# Consultation with the Specialist

## Diagnosis and Management of the Newborn and Young Infant Who Have Nasal Obstruction

**Susannah Q. Olnes, MD,* Richard H. Schwartz, MD,* Robert S. Bahadori, MD†**

### Introduction

Because neonates may be obligate nasal breathers until they are at least 2 months old, nasal obstruction, particularly if bilateral and complete, can cause severe respiratory distress quickly. Nasal airway problems far less consequential than total nasal obstruction can be worrisome in the neonate and young infant. Their nasal passages may exhibit as much as 50% of the total airway resistance, and the degree of obstruction often worsens when the infant has an upper respiratory tract infection. Focal obstruction can occur in the nasal vestibule or in any of the three anatomic regions of the nose: nasal piriform aperture, mid-nasal cavity, or the posterior choanae.

Most cases of nasal obstruction in the neonate and young infant are due to generalized nasal airway obstruction associated with neonatal rhinitis, viral upper respiratory tract infections, and possibly milk/soy allergies. A relatively unrecognized, but important percentage of neonatal nasal obstruction is due to gastroesophageal reflux disease (GERD), with secondary inflammation of the posterior nasal passages (reflux rhinitis). Less common causes of generalized neonatal/young infant nasal obstruction include rhinitis medicamentosa due to the overuse of topical vasoconstrictor nose drops and maternal ingestion of drugs such as methyldopa, tricyclic antidepressants, or propranalol. Trauma from nasal prongs or nasogastric tubes may produce unilateral or bilateral nasal obstruction.

With the exception of posterior choanal atresia, the challenging differential diagnosis and management of the neonate who has nasal obstruction is described in only a few English language pediatric journal articles. There are several reviews of the subject in the subspecialty literature.

Syphilitic snuffles, although an infrequent cause of nasal obstruction, merits particular mention because it sometimes is misdiagnosed. The watery nasal secretions associated with snuffles are teeming with spirochetes and highly contagious. Chlamydial rhinitis can produce similar clinical symptoms.

Successful management of nasal obstruction in the neonate or young infant entails: 1) obtaining a pertinent history and performing a physical examination, 2) demonstrating persistent reduction or absence of nasal patency in each nostril, 3) pinpointing the site of the obstruction, 4) determining the exact cause of the obstruction, and 5) instituting corrective medical or surgical measures. In addition to the usual bedside tests for nasal patency, the most important initial diagnostic modality usually is nasopharyngoscopy with a rigid or flexible endoscope. Contrast-enhanced, high-resolution computed tomography (CT) or magnetic resonance imaging (MRI) typically is the next diagnostic procedure. Because a midline nasal mass may represent an intranasal encephalocoele, biopsy of such a mass must not be undertaken without preliminary imaging.

The purpose of this article is to identify some of the multiple causes of neonatal nasal obstruction (Table) and describe management strategies used by pediatric otolaryngologists. The importance of GERD as a cause of neonatal nasal obstruction is underscored. Seven illustrative cases are included.

### Case 1

*A 3-day-old term baby was seen in the office for a routine newborn health assessment. The pregnancy and delivery had been routine, and the mother was breastfeeding the baby. Noises from the nose were audible with each breath taken by the baby. The nasal passages were patent, but less air came out of the right nostril than the left. Anterior rhinoscopic examination revealed a globule of mucus proximal to the nasal vestibule. A moistened cotton swab was inserted gently past the nasal vestibule and rotated several times. On removal of the swab, a large globule of mucus was noted to cling to the cotton fibers. Breathing improved instantaneously. Instillation of saline nose drops and extrication of additional nasal mucus were recommended.*

Mucus is one of the more frequent causes of neonatal nasal obstruction. The mucus may be thick, tenacious, and resistant to bulb suctioning. Administration of

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**TABLE. Causes of Neonatal Nasal Obstruction**

