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*The invention of the mucosal brush biopsy provides a minimally invasive way of testing for local antibodies.*

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## Addressing Hypernasal Speech in Children

**H**ypernasality – or velopharyngeal insufficiency – often results following cleft palate surgery, whereby the palate can become scarred and does not function properly. “Normally, for the pronunciation of most speech sounds, the palate seals up the back of the nose so that the sound energy can resonate and come out of the mouth,” says Eli Grunstein, MD, Assistant Director of Pediatric Otolaryngology at NewYork-Presbyterian/Columbia University Medical Center. “Children who have hypernasal speech have difficulty sealing off the back of their nose in order to make the oral sounds.”



During speech, the velopharyngeal sphincter must close off the nose to properly pronounce strong consonants such as p, b, s, and k. Several structures come together to achieve velopharyngeal closure, including the velum, the lateral pharyngeal walls,

and the posterior pharyngeal wall. Improper closure of the velopharynx produces a nasal tone in the voice.

“Severe hypernasal speech can affect children socially,” says Dr. Grunstein. “They are often perceived as less intelligent and less attractive than their peers with normal speech. Such perceptions can seriously affect a child’s self-esteem

and emotional development and growth. Their unusual speech sound can significantly impact their quality of life.”

Studies have shown that up to 40 percent of patients who have had cleft palate surgery, even after repair of the palate, experience hypernasal speech that requires further intervention. “Hypernasality can be secondary to other etiologies, but it’s most commonly related to a previously repaired cleft or a sub-mucous cleft of the palate,” says Dr. Grunstein,

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## Looking for Allergies in All the Right Places

**S**ometimes the answer to a puzzling question is right under your nose. Just ask William R. Reisacher, MD, an otolaryngologist in the Department of Otolaryngology – Head and Neck Surgery, NewYork-Presbyterian/Weill Cornell Medical Center. Dr. Reisacher has developed a diagnostic strategy for allergies that focuses on detecting allergy-producing IgE in the region where the symptoms are occurring. “What’s been known for many years is that the mucosal lining of the nose, mouth, and throat is able to produce all of the IgE necessary to produce symptoms, without involvement from the spleen or larger lymph nodes in the body. Many people will have those antibodies in a local region, such as the nasal cavity, but they’re not going to have any evidence of sensitization in the blood or in the skin.”

Testing for locally present IgE is useful in many conditions, such as airborne and food allergies, nasal polyps, allergic fungal sinusitis, and chronic rhinosinusitis, but it is particularly important for the 45 million people in the U.S. who are diagnosed

with “nonallergic” rhinitis, in which individuals have classic allergic symptoms but whose skin and blood tests are negative. “The cause of their symptoms remains unclear after conventional testing,” says Dr. Reisacher. “Some estimates suggest that 45 to 50 percent of patients who test negative will still have allergy antibodies in their nose. So the ability to test for these antigen-specific antibodies is important not only for establishing the correct diagnosis, but also to open up other avenues of treatment, such as immunotherapy.”

### The Proof is in the Studies

Until now, testing for locally present IgE has involved invasive, inconvenient, and inaccurate methods. The focus of Dr. Reisacher’s research was to find a simple and more effective way of testing for these antibodies. “I realized that the best way to accomplish this was by using a mucosal brush biopsy,” explains Dr. Reisacher. First, a cytology brush collects mucus and epithelial cells from the nasal mucosa. Then, those cells are processed in

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## Giving a Stronger Voice to the Elderly

Just as the skin thins as part of the normal aging process, so, too, do vocal cords, resulting in presbyphonia, also called the “aging voice.” And while this is not a new phenomenon, what is new is the increasing number of people over 60 who are seeking help from otolaryngologists for changes in their voice.

“A lot of people are having increased vocal demands because they are working much later past a previously normal retirement age,” says Chandra M. Ivey, MD, Director of Laryngology, Voice and Swallowing in the Department of Otolaryngology, NewYork-Presbyterian/Columbia University Medical Center. “The majority of our older patients are continuing to work in part-time or full-time positions that require them to project their voice – as in a courtroom or in a classroom.”

Patient complaints are fairly similar. “Many times patients tell us, ‘My voice doesn’t sound like it used to, it’s creaky and has lost its robustness.’ Or, ‘My voice fatigues over time...it’s thinner.’

“These are very much quality of life issues,” continues Dr. Ivey. “Older individuals want to use their voice all day without tiring, as was typical when they were younger. However, certain factors contribute to voice changes over time. The superficial lamina propria of the human vocal fold – the structure that vibrates during phonation – requires viscoelasticity to support its vibratory function. Collagen types 1 and 2, as well as the elastic components of this structure, do change as people get older and decrease slowly over time. This causes thinning and decreased pliability of the mucosal wave, and the result is the need to increase muscle tension and force to vibrate the vocal folds.”

Through videostroboscopy, voice specialists examine not just the skin and the gross motion of the vocal folds, but also the very fine dynamics of the mucosal wave or the epithelium moving over the superficial lamina propria, allowing them to look for stiffness or lesions. “When we see the videostroboscopy of older patients, quite often it shows a loss of tissue layers – a thinning of the vocal cords as they come together in a spindle-shaped manner,” says Dr. Ivey.



