nasal obstruction was recognized in 1984, when Sheen first described the use of grafts (spreader grafts), to dilate the internal nasal valve. Sheen recognized the need to correct the nasal dorsum after hump removal to avoid creating a narrow middle third and inverted V deformity. The graft was observed to increase the internal valve angle, displacing the ULC laterally (10). Since Sheen's publication, the spreader graft has become the gold standard for internal nasal valve management. However, this technique alone is often not sufficient for effective nasal valve management. Today, there are various surgical techniques to treat it (11, 12). The purpose of the present study is to provide a detailed description and evaluation of therapeutic techniques for the management of nasal valve in rhinoseptoplasty. ❑

MATERIALS AND METHODS

An extensive review of the international bibliography has been conducted to highlight published articles on nasal valve pathology and therapeutic measures to address it, using the PubMed, Google Scholar, ScienceDirect and Cochrane Library. We used various keywords in English, including "management of nasal valve", "controversy in technique selection", "surgical planning of nasal valve", "cosmetic rhinoplasty", "Asian rhinoplasty", "ethnic rhinoplasty", "surgical anatomy of the nose", and a careful selection of published articles followed, so that we performed a thorough review of the international literature. However, a quantitative statistical analysis of the collected data was not done due to the great heterogeneity in terms of geographic distribution and characteristics of the participating patients as well as the variety of methods used in the different explored studies/articles. ❑

RESULTS

To date, many techniques have been described for increasing the cross-sectional area of the nasal valve. Selection of the appropriate technique poses a significant challenge to the nasal valve surgeon. Long-term correction of NVD requires surgical intervention (13). Correction typically involves the use of various grafts or suture techniques to enlarge and/or support the nasal valve. Selection of the appropriate technique largely depends on the location and type of dysfunction (dynamic/static) (14-20). Often, multiple techniques need to be used in the same surgical procedure. Another important consideration is that many of the maneuvers can impact both the internal and external valves. Some techniques are traditionally thought of as impacting the internal valve alone, with the primary effect of increasing the valve angle and altering static narrowing. Spreader grafts, autospreader grafts and flaring sutures typically fall into this category (16). Most of the remaining techniques, including grafts, such as alar batten grafts and butterfly grafts, can impact both the internal and external valves. While the lateral crural strut grafts,

lateral crural turn-in grafts and alar rim grafts affect only the external valve (21). ❑

DISCUSSION

When evaluating a patient with internal nasal valve dysfunction, knowledge of the anatomy is important. According to Bernoulli's law, as air velocity increases pressure falls, leading to external nasal valve dysfunction (22-24), which is exacerbated when the nasal valve is weak.

In the international literature there are conflicting opinions concerning the anatomy, terminology, evaluation and management of NVD. Anatomy and terminology need standardization, so that future research can be consistent in describing how the techniques affect the nasal valve. Many objective tools have been developed to assess the nasal airflow, although correlation with subjective patient outcomes is inconsistent in the literature. Most nasal valve surgeons rely on the history and physical examination to determine which patients are candidates for surgery.

Regarding the nasal valve management, there are many options available to the surgeon. In general, techniques using cartilage grafts are relatively permanent. Limitations to their use include the need to treat multiple sites, with the potential risk of insufficient grafts (25). The use of sutures is relatively less invasive and simpler, but concerns have been raised about their durability as well as their use in large NVD. Non-surgical methods include topical nasal strips, cones and sponges.

Graft-based techniques represent a broad category characterized by inserting or transferring a graft to various areas of the nose. Alar batten grafts and butterfly grafts are advantageous because of the relative ease of placement, although the alar batten graft is less effective for medial dome deformities and the butterfly graft has been associated with worse aesthetic results (26, 27). The titanium butterfly implant represents an option to improve the aesthetic outcome, due to post-implantation adaptation, although rejection of the graft may limit overall efficacy (28). The spreader graft represents a useful technique for the correction of medial dome collapse (29). While direct comparison of the techniques is limited, the alar batten and autospreader graft had the best results, followed by butterfly grafts, with 88% (30) and 83% (21) of patients, respectively being satisfied postoperatively.

Suture techniques are generally less invasive than graft techniques and do not require tissue transfer. They are also effective for both static and dynamic dysfunction of the nasal valve. The transconjunctival incision can cause nasal asymmetry as well as granuloma formation at the site of the operation (31-33). For the mitec bone anchor and flaring suture, no granuloma formation has been reported, but loosening or failure of the suture, leading to eventual partial or total failure of the operation (34).

In their review, Sinkler *et al* (35) propose the piriform rim suture suspension (a multitude of holes and sutures to create multiple contact points), so that the force is distributed to the piriform bone. However, this technique is limited to patients with relatively mild nasal deformities and a nasal valve angle <15°. Postoperatively, the NOSE score showed an improvement in 70% of these patients. But the comparison of results in suture techniques is limited again by the lack of available data. However, studies have shown postoperative satisfaction of 91% with the mitek bone anchor technique and 63% with the flaring suture (31). Unfortunately, no large studies have investigated postoperative patient satisfaction using other suture techniques to repair NVD.

Most of the above-described techniques were shown to have positive results, despite the lack of randomized controlled trials comparing those techniques directly. A large part of the problem is that the choice of the surgical method must be adapted to each patient and his/her pathology (individualized treatment), because there is no one-size-fits-all approach. Nevertheless, Barrett *et al* (21) report that the butterfly graft is a versatile option that is useful for many patients.

Future research using more standardized definitions and validated outcome measures may help improve the quality of evidence for nasal valve management in the literature. Also, direct comparison of techniques would be ideal, although difficult to achieve. ❑

CONCLUSIONS

The nasal valve plays an important role in the nasal airflow. It is important for the otolaryn-

gologist not only consider but also to fully evaluate the nasal valve when seeing a patient with nasal obstruction. If it is not the primary cause of obstruction, it is often a contributing factor. If NVD is discovered, it should be addressed during surgical intervention (functional rhinoplasty) to avoid a suboptimal outcome.

Currently, there are many available options for nasal valve management in septoplasty. Most of the described techniques were shown to have positive results, despite the lack of randomized controlled trials that directly compare the techniques. Patients should be carefully evaluated for the most appropriate technique, which should be individually tailored according each one's pathology (individualized treatment). Nevertheless, improvements in the quality of evidence from the international scientific community will undoubtedly impact surgical decision-making. ❑

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