

Empty Nose Syndrome: What are We Really Talking About?

Spencer C. Payne, MD

KEYWORDS

- Atrophic rhinitis • Empty nose syndrome • Turbinatectomy
- Inferior turbinate • Middle turbinate • Nasal obstruction

In their 2001 article on atrophic rhinitis (AR), Moore and Kern¹ state in reference to those suffering from this affliction that, “the absence of normal nasal structures is universal in these patients, and the symptoms of atrophic rhinitis coupled with a cavernous nasal airway lacking identifiable turbinate tissue has been termed ‘the empty nose syndrome.’” The term “empty nose syndrome” (ENS) had been previously coined by Eugene Kern in the 1990s and used during a presentation on the same subject as his 2001 article at the spring meeting of the American Rhinologic Society in 1997.² Since that time, however, little has been explicitly stated about ENS and its number of direct references in the scientific literature has been few.^{3–9} In his article in this issue, Dr. Houser presents his definition, proposed explanation, and suggested treatment for ENS, but just as many questions are raised as are answered, not the least of which being which definition of ENS we are to use for the purposes of this debate. Dr. Houser³ presents ENS as a separate entity from secondary iatrogenic AR and has deemed its interchangeable use with this term as erroneous, citing only his own prior article as proof. However, it is clear from the above quotation that the broadening of the definition for ENS to include those patients who may not even be missing a turbinate is a misappropriation of the term. This is mentioned only to establish where the term originated, so that for the purposes of this article semantics can be put aside and we can remain on common ground throughout the discussion. As such, for the purposes of this article and perhaps in the medical literature to come, the term ENS should be adapted to not be considered a form of AR, but redefined as a symptom complex that, at a minimum, includes a paradoxical sense of obstruction in the face of partial or complete turbinate resection. Even still, the result of ENS or iatrogenic AR as a consequence of turbinatectomy remains a controversial topic that deserves further scrutiny.

Division of Rhinology and Sinus Surgery, Department of Otolaryngology–Head & Neck Surgery,
University of Virginia, P.O. Box 800713, Charlottesville, VA 22908-0713, USA
E-mail address: spencer.payne@virginia.edu

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INFERIOR TURBINECTOMY

The inferior turbinate (IT) has long been recognized as a source of nasal obstruction, and seemingly every passing year brings a new technique to address this. Once medical management has failed, a plethora of options are available to reduce its size, including simple outfracture, extramural mucosal ablation (eg, superficial cautery or laser therapy), submucosal ablation (eg, intramural cautery, radiofrequency ablation, or powered resection), or partial or total resection of the turbinate. Over the years, the American literature has seen a trend toward recommending more conservative measures, so as to avoid the possibility of ENS or AR. In fact, one investigator reversed his prior recommendation of complete turbinate resection after finding, on further follow-up, that 89% of patients suffered from crusting while 39% had thick, foul-smelling secretions.¹⁰ Given this, a panel recommendation to avoid such extensive resection was published.⁹ One of the largest series of total inferior turbinectomy published within the last decade by Talmon and colleagues,¹¹ however, found that 97.4% (342 out of 351) of patients noted improved breathing. The investigators further stated that there were no complications of AR, despite the study being performed in “a hot, dusty climate.” A comment regarding that article in a later issue also noted a lack of development of AR in 1,156 patients on whom subtotal or total inferior turbinectomy had been performed.¹² Ophir and colleagues¹³ has also published a series of 186 patients in whom none developed AR after total inferior turbinectomy and, given the long-term follow-up of 10 to 15 years, it is unlikely that this represented an inability to capture a delayed presentation.

