**Case (Continued)**

Nasal endoscopy revealed a perforation of the mid-portion of the left uncinate. After this was determined as a possible cause of her whistling symptoms, she was taken to the operating room. A completion uncinctomy, anterior ethmoidectomy and revision maxillary antrostomy was performed. On post-operative follow-up, her nasal whistling had completely resolved and the remainder of her examination was unremarkable. She denied any sinonasal symptoms and reported significantly improved sleep due to the cessation of the whistling noise.

**Discussion**

Nasal whistling has been described as a symptom of septal perforation. Although septal perforation may be caused by trauma, inflammatory processes, malignancy, infectious diseases and substance abuse; it is most commonly iatrogenic subsequent to undergoing a transnasal procedure.

Patients with septal perforation most commonly present with major symptoms of nasal obstruction, crusting, and epistaxis. A sensation of abnormal airflow as well as an audible noise may be experienced as well. In the case of septal perforation, whistling is thought to occur secondary to aberrant intranasal aerodynamics created by the septal perforation. (1)

Grützenmacher et al. (2,3) have performed fluid dynamic experiments on functional nasal models to investigate the flow pattern in models with septal perforations. The perforations were analyzed relative to both their size and location as well as with or without the presence of septal deviation. Their work concluded that the location of the perforation had less of an impact on nasal airflow than the size of the perforation.

Lee et al. (4) observed nasal airflow exchange from higher flow rate to the lower flow rate side of a septal perforation. The cross-flow, which might be the cause of whistling, is more significant in moderate–to-large sized perforations.

The thin flow of air directed against the narrow lip of the uncinate perforation can produce whistling in the same manner that air flowing through a whistle causes a sound by oscillating rapidly back and forth between the two sides of the blade, creating a string of air pressure pulses.

Nasal aerodynamics depend greatly upon the structures found within the nasal cavity. This includes the septum as well as the lateral nasal wall structures including the turbinates and the uncinate. Surgical manipulation and removal of these structures can be expected to directly impact the patient’s nasal airflow. Additionally, a patient’s perception of nasal airflow does not always correlate with the realized airflow (as seen in empty nose syndrome). In an ideal case, endonasal surgery will improve both the objective and subjective experience of improved nasal airflow.

Nasal whistling secondary to aberrant nasal flow from iatrogenic alteration of intranasal anatomy has been described relative to septal perforation. No previous cases of audible whistling secondary to incomplete uncinctomy have been described. Care must be taken during endonasal surgery to prevent such an injury. Should nasal whistling present after endonasal surgery in a patient without septal perforation, lateral nasal wall structures such as the uncinate should be assessed as the possible source.

**Bibliography**


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**Objective**

Describe the diagnosis and treatment of a patient who underwent endoscopic sinus surgery and subsequently experienced the post-operative complication of nasal whistling in the absence of a septal perforation.

**Introduction**

Endonasal surgery is commonly performed by otolaryngologists to treat a variety of disease processes, both intranasal and paranasal. During the evolution of endonasal procedures, otolaryngologists have gained a deeper understanding of the complex form and function of endonasal anatomy. This functional aspect of endonasal anatomy is needed in order to understand the impact endonasal surgery may have on nasal airflow.

One complication occasionally seen in endonasal surgery is septal perforation. In some cases of septal perforation, patient’s have reported symptoms of audible nasal breathing, reminiscent of a whistling sound. (1) A PubMed literature review shows several reports of patients presenting with nasal airflow symptoms, including audible whistle-like noises after undergoing endonasal surgery.

In patients who reported symptoms of audible airflow disturbance, the majority appeared to be caused by a cross-flow air pattern caused by the septal perforation. In our review of the literature, none of the cases describing audible nasal airflow disturbance were caused by alteration in the lateral nasal wall anatomy.

In this case, we describe a patient whom experienced significantly debilitating audible whistling with nasal respiration following injury to the uncinate during functional endonasal sinus surgery.

**Case**

A twenty-four year old female presented with a long standing history of nasal obstruction and recurrent sinus infections. She had previously undergone a septoplasty, submucous inferior turbinate reduction, and maxillary antrostomy nine months prior to presentation in our clinic. Post-operatively, the patient’s sinonasal symptoms had largely resolved, but she noted a new audible whistling noise when breathing through the left side of her nose. The whistling was primarily with inspiration. It bothered her greatly, even resulting in loss of sleep due to awakening from the noise.

Non-contrast computed tomography (CT) demonstrated mild mucosal thickening in maxillary and anterior ethmoidal sinuses, but patent osteomeatal complexes bilaterally. CT failed to reveal any other potential sources of her nasal whistling.

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**Figure 1 (A,B)**

- **A.** Endoscopic image of left lateral nasal wall prior to revision FESS. A: septum, B: middle turbinate, C: residual uncinate, D: inferior turbinate, arrow: uncinate perforation.
- **B.** Endoscopic image of left lateral nasal wall following revision FESS. A: septum, B: middle turbinate, C: inferior turbinate, Arrow: maxillary ostium exposed after uncinctomy.