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| **Congenital narrowing** |
| • Choanal atresia |
| • Choanal stenosis |
| • Piriform aperture stenosis |
| • Binden syndrome (nasal/midface hypoplasia and nasal passage stenosis) |
| **Congenital tumors/cysts** |
| • Nasolacrimal duct cyst (nasocystocele) |
| • Hemangioma |
| • Other vascular malformations |
| • Encephalocele/meningoencephalocele |
| • Glioma |
| • Heterotopic brain tissue |
| • Dermoid cyst |
| • Teratoma |
| • Hamartoma |
| **Genetic** |
| • Fetal alcohol syndrome |
| • CHARGE association |
| • Treacher-Collins syndrome |
| • Crouzon syndrome |
| • Apert syndrome |
| **Inflammatory** |
| • Upper respiratory tract infection |
| • Respiratory syncytial virus infection |
| • Gastroesophageal reflux disease |
| • Recurrent vomiting from any cause |
| • Allergic (cow milk or soy protein) rhinitis |
| • Congenital syphilis (“snuffles”) |
| • Chlamydial nasopharyngitis |
| **Iatrogenic** |
| • Nasotracheal tube pressure |
| • Nasal suctioning irritation |
| • Rhinitis medicamentosa |
| • Maternal ingestion of drugs (eg, methyldopa) |
| **Metabolic** |
| • Hypothyroidism |
| **Trauma** |
| • Intrauterine pressure on the nasal tip (positional asymmetry) |
| • Nasal septal dislocation |
| **Malignant** |
| • Lymphoma |
| • Nasopharyngeal rhabdomyosarcoma |
| **Foreign body** |

buffered hypertonic (3%) or normal saline (0.9%) nose drops and frequent gentle bulb suctioning may be required if such an obstruction occurs.

## Case 2

*A 3-week-old infant was referred to a pediatric otolaryngologist because of severe bilateral nasal congestion that was unresponsive to phenylephrine 0.125% TID and triamcinolone aqueous spray (one spray into each nostril TID for 3 days). The nasal obstruction was interfering with the baby’s eating and sleeping. Anterior rhinoscopic examination revealed enlarged turbinates and edematous nasal mucosa. A 3-mm fiberoptic nasal endoscope could not be inserted past the stenotic area. However, the infant was able to breathe, although poorly, through both nostrils. Findings on the remainder of the head and neck examination were normal. Saline nose drops were begun with the instillation of 4 to 6 drops of the solution, four to six times per day. An apnea monitor was ordered. Further diagnostic evaluation found marked gastroesophageal reflux. Antireflux medication (cisapride [no longer available for routine use] and ranitidine) was prescribed. The nasal swelling was reduced, and nasal endoscopy and laryngoscopy were performed successfully. The nasal passages, nasopharynx, posterior choanae, and larynx were visualized and appeared normal after antireflux therapy. The posterior glottis was erythematous, consistent with high GERD.*

GERD is one of the potential causes of persistent neonatal nasal obstruction. Although it is not well described in the medical literature, GERD inflames and narrows the posterior nasal choanae as a result of acid inflammation. GERD is particularly common in preterm infants and those who have neuromuscular weakness. The diagnosis is made when nasopharyngoscopy reveals the typical findings of marked inflammation of the tissues around the posterior choanae and the supraglottic area or the presence of milk residue in the nasopharynx. A pH probe test may confirm high reflux of stomach acid, but there is a high rate of presumably false-positive studies in asymptomatic infants. Milk scintography can demonstrate reflux of stomach contents into the nasopharynx. Propping up the baby after feeding, thickening the formula with rice cereal, and administering ranitidine often are curative.

