

ABSTRACT

A patient with a three-year history of olfactory and gustatory dysfunction is presented. The onset was associated with acute sinusitis. After recovery from the infection and undergoing medical treatment, smell and taste losses persisted and he also developed phantosmias. After a large yawn, however, his smell would completely return for a second. The polite yawning technique has been used as an olfactory rehabilitation treatment for laryngectomy patients by increasing the nasal airflow rate. This technique, while not effective in this case, should be considered as part of the evaluation in those with chemosensory complaints.

Keywords: gustation, hyposmia, olfaction, yawning

INTRODUCTION

Sinusitis is a frequent cause of chemosensory dysfunction, including hyposmia, dysosmia, and phantosmia. Twenty seven percent of patients that present to chemosensory clinics with olfactory loss have sinus disorders as the etiology. [1]Forty five percent of these display fluctuation in olfactory ability with every day activities such as exercising and showering. [2] Yawning has also been found to transiently improve olfaction in those with post laryngectomy patients, but has not heretofor been described in sinusitis induced smell loss.

Methods:CASE REPORT

This 61 year old, right handed, white male, developed acute sinusitis three years ago. He noticed nasal congestion, and over a few days, loss of smell and taste. A sinus CT scan showed opacification of the ethmoidal sinus and an air-fluid level in the right maxillary sinus. After recovery from the sinusitis and despite treatment with oral steroids, zinc, and alpha lipoic acid, olfaction was not restored. Five months later, a follow-up sinus CT, MRI, and fiberoptic endoscopy were normal.

About one year later, he developed phantosmias. Initially, it was the smell of the heating of electric wire with rubber insulation. At other times, it was the smell of chemicals like floor cleaner. Nothing would trigger, exasperbate, or relieve them. They would last for a fleeting moment and occur once every few weeks. While persistent, the frequency of phantosmia decreased over the past year.

Three years after onset, smell ability was perceived to be 5% of normal. He could smell odors, such as flowers and gasoline, if his nose was close. There is no diurnal variation in the hyposmia. Despite this virtual absence of smell, he found that immediately after sneezing he was able to note an intense aroma of coffee brewing for a second. Also, after a large pandiculation,

100% of smell would return for a second or so. Furthermore, the larger the yawn, the greater ability to smell. Thus, with small yawns, only 20% of smell returned. For example, before yawning, he would barely notice the charcoal grill burning, but upon yawning, this aroma would be intensely perceived.

He rated his gustatory sense as 1-2% of normal and found that he used more spice in his food. He could sense sweet, sour, bitter, and salty tastes, but to a lesser degree. He could taste spicy foods like: blue cheese, feta cheese, bacon bits, smoked salmon, Chinese mustard, red pepper, cilantro, cherry cherry beans, lime jelly beans, and ripe bananas. Since onset, there has been a reduction in his appetite and he has lost ten pounds. There was no diurnal variation, and nothing increased or decreased the taste problem.

He denied phantosmia, dysguesia, oral pain, soreness, difficulty swallowing, and dysarthria. The quantity and quality of saliva was subjectively normal.

Results

Gustatory testing demonstrated mixed results. Spatial Taste Test revealed weakness on the whole tongue and palate to NaCL and Sucrose, and the right anterior and posterior tongue to citric acid and quinine hydrochloride. Propylthiouracil disc testing was normal. Fugiform papillae counts on the left (Lt) and right (Rt) were 22 and 18, respectively.

Olfactory testing revealed reduced olfactory ability consistent with hyposmia: Quick Smell Identification Test 2/3; Sniff Magnitude Test with Sniff Magnitude Ratio of .87; Alcohol Sniff Test 11 cm; Sniffin' Stick Threshold Lt < 1, Rt < 1, bilateral < 1; Discrimination Lt 4, Rt 4, bilateral 6; Identification Lt 4, Rt 5, bilateral 7; University of Pennsylvania Smell Identification Test Rt 19, Lt 18; Odor Memory Test 10 sec 3, 30 sec 4, 60 sec 2, total score 9/12; Smell Threshold Test with Phenylethyl Alcohol (PEA) Lt > - 2.0, Rt > - 2.0. Suprathreshold Amyl

Acetate Odor Intensity Testing - normal at high intensity; Suprathreshold Amyl Acetate Odor Hedonic Testing - normal. Retronasal smell with nose clip 1/10, without nose clip 4/10.

