Piriform Widening with Z-plasty for Nasal Valve Surgery

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ABSTRACT

Nasal valve collapse is recognized as one major cause of nasal airway obstruction. Soft tissue laxity of the nasal vestibule and flimsy lower and/or upper lateral cartilages can collapse during inhalation. A multitude of surgical techniques to expand the nasal valve are available but often fail to maintain lateralization of the collapsing soft tissue due to a narrowed bony piriform aperture. We present a powerful technique to widen the narrowed or collapsing nasal valve which is useful for treating patients failing traditional nasal valve surgery or who have inherent narrowing of the bony piriform aperture.

INTRODUCTION

Goals of a functional septorhinoplasty must include techniques aimed at improving narrow regions within nasal cavity lumen. Bloching describes that treatment of disorders of the nasal valve has three specific aims: widening of the angle of the nasal valve, stabilizing the mobile lateral wall, and correcting stenosis of the soft tissue, cartilage, or bone (1). The operative techniques that fall within these aims include septoplasty, inferior turbinate reduction, alar batten grafts, lateral cranial strut grafts spreader grafts, butterfly grafts, flaring sutures, and nasal valve suspension to name a few (3).

A multitude of surgical techniques to expand the nasal valve are available but often fail to maintain lateralization of the collapsing soft tissue due to a narrowed bony piriform aperture. We present a powerful technique to widen the nasal valve, stabilizing the mobile lateral wall, and correcting stenosis of the soft tissue, cartilage, or bone (1). The operative techniques that fall within these aims include septoplasty, inferior turbinate reduction, alar batten grafts, lateral crural strut grafts spreader grafts, butterfly grafts, flaring sutures, and nasal valve suspension to name a few (3).

TECHNIQUE/PATIENT CASES

All procedures were performed by the same surgeon (C.S.). The patient is intubated by anesthesia, then prepped and draped in standard surgical fashion. The nose is decongested with pledgets soaked in 4% cocaine solution followed by injection with 1% lidocaine with 1:100,000 epinephrine. All other nasal work is done prior to the piriform widening. Next, an incision is made anterior to the head of the inferior turbinate along the bony piriform rim contour (Figure 2). The periosteum is elevated off the thin bony rim with a freer or cottle elevator and a rongeur is then used to widen the bony rim (Figure 3A). Next, oblique incisions are made from the ends of the initial incision at approximately 60-degree angles to create a standard intranasal z-plasty. The lateralized soft tissue is then secured along the incisions after rotating the flaps appropriately using plain gut suture (Figure 5,6). Standard closure of the hemitransfixtion incision is performed followed by a whipstitch opposing the mucoperichondrial flaps with a 4-0 chromic suture.

Patient 1: A 38 year-old man presented 5 months after turbinate coblation and septorhinoplasty for nasal obstruction. His exam showed significant internal valve collapse with brisk inspiration, moderately obstructing turbinates, and relatively straight septum. He underwent thinnedoplasty with alar flaring sutures, revision septoplasty, turbinnoplasty, and bilateral piriform aperture widening. At the 4 and 6-week post-operative visits, the patient expressed happiness with his improved nasal breathing. There were no post-operative complaints regarding the operation beyond expected pain, congestion secondary to edema, and crusting.

Patient 2: A 48-year-old man presented 6 months after a septoplasty and turbinnoplasty for chronic nasal obstruction. His exam showed a scar band causing narrowing at the right nasal vestibule, a narrow nasal passage at the left vestibule, mild septal deflection to the right, moderately enlarged inferior turbinates, and no significant internal valve collapse. He underwent bilateral piriform aperture widening. Three weeks post op he presented with some crusting along the incision lines but improved breathing. At the 6-month follow up visit, the patient noted some tenderness and left sided facial pain that extended from left upper teeth to the medial eyelid, yet subjectively he described his nasal breathing as excellent.

Patient 3: A 67 year-old woman presented with long standing history of nasal obstruction with the left worse than right. Allergy testing was negative and congestion was refractory to a trial of nasal steroid spray. Examination revealed septal deviation to the left with approximately 80% obstruction, moderately sized inferior turbinates, and narrowed piriform aperture on the left. She underwent septoplasty, submucous resection of the inferior turbinates, and piriform aperture widening on the left. At her 10-week postoperative visit, she stated her nasal congestion was much improved. Her pictures are shown.

DISCUSSION

We identified a narrowed piriform aperture with overlying soft tissue laxity as a cause of previous surgical failure in two patients, and as a contributing cause of obstruction in a third patient. In their finite element analysis of airflow in the nasal valve, Tarabichi and Fanous discovered that most flow occurs through the ventral part of the valve in proximity to the inferior rim of the piriform aperture. Furthermore they concluded that the inferior rim of the piriform aperture is a critical component in the geometry of the valve distorting airflow and that removal of this rim should result in more even flow across the valve (4).

Physiologic changes within the nose also contribute to dynamic shifts in airflow, as seen with congestion and decongestion of the nose. In their description of the lateral wall of the bony valve region, Weckler et al. discussed that CT scans consistently showed that the interior turbinate soft tissue contour protruded into the airway at the level of piriform rim (5). Furthermore, Jones et al. noted that the decongested inferior turbinate head rested at the level of the piriform rim, approximately 2.15 cm within the nasal passage (6). In his paper, Woodhead discussed the narrow piriform aperture as a cause of refractory nasal congestion after inferior turbinate reduction/resection. His technique included work directed at the “web” of soft tissue at the muco-cutaneous junction within the nasal vestibule and then bony removal of the piriform rim (7). Our technique is similar and documents this with intra-operative and post-operative photographs.

One of the most compelling explanations for the nasal valve is by Wexler, who describes the nasal valve as a set of interrelated structures that extends approximately from the limen nasi, to the nasal bony cavum just beyond the piriform aperture. The anterior half of this zone is modulated by cartilaginous and muscular support, the posterior half by bony encasement and overlying mucosa. The flow resistance is distributed along this entire passage, and thus the flow dynamics can change dramatically depending on the underlying physiologic process (5). This description lends to a surgical approach that aims to correct cartilaginous or bony problem with mucosal engagement affecting either of these, or both.

Regardless of what method one uses to evaluate their patient for nasal congestion and valve collapse, a thorough understanding of the nasal anatomy and airflow dynamics in relation to the cartilaginous and bony portions is paramount. A heightened awareness of the narrowed piriform rim and its contribution to nasal congestion, paired with our described technique of piriform widening and intranasal z-plasty, can provide a strong addition to armamentarium of nasal valve procedures.

REFERENCES