## Case 3

*A 4-month-old female infant, the product of a term uncomplicated pregnancy, was brought to the emergency department in cardiopulmonary arrest. She was resuscitated successfully but had severe nasal obstruction. Nasal endoscopy revealed synechial bands in the pos-*

*terior nasal passage causing the obstruction. Surgical lysis produced marked improvement in nasal breathing, and nasal stents were inserted. During the medical evaluation, several additional organ systems were found to be abnormal, and the infant was diagnosed with CHARGE association.*

Choanal atresia, which has an incidence of 1:8,000 births, usually occurs during the fourth week of embryonic life, when a mesenchymal plate fails to atrophy, then ossifies, occluding the posterior nasal aperture (Fig. 1). Most references state that choanal atresia is usually unilateral and complete, although bilateral atresias are more common in the experience of some pediatricians and otolaryngologists. Approximately 70% of patients who have choanal atresia have mixed bony/membraneous choanal atresia; 30% have pure bony atresias. The current thinking is that few, if any, affected babies have purely membraneous atresias. As many as 50% of babies born with choanal atresia have other anomalies, the most frequent of which is the CHARGE association (Coloboma, Heart defects, Atresia choanae, Retardation of growth and development, Genitourinary anomalies, and Ear anomalies, including deafness). Diagnosis begins with the suspicion of total nasal obstruction. The neonate who has bilateral choanal atresia often breathes best when crying and may become cyanotic with feeding. Failure to establish patency with a #5 or #6 French feeding catheter at the 32-mm level requires immediate establishment of an oral airway, nasapharyngoscopy, and CT scanning. The imaging study of choice is a high-resolution axial CT with bone windows.

Management is oriented toward temporarily securing an oral airway with a McGovern nipple or similar device and by gavage feeding. Definitive surgery to secure a patent nasal airway should be performed prior to discharge from the intensive care nursery. Surgical management involves removal of the bony atretic plate with a carbon dioxide laser, bone curettage, or high-speed drill. If clinically indicated postoperatively, the baby can be sent home with a cardiopulmonary monitor.

## Case 4

*During the initial examination of a newborn, the physician noted that the nasal columella was lying at an oblique angle (Fig. 2). Airflow from the right nostril was considerably less than from the left. Depression of the tip of the nose with the examiner's finger revealed asymmetry of the nasal apertures. Cartilage was impinging into the right nasal cavity. A pediatric otolaryngologist diagnosed dislocation of the nasal septum. The septum was repositioned into the vomerine groove by means of a septal elevator.*

Nasal septal asymmetry occurs in as many as 1% of newborns. Septal asymmetry due to compression of the nasal tip is much more common than true septal dislocation and requires only watchful waiting and therapeutic measures to reduce mucosal edema. It is a result of excessive pressure on the baby's nasal tip during vaginal delivery. Manipulation of the nasal septum is unnecessary in the majority of cases. With persistent septal dislocation, the nasal columella is tilted, and the off-center nasal septum causes unilateral nasal obstruction. One alae nasae appears slit-like; the other appears normal. To prevent permanent disfigurement of the nose, dislocation of the septum must be reduced within a few days. A septal elevator is placed into the narrowed nasal vestibule and lifted upward. The septal cartilage then is guided into the vomerine groove. A click may be heard and felt as the septum falls into position.

## Case 5

*A 2-day-old term neonate was noted by a nurse to have difficulty breathing through her nose. The neonatologist noted a shiny, pearl-like mass in the inferior meatus of the baby's nose (Fig. 3). CT imaging confirmed that it was a nasolacrimal duct mucocele. The cyst was aspirated and marsupialized by a pediatric otolaryngologist. There were no recurrences.*

In our pediatric hospital, which has more than 9,500 deliveries annually, nasolacrimal duct mucocele (nasocystocele) is the most common intranasal mass. Three or four of these 2- to 3-cm pearly cysts are diagnosed each year. One in five mucoceles is bilateral, and most cause nasal obstruction. Approximately 15% of unilateral mucoceles are associated with clinically appar-