MIDDLE TURBINECTOMY

Perhaps even more controversial than IT resection is the removal of the middle turbinate (MT) during surgery. Giacchi and colleagues¹⁴ nicely summarized many of the main issues regarding partial or complete resection of the MT in their study, looking at its effect on frontal-sinus patency, in which they found no frontal sinusitis in their resection group. They agreed with Fortune and Duncavage,¹⁵ who felt that this specific risk was minimal after partial middle turbinectomy. Giacchi and colleagues additionally noted Lawson's¹⁶ series of 1,077 intranasal ethmoidectomies with partial middle turbinectomies, in which none of the patients developed AR. Despite this, as noted by Houser, Kennedy¹⁷ argues that as an important structure within the nose, the MT, should not be arbitrarily removed unless obviously damaged or involved in the disease process, and this was echoed by Rice and colleagues.⁹ Several conditions in addition to tumor resection are noted, where its removal is considered appropriate by Rice, but neither investigator universally condemns its removal. Moreover, in none of the articles regarding MT resection is there any mention of the development of AR.

CONTROVERSY OR NOT?

How then can we rectify the IT data with other reports of seemingly high numbers of AR or AR-like symptoms in other studies? Why is there no apparent reporting of AR in the middle turbinectomy patients quoted in these studies? And what of ENS? Are we certain this did not occur, especially if these investigators were using its original definition as a virtual synonym of AR? Closer inspection reveals that Talmon¹¹ still had nine patients on follow-up who noted no improvement in their breathing. Eight and 11 patients out of 351 were also each noted to have complaints of crusting or pain/discomfort, respectively. Furthermore, Ophir¹³ also acknowledged that 11 out of 186 (5.9%) patients had no readily obvious reason for their continued complaints of

nasal obstruction, despite a wide, clean airway. It is uncertain if these patients would go on to suffer from AR, but it remains concerning that their persistent obstruction may have been evidence of ENS. In the middle turbinectomy patients, most of whom had resection during the course of chronic rhinosinusitis (CRS) surgery, it may have been difficult to tease out persistent obstruction in the face of this more diffuse mucosal disease process. Furthermore, it is possible that in the CRS patient, hypertrophy of the nasal septum after turbinate resection would prevent AR- or ENS-like symptoms. The author has seen this many times, especially in those patients with polypoid (CRS_{WN}P) type disease presenting for revision surgery. In addition, if mucosal inflammation and glandular hypertrophy were to continue after surgery, any crusting might be assumed to be secondary to the disease process.

ATROPHIC RHINITIS VERSUS EMPTY NOSE SYNDROME

In Dr. Houser's discussion in this issue, as well as his two prior publications on the subject,^{3,4} he discusses the significant differences which he has been able to elucidate between AR and ENS. He divides ENS into three subtypes representing and named for the turbinates that had been resected in each (either inferior, middle, or both; abbreviated as ENS-IT, ENS-MT, or ENS-both). He also characterizes a fourth entity that he dubs "ENS-type," in which patients have symptoms similar to the other subtypes but with a seemingly normal-appearing airway. In addition to the major symptom of paradoxical obstruction, he notes that patients also develop "an inability to concentrate, chronic fatigue, frustration, irritability, anger, anxiety and depression," as well as a decreasing sense of smell.⁴ ENS-MT, which he states is more controversial, given the wider support for MT resection compared with IT resection, is characterized by a sense of pain with breathing and is seen less frequently than in ENS-IT. Houser theorizes that this may be secondary to circulating, cool air striking the area of the sphenopalatine ganglion, which is no longer protected by the shielding effect of the MT. ENS-both represents those who may go on to become "nasal cripples," as Kern¹⁸ has referred to them, lacking both major turbinate structures of the nose. More controversial is Houser's ENS-type patient. These patients have undergone a partial turbinate procedure, yet present with similar symptoms of nasal obstruction despite the apparent normal airway. As the only real article to describe ENS as we are presenting it here, Dr. Houser's work is landmark. His careful evaluation of patients who were most likely ignored by their operating surgeon and his adaptation of techniques used to rehabilitate the noses of patients with AR is commendable; however, several issues are raised by his article that require addressing before we can either fully understand ENS as it is described here or plan treatment options.

