Surgical Management of Nasal Airway Obstruction

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KEYWORDS

• Nasal obstruction • Nasal breathing • Septal deviation • Nasal valve narrowing
• Turbinate hypertrophy

KEY POINTS

- The management and diagnosis of nasal airway obstruction requires an understanding of the form and function of the nose.
- Nasal airway obstruction can be structural, physiologic, or a combination of both.
- Anatomic causes of airway obstruction include septal deviation, internal nasal valve narrowing, external nasal valve collapse, and inferior turbinate hypertrophy.
- Thus, the management of nasal air obstruction must be selective and carefully considered.
- The goal of surgery is to address the deformity and not just enlarge the nasal cavity.

INTRODUCTION

The management and diagnosis of nasal airway obstruction requires an understanding of the form and function of the nose. Nasal airway obstruction can be structural, physiologic, or a combination of both. Thus, the management of nasal airway obstruction must be selective and often involves medical management. The goal of surgery is to address the deformity and not just enlarge the nasal cavity. This article reviews airway obstruction and its treatment.

ANATOMY

The nasal airway is both a dynamic and rigid structure. It begins at the external nasal valve, which is composed of the caudal edge of the lower lateral cartilages, caudal septum, nostril sill, and the soft tissue alae. The septum and the bone walls provide the rigid structure of the nose. The septum is made up of quadrilateral cartilage, nasal spine, frontal spine, perpendicular plate of the ethmoid, vomer, and maxillary crest. The narrowest portion of the nose is the internal nasal valve (10°–15°), which is formed by the septum, the inferior turbinate, and the upper lateral cartilage. Short nasal bones, a narrow midnasal fold, and malposition of the alar cartilages all predispose patients to internal valve incompetence.

The lateral wall of the nose contains 3 to 4 turbinates (inferior, middle, superior, supreme) and the corresponding meatuses that drain the paranasal sinuses. The nasolacrimal duct drains through the inferior meatus, whereas the maxillary, frontal, and anterior ethmoid sinuses articulate with the middle meatus. The posterior ethmoid sinus opens into the superior meatus. The nasal cavity ends at the choanae as the airflow passes into the nasopharynx.

FUNCTION

The nose is not only a conduit for inspired air but also an air conditioner that cleans, humidifies,

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and warms the inspired air. It is also involved in olfaction and speech. Inspired air passes through the nose at 200 kph (125 mph) in a parabolic curve moving vertically through the roof of the nasal vestibule and then through the internal nasal valve. The nose is the site of nearly half of the total respiratory resistance; a third of the resistance occurs at the external valve and two-thirds occur at the internal valve. The gatekeeper of nasal airflow is the internal valve, which aids in respiration by limiting the flow of air so that it does not exceed the nose's ability to process it. On deep inspiration the nostril enlarges and the internal valve narrows, whereas on expiration the nostril narrows and the internal valve enlarges. Complete closure of the internal valve is prevented by the action of the alae, which flare outward and upward exerting a checkrein action on the connective-tissue aponeurosis of the upper lateral cartilages.

CAUSES

Nasal obstruction can be physiologic and/or structural. The differential diagnosis of physiologic nasal obstruction includes infections, allergies, medications, vasomotor rhinitis, endocrine disorders, and chemical irritants.

The common cold is the most frequent cause of physiologic nasal obstruction. It is usually self-limiting and treated with antihistamines and decongestants. Allergic rhinitis can be seasonal or perennial. Seasonal symptoms can be managed with antihistamines, decongestants, and topical and/or systemic steroids. Perennial allergic rhinitis requires a work-up, which includes nasal cytology, blood tests for immunoglobulin E levels, and skin test.

Rhinitis medicamentosa is most frequently seen in patients who use long-term nasal sprays or drops. However, it can also result from oral medications such as reserpine, propanol, and chlorpromazine. Its treatment requires stopping the offending medication and providing airway support with decongestants and systemic and/or topical steroids.

Pregnancy is a common endocrine cause of nasal obstruction. However, rhinitis of pregnancy usually resolves with the end of pregnancy. Interim treatment depends on the stage of the patient's pregnancy and the approach that the patient's obstetrician has toward therapy during pregnancy.

Persistent irritants can cause chronic allergic rhinitis, and pollution is the most common environmental cause. Other causes are primarily occupational, which include dust, fumes, and chemicals. The treatment is preventative and avoidance of the irritants.

DIAGNOSIS

The diagnosis of nasal obstruction begins with a complete history, including several key elements, including (1) duration and frequency of the symptoms, (2) whether they are unilateral or bilateral, (3) whether they are perennial or seasonal, (4) history of trauma, (5) history of surgery, (6) presence of allergic symptoms, and (7) medication usage. Examination of the patient's nasal cavities requires good illumination and adequate decongestion. The patient is initially observed at rest without a speculum. The external nasal valve is first examined and noted for alar collapse. The internal valve is also evaluated without a speculum, checking for mucosal scarring and the relationship of the upper lateral cartilage to the septum. The Cottle test is used to evaluate nasal valve disorder. While the patient breaths quietly, the cheek is retracted laterally in order to open up the nasal valve. If the patient's breathing is improved, the Cottle test is positive, indicating that the nasal valve is a factor in the patient's respiratory symptoms. However, if the valve is scarred, the maneuver may not alter the symptoms, and the test results are designated as false-negative. In this case, a Q-tip may be used to retract the nasal valve laterally. Although the Cottle test is specific for nasal valve collapse, false-positive tests are seen in patients with flaccid valves. Gruber and colleagues also described the use of a Breathe Right strip test to evaluate the internal and external valves separately.

The nasal structures are then examined with a nasal speculum. The nasal septum is evaluated for deviation, whereas the turbinates are evaluated for hypertrophy (**Fig. 1**). The caudal end of the septum is examined and deviations of the quadrilateral cartilage and bony septum are noted (**Fig. 2**). The nasal mucosa is examined for scarring or thinning. In addition, both inferior and middle turbinates are evaluated.

TREATMENT

Correction of the nasal airway obstruction is directed toward the anatomic source of obstruction. For septal deviation, a septoplasty can be considered. The goal of the septoplasty is the correct septal deviation while at the same time preserving as much of the septum anatomy as possible.

The septum can be approached endonasally through a hemitransfixion or Killian incision. Alternatively, an open approach can be used. In complex nasal airway cases, the septum is best treated with an open rhinoplasty. The open