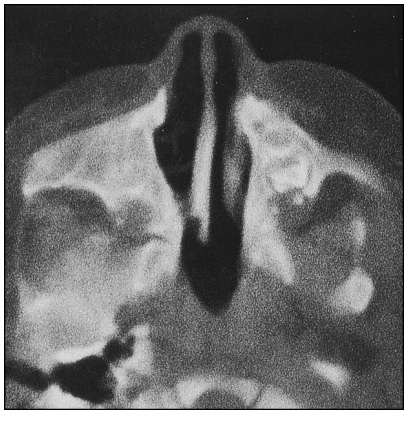

*FIGURE 1. Axial CT scan of unilateral choanal atresia.*

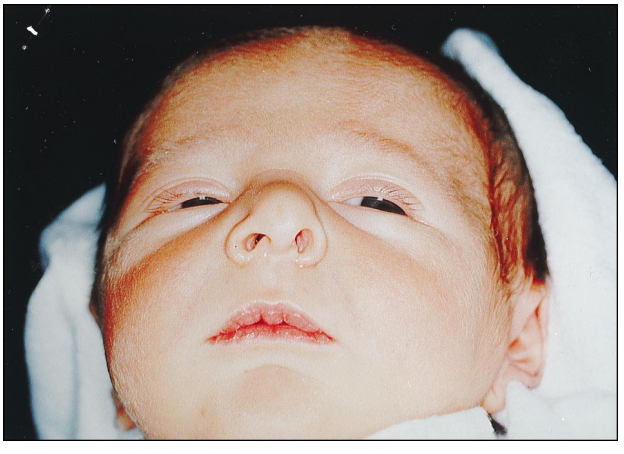

*FIGURE 2. Newborn infant whose nasal columella lies at an oblique angle.*

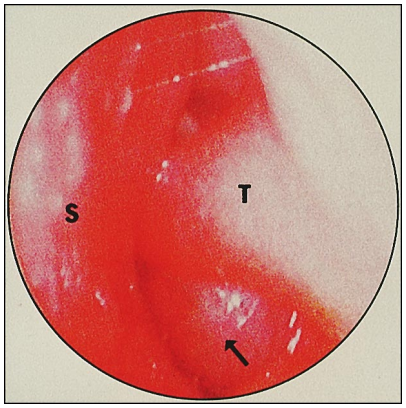


*FIGURE 3. Endoscopic view of a congenital nasolacrimal duct cystomyocele (arrow). S=septum; T=inferior turbinate.*

ent nasal obstruction. The inferior turbinate sometimes is pushed upward by the mass. Nasolacrimal duct cysts often cause swelling around the medial canthus of the ipsilateral eye, and if not detected early, they may become an infected dacrocystocele. CT shows a well-defined, thin-walled cyst in the inferior meatus and dilatation of the nasolacrimal duct and the lacrimal sac.

## Case 6

*A 2-week-old infant was referred by his pediatrician to an otolaryngologist for noisy nasal breathing and occasional episodes of "struggling for breath." There was no history of cyanotic episodes. Nasal endoscopy revealed narrowing at the anterior portion of the nose and copious serous rhinorrhea, consistent with a diagnosis of piriform aperture stenosis. There was no evidence of choanal atresia or an intranasal mass, and the vallecula, vocal cords, and subglottic area were normal. CT imaging confirmed the diagnosis. Medical management consisted of securing an airway and using saline nasal lavage and hypertonic (3%) buffered saline nose drops. These measures produced slow but steady improvement in nasal patency. Surgery was unnecessary.*

Piriform aperture stenosis, an infrequent cause of nasal obstruction of the newborn, may be unfamiliar to pediatricians. The piriform aperture lies just distal to the nasal vestibule and is the narrowest portion of the nasal cavity. Bony overgrowth of the medial maxilla narrows the piriform aperture to a slit-like opening, and life-threatening obstruction may occur. The baby presents with stertorous breathing and cyclic cyanosis that is worsened by feeding and relieved by crying. This symptom complex mimics that of choanal atresia. A narrow-gauge feeding tube may be passed distal to the anterior obstruction. If thin, contiguous axial section slices are taken in a plane parallel to the anterior hard palate, high-resolution CT shows excellent anatomic detail. CT imaging also may demonstrate a single central incisor, which often is associated with piriform aperture stenosis. Conservative management includes use of saline nose drops, frequent gentle suctioning of nasal secretions, topical nasal steroid medication, use of a McGovern nipple as a temporary airway, and occasional use of orogastric feeding tubes. Surgical correction using a sublabial approach for the bone drill may be required for severely affected patients whose failure to thrive is unresponsive to medical management. Parental training in airway management and cardiopulmonary resuscitation techniques sometimes is necessary.