First, a concern is raised regarding such a small sample of only eight patients after three were lost to follow-up among the 11 originally undergoing an operative procedure. It is not clear why of the "dozens of patients" who had undergone evaluation for ENS, that more did not undergo an operation. One would assume one of the following: (1) many resolved with medical therapy, (2) subjective improvement was not seen with the cotton test, or (3) the patients refused surgery. Those falling into the second category represent an important statistic because, if a substantial number, it would indicate that something other than airway shape or size is playing a role. Second, Houser reports a significant improvement rate in the Sino-Nasal Outcome Test (SNOT-20) scores of the eight patients involved, from a median (the more appropriate way to report a nonparametric result) of 56 to 37.5. However, SNOT-20 results, to be considered clinically significant, require an improvement of 0.6 in their indexed score (ie, total score divided by 20). Of the eight patients in the study, only four of them

had an improvement greater than 12 (0.6×20) in their total score, indicating a failure of 50% to reach clinically significant improvement. Given this, it remains uncertain if failure to improve was a result of the size or placement of the implant or if the patients' symptoms rely on more than just the cross-sectional area of the nasal cavity. Houser does somewhat address this by discussing the possible contribution of poor nerve regeneration in the turbinate tissue after partial or complete resection of the turbinate. It would not seem logical, however, that one could then "fix" this with simply placing an implant in lieu of correcting the neurologic defect, especially at the risk of developing further neuropathy while raising the septal flap for its placement.

Neither of these two points invalidates the concept of ENS, but they do raise questions regarding what we understand, especially with what we can glean from a very limited study.

ALTERNATE EXPLANATIONS FOR THE ETIOLOGY OF ENS

Why do only some people develop AR or ENS after turbinate resection, and why does it appear from the literature that certain geographic areas may be less affected (all three articles mentioned above in the inferior turbinate section were of Israeli origin)? If what Houser provides us is only a piece of the puzzle, where else can we turn? He has already touched on concepts that may likely play a role. In dealing with such a complex topic, the airflow dynamics of the nose and how they may be affected by the internal and external nasal anatomy cannot be ignored. Significant work has already been performed to understand the effect of nasal shape on airflow.¹⁹⁻²² The nasolabial angle, morphology of the nasal valve, and position of the turbinates not only affect the path of nasal airflow, but they also vary ecogeographically.¹⁹ When the nostrils are directed anteriorly, more airflow is directed toward the floor of the nose along the inferior turbinate.²³ As the nasolabial angle decreases, the air pattern tends to be directed higher in the nose toward the middle meatus. This is further accentuated in the leptorrhine nose, where the nasal sill is often higher, acting as a baffle to direct airflow up and over the inferior turbinate.¹⁹ The function of the nasal valve is that of a Venturi throat valve, such that the rapid expansion of cross-sectional area behind the valve results in a generator of turbulence distributing the airflow throughout the nose and allowing for more thorough contact of inspired air with the mucosal surface of the nose for conditioning purposes. As the nasal valve widens, this turbulence effect is less seen.²⁰ The more medially positioned the turbinate, the greater the turbulence of airflow. It is reasoned that in geographic regions where inspired air is colder and dryer, these features clump to maximize the air/surface interface, but that in warmer and more humid climates, the morphologic features that are conducive to the less energetically costly laminar airflow are favored.¹⁹ The effect of turbinectomy on airflow can theoretically be varied. Removal of the posterior-inferior turbinate while leaving the anterior segment in place may serve to increase the turbulence of the air. This could possibly be sensed as improved or worsened airflow, depending on how turbulent it became. Removal of the IT head, however, would remove the Venturi valve phenomenon and create a more laminar column of air that, while flowing more "smoothly," would result in less mucosal contact and be sensed as decreased flow by the mucosa. As a result, it is clear that, given the significant morphologic differences already notable for aesthetic reasons between the leptorrhine (tall, thin), platyrrhine (short, broad), and mesorrhine noses, that individuals with these varied features may respond differently to adjustments in the airflow resulting from the resection of a turbinate. Furthermore, depending on the exact morphology and the extent of resection, an individual may be more susceptible to the removal of the MT instead of the IT or vice versa.