Dr. Chandra M. Ivey

“Another test we do is pressing slightly on the front of the larynx, which allows the vocal cords to be pushed a little bit closer together. Sometimes the voice gets a little lower or a little more resonant.”

Some patients may have medical problems that affect their voice. For example, significant weight loss may cause thinning of the vocal cords. “Any other condition that may cause dryness or irritation can certainly worsen the voice and needs to be treated as a secondary problem,” she says.

### Treating the Aging Voice

If the diagnosis is vocal fatigue, Dr. Ivey and her team look very specifically at how the patient’s voice is being used. “With aging, people do lose some breath support and tend to push more with their throat muscles leading to vocal fatigue,” she says. “Voice therapists can develop an exercise regimen to help recondition the vocal cords and to increase muscle strength. Greater than 50 percent of patients – while not expecting to regain their former plump vocal cords – embrace this regimen without further need for surgical intervention.”

In other instances, Dr. Ivey administers collagen or gelatin injections to augment the vocal folds, a procedure that is unique to the skills of a laryngologist, of which there are only about 25 in the tri-state area. The injectable material, which is gradually reabsorbed by the body, is usually effective for about four to six weeks.

With professional voice users, Dr. Ivey administers a test injection under local anesthetic. “If the voice doesn’t improve in the way that the patient hoped, the treatment wears off after a few weeks,” she says. “While we can’t take them back 20 years in their career, we can often take them back three to five years. Managing expectations for the aging professional is different than for other patients.”

Other vocal fold injections can last from six to nine months. “These injectable materials are safe,” says Dr. Ivey. “We are still looking for something that actually more closely approximates what has been lost from the vocal cords. Research is still being done with hyaluronic acid to create a viscus quality that mimics the superficial lamina propria that is lost, but we’re not quite there yet.”

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who oversees the Hypernasality Program at NewYork-Presbyterian/Morgan Stanley Children’s Hospital.

The Hypernasality Program, staffed by otolaryngologists and a craniofacial speech therapist, typically treats children between four and six years of age. “These are often children who have complicated and multiple craniofacial and medical issues,” notes Dr. Grunstein.

One of the most important diagnostic assessments is a videonasopharyngoscopy, performed by an otolaryngologist, to visualize the anatomy of the nasopharynx. The

speech therapist prompts the child to make certain speech sounds during the exam. This test helps to define how large the gap is at the back of the throat and to see which structures are not able to help close off that gap. It also helps guide treatment options, which may range from speech therapy to prosthetics to help seal off the back of the nose during speech.

“However, in the majority of cases, surgery is part of the treatment algorithm,” says Dr. Grunstein. Surgical techniques include a furrow palatoplasty to realign the muscles of the soft palate while also

lengthening the structure, and a sphincter pharyngoplasty in which flaps of tissue from the back of the throat are used to build a “speed bump” in the nasopharynx, thereby helping the soft palate connect with the back of the throat.

Adds Dr. Grunstein, “The goal is to improve the anatomy to make it more functional for the patient to generate intelligible speech.”

#### For More Information

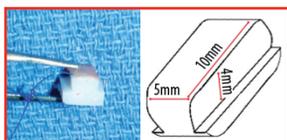
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## Case Study Review: Endoscopic Approach to Pediatric Laryngotracheal Reconstruction

As many pediatric otolaryngologists agree, one of the most challenging problems they confront is a child who has difficulty breathing. Either their vocal cords do not open and close properly during breathing or they have a narrowed airway. “In a neonate or infant, the cricoid is between four to six millimeters in diameter,” says Vikash K. Modi, MD, a pediatric otolaryngologist at NewYork-Presbyterian/Weill Cornell Medical Center. “In this population a narrowing of the airway by 1 mm circumferentially is very significant.”

In the past, infants with this condition often required a tracheotomy. Approximately 25 years ago, through the development of laryngotracheal reconstruction, surgeons were able to enlarge the narrowed segment of the infant’s subglottis by inserting a rib graft through an incision in the neck. “Since the cricoid is made of cartilage the rib graft incorporates nicely and is able to grow with the child,” says Dr. Modi. “We can provide these children with a normal sized airway and subsequent decannulation.”

In the last decade, the development of a newer procedure allowed surgeons to insert the rib graft endoscopically, rather than through open surgery. “Previously in



Carved graft showing the locations of the length and inner and outer diameter measurements.

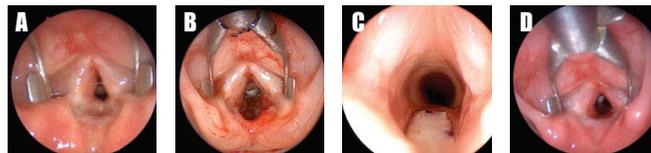
children with bilateral vocal fold paralysis, cricoarytenoid joint fixation, or posterior glottic stenosis, the cricoid had to be divided anteriorly and posteriorly in order to insert a posterior rib graft through an

open approach. This led to destabilization of the cricoid, necessitating a suprastomal stent. The endoscopic approach allows us to precisely divide the cricoid posteriorly and insert a rib graft without dividing the anterior cricoid. This allows for less destabilization of the cricoid, faster healing, quicker decannulation, and avoidance of a suprastomal stent,” notes Dr. Modi.