## Case 7

*A 1-day-old term infant had loud, snorting noises coming from his nose. Examination of the external nose and nasal vestibule revealed no remarkable findings, but airflow in the right nasal passage appeared to be partially obstructed. Anterior rhinoscopic examination performed with an otoscope and a 4-mm aural speculum revealed a nasal mass. Flexible nasoendoscopy performed by a pediatric otolaryngologist confirmed the presence of a midline intranasal mass. Further evaluation by high-resolution CT and MRI revealed a solid tumor that was not connected to the brain. Following excision of a hamartoma, nasal airway patency immediately improved. There was no recurrence during a 1-year follow-up period.*

Dermoid cysts, teratomas, and hamartomas, as well as tumors containing neural tissue (gliomas [Fig. 4], encephaloceles, and heterotopic brain) may develop inside the nose. When an intranasal tumor is diagnosed, it is imperative to rule out an intracranial extension prior to biopsy or excision of the mass with high-resolution CT or MRI. Intracranial connections, if found on imaging, mandate cooperative effort between the otolaryngologist and neurosurgeon.

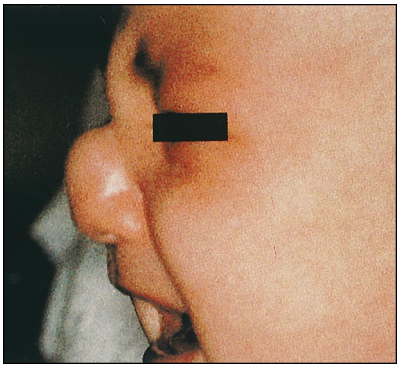

*FIGURE 4. Large glioma under the nasal dorsum.*

## Discussion

Nasal obstruction is a common, and often vexing, condition in the newborn and young infant. The most common cause in young infants is neonatal rhinitis (stuffy nose of infancy). Complete bilateral obstruction of the nasal passages is a medical emergency in the neonatal period, demanding placement of a secure airway. In the absence of complete nasal obstruction, a nasal septal deformity, or an easily visible intranasal mass, it is helpful to consider common causes first and develop a management plan with this in mind.

After determining that nasal obstruction is affecting breathing, feeding, or sleeping, it is necessary to elucidate the extent of the problem by history, physical examination, and bedside tests for nasal patency. Localized symptoms of nasal obstruction include stuffy nose, rhinorrhea, nasal mucus production, a whistling or whipping sound during breathing, or noisy (stertorous) breathing. Physical examination may reveal a nasal whistle or stertorous noise, labored breathing, complete unilateral or bilateral nasal obstruction, rhinorrhea, cyanosis, or apneic spells.

Generalized symptoms associated with nasal obstruction include irritability (sometimes misdiagnosed as colic), feeding or sleep disturbances, abdominal distension caused by aerophagia, and a hyponasal quality to the baby's cry.

Management of the neonate who has a stuffy nose begins with inspection of the nose for gross deformities and marked asymmetry of the columella and nasal septum. Nasal patency can be assessed easily by occluding the baby's mouth and one nostril with the examiner's palm and index finger while listening for sounds of air entry and exit through the other nostril. Auscultation of the air exchange is heard better with the bell attachment of a stethoscope. If nasal patency is not certain, the examiner may instill a few drops of saline into one nostril. Bubbling of the saline documents nasal patency. Nasal air flow can be evaluated at the bedside with a wisp of cotton held adjacent to each nasal aperture. Determining whether the baby's exhaled water vapor fogs the convex side of a cold, metal spoon or a cold mirror is another useful diagnostic test for nasal patency. Passage of a #5 feeding catheter through the nose may be necessary to confirm complete obstruction.

