Quick Review: Non- Airflow Rhinitis

The nasal mucosa humidifies warms and filters inspired air before it passes to the lower respiratory tract. In order to maintain the physiological activity of the respiratory epithelium, a certain amount of airflow is required.

The non- airflow rhinitis is a variant of vasomotor rhinitis. When the nose has, by some structural abnormality, become excluded from the reciprocating flow of air with its cyclic variations in temperature and humidity and its effects on movement of mucus, a vasomotor reaction occurs. The vascular bed loses its tone, and the turbinates become boggy, swollen, and violaceous (violet colored). The condition also known as the rhinitis of no air flow may be caused by laryngectomy, choanal atresia, and adenoid hyperplasia.

At laryngectomy, the lungs and lower trachea are completely disconnected from the nose, mouth and pharynx and respiratory airflow takes place directly through an end tracheostome, above the suprasternal notch. This contrasts with an ordinary tracheostomy where continuity still exists between lungs and upper airways. (1)

In normal individuals, inspired air causes drying of the sol part of the mucus layer and consequently some destruction of cilia in the anterior part of the nose. Following laryngectomy, airflow through the nose ceases.

Studies on the effect of cessation of supraglottic airflow on nasal cycle have yielded varying results. The results of a study by Havas TE and coworkers demonstrate cessation of the cycle following chronic absence of supraglottic airflow, temporary cessation during acute absence, and independence of the cycle from superior laryngeal innervation. (11)

Another study of nasal cycle in laryngectomy patients using acoustic rhinometry by Fisher EW and co-workers demonstrated retention of nasal cycle after airflow deprivation. It concluded that whilst the cycle may in some instances be modified after operation, it is not abolished. The central generation of the cycle is confirmed, although afferent input from airflow receptors may play a role in modulating the cycle's pattern and amplitude. (12)

Light microscopy studies have suggested a change towards a more densely ciliated nasal epithelium in laryngectomized subjects and this is strikingly demonstrated in the scanning electron micrographs. (2)

The biopsies of nasal mucosa from post – laryngectomy patients show two consistent features: a densely ciliated mucosa, and an abundance of mucus as compared to 'transitional' epithelium in which the cells are mainly nonciliated stratified microvillous cells with a cuboidal outline seen in pre-laryngectomy biosies. (1)

Another study conducted to determine the long-term histopathologic changes in nasal mucosa and the relationship between progression of the histopathologic changes and the duration without air current stimulation concluded that histopathologic changes do occur after laryngectomy. Pseudostratified columnar ciliated epithelium changes, decrease in goblet cells and submucosal glands, fibrosis in stroma, myxoid degeneration, neovascularization, and congestion in lamina propria at some sites are detected in histopathologic examination. The changes in the nasal mucosa after airflow cessation are dynamic and require months to equilibrate. In total laryngectomy patients hypersecratory phase is produced in early period and nasal mucosal clearance is increased. Mucus-producing cells gradually decrease in proportion over the first postoperative year. Stimulation of the respiratory mucous membrane by air stream may be important factor for normal functioning of the ciliary apparatus, glandular, and vascular elements of the nasal mucosa. (10)

The saccharine clearance time (SCT) is a measure of nasal mucociliary function and the significant shortening of SCT in the post-laryngectomy patients implies that mucociliary transport is faster in laryngectomees. This functional improvement seems to correlate well with

the structural change towards a more densely ciliated mucosa with an increase in mucus secretion. [1]

To a variable extent vasomotor changes may also occur in a child whose nasopharynx is largely occluded by adenoidal hypertrophy. Whether or not infection is active, the phenomenon of no airflow creates a vasomotor rhinitis with boggy, swollen turbinates and accumulations of clear, watery secretions.

The electron microscopy findings in the nasal mucosa of patients who have decreased airflow through the nose due to stenosis of the nasal vestibule reveals stratified squamous epithelium composed of markedly degenerated cells.

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A change in anatomy after total laryngectomy leads to deterioration in pulmonary function as well as loss of the normal senses of smell and taste, loss of voice, and associated physical and psychosocial problems. As the normal passive nasal airflow and thereby the odor stimulation to the olfactory epithelium will be lacking, the patient's ability to smell will severely deteriorate. [3] This may have serious consequences to daily life, as the patients are unable to detect spoiled food, smoke, or leaking gas. Moreover, since most so-called tastes (eg, chocolate, coffee, tea, meat, and others) are dependent on retronasal stimulation of the olfactory receptors, the perception of such tastes will also be negatively influenced. [4-6]

Olfaction is either a passive process that occurs during normal nasal breathing (so called passive smelling) or an active process (so-called active-smelling or sniffing).Total laryngectomy inevitably results in the loss of passive smelling, and only a minority of patients are still able to actively smell anything. In a recent study of 63 laryngectomees, it was found that about two thirds of the patients were anosmic and that the rest had difficulty in smelling. [3] However several techniques that might generate an airflow in the nose and thereby restore olfactory function have not been incorporated into routine rehabilitation methods, and their effectiveness has not yet been evaluated either. [7]

Recently Hilgers and his co-workers developed a technique that makes use of a simple physical mechanism by creating an “under-pressure” in the oral cavity, which then generates a flow of air through the nose. Patients are instructed to make an extended yawning movement while keeping their lips securely closed and simultaneously lowering their jaw, floor of the mouth, tongue, base of the tongue, and soft palate. The under-pressure thus created in the oral cavity results in airflow through the nose. This technique, which is easily mastered by the patient, is taught by explaining that this movement resembles what one does when yawning with the mouth closed, i.e., so-called polite yawning. This polite yawning maneuver has to be repeated rapidly to increase its effectiveness. In an intervention study, they were able to show that after only one 30-minute training session, 25 (57%) of the 44 laryngectomees were able to smell using this technique. [6]

A study to examine the olfactory function in patients with laryngectomy and to assess the results of the Nasal Airflow–Inducing Maneuver (NAIM) odor-rehabilitation technique reported three major findings. First, 75% of the patients who had undergone laryngectomy had impaired olfaction (n = 18), and more than 50% had anosmia (n = 14). Second, after undergoing training in the NAIM technique, 72% of the patients with anosmia and hyposmia (n = 13) improved their olfactory capacity. Finally, even the patients with pre-intervention normosmia experienced improved olfactory capacity after using the NAIM technique. [8]

A study with the main aim to establish whether a single training session in the past had a permanent effect on the use of the NAIM in daily life concluded that a single training session is probably insufficient and most patients may need more training. This intensified training may then serve to rehabilitate olfaction in a higher percentage of patients and to make this maneuver an automatism to compensate for the loss of passive smelling after total laryngectomy. In view of this reconfirmation that it is possible to restore olfaction in individuals after total

laryngectomy, rehabilitation of the sense of smell should form an integral part of the multidisciplinary post-laryngectomy rehabilitation program. [6]
A study conducted with the purpose to assess changes in olfaction, health-related quality of life (HRQL) and communication 3 years after NAIM rehabilitation recommended that olfactory testing and training with NAIM should be integrated into the multidisciplinary rehabilitation program after total laryngectomy. The study showed that laryngectomized patients who were successfully rehabilitated concerning smell and communication had an overall good HRQL and no mental distress. [9]

The use of ipratropium nasal spray has also been proposed as a safe, effective way to treat chronic rhinorrhea in laryngectomized patients, improving their quality of life.

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