While the original open surgical approach had been well established, the minimally invasive endoscopic technique had not. So Dr. Modi and his colleagues at two other tertiary care medical centers undertook a review of their multi-institutional experience utilizing the endoscopic posterior cricoid split and costal cartilage graft placement in the management of bilateral vocal fold immobility and posterior glottic stenosis.

The researchers studied 28 patients, from age one to 15 years old, treated between 2004 and 2012. Overall, 25 of the 28 patients were decannulated or never required a tracheostomy, and 24 of the 28 had adequate symptom control with a mean follow-up of 25 months. “This is the largest study of its kind undertaken with the newer endoscopic technique,” says Dr. Modi. “Our decannulation and tracheostomy avoidance rate approached 90 percent.”

This minimally invasive endoscopic approach, says Dr. Modi, leads to shorter



Endoscopic view of a patient with isolated posterior glottic stenosis and cricoarytenoid joint fixation with laryngeal spreader in place. (A) Preoperative view (B) After carbon dioxide laser division (C) With rib graft in place (D) One month postoperative view

operating times, avoidance of stenting with subsequent less scarring, and quicker time to decannulation.

“The long-term decannulation rate is similar to the open approach but how one arrives to the outcome is very different,” says Dr. Modi. “The study confirmed that the procedure can be safely performed with equal effectiveness and without increased surgical risk as the open technique. Although it remains to be studied, I believe in addition to less destabilization of the cricoid it also allows for a more precise division of the posterior cricoid, which in the long run may lead to fewer delayed complications, such as arytenoid prolapse. It is an important option to have in the management of children with these conditions.”

### Reference Article

Gerber ME, Modi VK, Ward RF, Gower VM, Thomsen J. Endoscopic posterior cricoid split and costal cartilage graft placement in children. *Otolaryngology – Head and Neck Surgery*. 2013 Mar;148(3):494-502.

### For More Information

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## Looking for Allergies in All the Right Places *(continued from page 1)*

a saltwater solution, using a specialized assay, and tested for the presence of IgE using existing blood serum testing equipment recalibrated for saline. The first study in 2012 was a landmark proof of concept paper that demonstrated for the first time that antigen-specific antibodies inside the nose could be measured using the mucosal brush biopsy – today referred to as the LAMB (Local Allergy Mucosal Brush) test.

Dr. Reisacher then embarked on additional studies using the LAMB test on oral cavity mucosa to see if it might represent a novel, minimally invasive testing method for people with food allergies. What he demonstrated was that the LAMB test –

especially when taken from the vestibule – correlated much better with clinical symptoms than blood testing.

“It is well known that individuals with allergies have IgE antibodies present on the mast cells in locally symptomatic areas,” says Dr. Reisacher. “What’s interesting is that the patients who don’t have specific IgE in the skin or blood, and only have these antibodies locally, tend to be misdiagnosed. So it’s important to do local allergy testing, particularly when the results of conventional testing methods do not make sense.”

To date there have been three proof of concept studies using the LAMB test. In October 2013, Dr. Reisacher presented the

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Advances in Adult and Pediatric Ear, Nose, and Throat

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Looking for Allergies in All the Right Places *(continued from page 3)*



Dr. William R. Reisacher

results of a recent study on nonallergic rhinitis patients at the American Academy of Otolaryngic Allergy Annual Meeting in Vancouver, BC. “These patients had all the symptoms of nasal allergies, but tested negative on skin and blood testing,” says Dr. Reisacher. “I had the sense that I was looking in the wrong location. They had problems in their nose and I was looking in the skin of their arm or in their blood. I performed the

LAMB test on the nasal mucosa from the inferior turbinates, and 100 percent had antigen-specific IgE present.”

This study focused on an inner-city population, of which 90 percent tested positive for cockroach allergens. “This is an important finding,” notes Dr. Reisacher. “All of these people would have been told that they didn’t have any allergies. Based on these results, two have begun immunotherapy, which otherwise would never have been offered.” The LAMB test may also function as a companion diagnostic test for immunotherapy, helping physicians decide which antigens are most important to treat from a lengthy list of positive reactions produced by skin or blood testing.

Planning for larger clinical trials using the LAMB test in normal populations and in groups with other allergic diseases is currently underway, with the hope that Dr. Reisacher’s invention eventually will be brought to market. “It’s very exciting to be able to make a difference in the world and in the lives of our patients,” he adds. “I’ve had great feedback from doctors in the community concerning the need for this type of testing.” Dr. Reisacher is working with Immunovent, a biotechnology company dedicated to allergy diagnostics, which is currently developing the LAMB test. “We hope to make this test available within the next couple of years to a larger market so that clinicians can easily perform local IgE testing in their offices on any child or adult with allergic symptoms.”

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