Anterior rhinoscopic inspection using a 3- or 4-mm aural speculum attached to a diagnostic otoscope head, an often underused procedure in the physical examination of the newborn, may reveal the presence of obstructing nasal mucus, stenotic areas in the nasal passage, or midline nasal lesions.

Because mucus is one of the more common causes of nasal obstruction, it may be diagnostically and occasionally therapeutically helpful to insert a moistened cotton swab gently into the nasal vestibule and twirl the swab to trap and extricate globules of mucus. If bilateral nasal patency is assured, the baby is not in serious distress, and no nasal masses are seen on rhinoscopic examination, normal saline (0.9%) nose drops (with or without the addition of phenylephrine 0.125% drops or oxymetazoline 0.025%), administered one spray into each nostril twice daily for no more than 3 days, can improve breathing and feeding temporarily. Administration of dexamethasone ophthalmic drops (0.1%) or beclomethasone aqueous nasal spray for several weeks may reduce edema and nasal secretions. If GERD is strongly suspected, a trial of antireflux medicine and antireflux positioning of the baby may be worthwhile. Should a brief therapeutic trial fail to improve nasal obstruction and promote better nasal air exchange or should the infant's condition worsen, prompt referral is essential.

## Conclusion

Nasal obstruction in neonates and young infants is common and sometimes vexing. The most common cause is nonspecific neonatal rhinitis. Inflammation and edema of the nasal mucosa from upper respiratory tract infections, GERD, nasal mucus, or mucosal trauma are the most common causes of bilateral incomplete obstruction. After testing for nasal patency, the most important initial diagnostic modality usually is nasopharyngoscopy. Often, contrast-enhanced, high-resolution CT will be the next diagnostic procedure.

**Acknowledgment**

We acknowledge the helpful critique from Charles Myer III, MD, and Steven Handler, MD. Sylvan Stool, MD, gave permission to use several of his slides for this article.

## SUGGESTED READING

Burstein FD, Cohen SR. Pyriform aperture stenosis: a rare cause of neonatal airway obstruction. *Ann Plast Surg*. 1995;34: 56–58

Castillo M. Congenital abnormalities of the nose: CT and MR findings. *AJR*. 1994; 162:1211–1217

Coates H. Nasal obstruction in the neonate and infant. *Clin Pediatr*. 1992;31:25–29

Derkay CS, Grundfast KM. Airway compromise from nasal obstruction in neonates and infants. *Int J Pediatr Otorhinolaryngol*. 1990;19:241–249

Engel RR, Lussky RC, Cifuentes RF. Assessing nasal patency in neonates. *Minn Med*. 1998;81:4–5

Gowdar K, Bull MJ, Schreiner RL, et al. Nasal deformities in neonates: their occurrence in those treated with continuous positive airway pressure and nasal endotracheal tubes. *Am J Dis Child*. 1980;134: 954–957

Handley GH, Reilly JS. Nasal obstruction in children. *Otolaryngol Clin North Am*. 1989;22:383–396

Ingall M, Glase J, Multzer RJ, Dreyfuss EM. Allergic rhinitis in early infancy. *Pediatrics*. 1965;35:108–112

Kim DW, Low W, Billman G, et al. Chondroid hamartoma presenting as a neonatal nasal mass. *Int J Pediatr Otorhinolaryngol*. 1999;47:353–359

Le Gras MD, Seifert B, Casiro O. Neonatal nasal obstruction associated with methyldopa treatment during pregnancy. *Am J Dis Child*. 1990;144:143–144

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*Pediatrics in Review* 2000;21;416
DOI: 10.1542/pir.21-12-416

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