Olfactory testing with yawning did not demonstrate any improvement. Baseline dirhinous PEA Threshold Testing -2.5; After Polite Yawning Technique (PYT) > -2.0; After Induced natural yawn > -2.0.

DISCUSSION

In this patient, yawning was the the most impressive alleviating factor for his olfactory dysfunction. Yawning may have enhanced his olfactory acuity by increasing nasal airflow rate. Yawning has been used as an olfactory rehabilitation treatment for laryngectomy patients. [3] This active voluntary yawning, PYT, is performed by producing a negative intraoral pressure that induces airflow through the nostrils to the olfactory mucosa. [4] The performance of PYT resembles a yawning at a public situation, lowering the jaw and tongue and lifting the palate with the lips sealed tight. The PYT in laryngectomized patients increases the nasal airflow, doubling the minimum rate required for successful olfaction. Greater volume of inhaled air correlates with increased olfactory identification test scores. [5]

Yawning also can be a sign that reflects an internal state of enhanced olfactory function. Two patients with Parkinson's disease (PD) experienced recovery of long lost olfaction following recurrent episodes of yawning during electromagnetic field (EMF) treatment of the head. The restored sense lasted for several hours. [6] Yawning is mediated by activation of postsynaptic D2 receptors in the corpus striatum and limbic system. [7] The olfactory bulb contains a large population of dopaminergic neurons involved in olfactory information processing. [8] This may explain how the treatment of PD with EMF induced yawning and enhanced olfactory ability.

Sneezing is triggered by irritants in the nose and relayed through the trigeminal nerve to the sneezing center in the brain stem. [9] Estimated speed of air exhalation during a sneeze varies from 100 km/h to 1,045 km/h. [10] Different from a cough, a sneeze has a longer inspiratory period. Sneezing and yawning share long inspiration, gaping the jaws and closing eyes at climax. During the long inspirational phase of yawning, air travels mainly through the mouth, whereas for sneezing, air enters through both the mouth and the nose. The improved olfactory function of the case described, upon yawning and sneezing, can be understood by the long inspirational period during yawning and sneezing, and thereby increased chance for odorants to bind on the olfactory mucosa.

Conductive olfactory loss is any process that causes sufficient obstruction in the nose to prevent odorant molecules from reaching the olfactory epithelium. The improvement of smell with maneuvers which change airflow, including sneezing and yawning, combined with intact retronasal olfaction, suggest a conductive origin for his chemosensory complaints. However, the absence of structural evidence of conductive blockade in this patient remains troubling. Possibly, viral olfactotoxins destroyed the sensory cells located in the essential region of the wind tunnel of the olfactory epithelium. The remaining sensory neurons which were not damaged may be located in a region not exposed to normal physiologic eddy currents of odors on inspiration. Thus, airflow manipulation bypasses the dysfunctional neuron, and stimulates those which remains.

There are several limitations in this study. Most importantly, this is based on subjective reports with no objective testing validating such complaints. Given the transient nature of the improvements and the long duration to perform such objective olfactory tests, this is not surprising. Also, in other neurological dysfunctions including

headaches and chronic pain, there is limited objective testing validating the complaints. Thus, lack of objective evidence, should not subtract from the importance of this clinical investigation.

Yawning enhances nasal airflow rate, and thereby may induce olfactory acuteness. The polite yawning technique, while not effective in this case, should be considered to be part of the evaluation in those who complain of chemosensory dysfunction.

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