Additionally, the effect of the underlying disease process may play a role. The patient with allergic rhinitis or CRS may be less susceptible to certain symptoms because of the persistent hypertrophy of the remaining nasal tissues, even after turbinate resection. Furthermore, the differentiation of patients with CRSwNP and those without polyps (CRSsNP) may also be key. CRSwNP is typically associated with eosinophilia and an underlying “innate” mucosal inflammatory state that is not solely dependent on the obstructed drainage patterns that are opened with surgery.²⁴ A case of CRSsNP that is primarily the result of a protracted infectious process, however, may resolve quite readily. It may be patients in this latter group who are more likely to fair worse if the MT is removed in the course of surgery.

And what of the issue of poor regeneration of sensory nerves to the area? Quite frankly, the authors agree with Houser, in that if the turbinate is no longer present, it would be impossible for the finely tuned mechanisms that so tightly regulate that narrow air column (which amaze this author every time he evaluates a CT scan) to function properly. Or, as is suggested by Moore and Kern¹ in AR, perhaps the “wear and tear” on the mucosa under the circumstances of altered airflow leads to a disruption and degeneration of the mucosal nerve fibers. This may partly explain the ENS-type patients that Houser describes. In his study, Houser notes that two of the ENS-type patients had undergone superficial laser therapy. It could be reasoned that the destruction of the overlying mucosa, and subsequent disruption of the superficial nerve endings by extension, resulted in a decreased ability to “sense” airflow, but this remains conjecture. Without further study on the mucosa of patients with ENS, this may be an impossible question to answer, especially given the low likelihood that anyone would wish to remove even more mucosa from their noses.

UNSETTLED ISSUES—PSYCHIATRIC COMORBIDITY AND NEUROPATHY

One issue that is troubling with ENS, as it is defined by Houser, is the significant level of psychiatric findings in this patient population. One might question which disease may have given rise to the other. While the author does not mean to classify the disease as *rhinitis hystericus*, it is possible that ENS could be likened to other phenomena where there seems to be a correlation between psychosocial distress and disease tolerance, such as tinnitus.²⁵ Additionally, given the lack of preoperative rhinomanometry before a patient’s initial turbinate surgery, it may be difficult to know to what extent they had objective nasal obstruction before surgery, especially for the ENS-type patients.

This latter point raises the possibility of a yet-to-be characterized or discovered entity, at least as far as this author is aware, akin to nasal neuropathy. Given the acceptance of neuropathic disorders of the head and neck as explanations for subjective-only complaints (eg, vagal neuropathy in the setting of globus sensation),²⁶ it is also possible that a certain subset of these patients could have had neuropathic issues even before their operations, which were only exacerbated by manipulation of the turbinates. While it might, literally, be a hard pill to swallow, a trial of amitriptyline or gabapentin may potentially be advantageous, especially in ENS-MT patients whose symptoms are more characterized by pain than obstruction. These patients may also benefit simply from sphenopalatine ganglion nerve blockade instead of invasive procedures, as has been advocated in Sluder’s neuralgia.

SUMMARY

The problem with ENS is probably not that it does not exist, it is that we cannot adequately explain its existence by what we currently understand about the nose.

To this end, many otolaryngologists are unwilling to make a “leap of faith” and, instead of acknowledging the existence of something they do not understand, are left skeptical of it in its entirety. As a rhinologist trained in the ways of minimally invasive sinus technique,²⁷ the author has never removed an inferior turbinate for benign disease and recognizes only the few circumstances where partial middle turbinate resection can be beneficial. However, it is clear from the literature that not everyone undergoing a turbinate procedure suffers from the debilitating symptoms of either AR or ENS. It behooves us to evaluate this latter entity with a more critical eye, so that we can avoid creating future sufferers and provide relief to those who have already been afflicted.

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