Rhinitis in the Elderly

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The effects of aging on the nose include structural, hormonal, mucosal, olfactory, and neural changes. As the US population ages and remains in overall better health, we will have more patients with rhinologic problems related to aging. In this manuscript, we review the available evidence on the structural and physiologic changes of the nose caused by aging, and we briefly describe management of common causes of rhinitis in the elderly.

Introduction

The US population has a higher life expectancy than ever before. According to the National Center for Health Statistics, life expectancy at birth was 47.3 years in 1900; by 2002, it had increased to 77.3 years [1]. US residents older than age 65 numbered 35 million in the year 2000, and that number is expected to reach 86 million by the year 2050. Those older than 65 will constitute approximately 20% of the US population [2]. A significant number of these people may experience rhinologic problems related to their age that could damage their quality of life.

During recent decades, geriatric medicine has experienced dramatic growth; however, little attention has been given to rhinologic diseases of the elderly [3,4••]. A search of English language articles on rhinologic diseases in the healthy, aging group revealed a limited number of results [4••,5–7]. It is of major importance to increase the number of research and clinical studies in this field to enhance our basic knowledge of the aging nose and to meet the needs and demands of the older population with rhinologic problems.

In this article, the structural and physiologic changes of the aging nose and the approach to common rhinologic diseases of the elderly are reviewed.

Aging and Nasal Anatomy

Nasal structures

The aging nose undergoes changes in all of its structural components, including the skin, muscles, cartilages, and bones. The skin quality changes, and the dermis becomes thinner with diminished skin elasticity [8]. Frequently, the alae and nasal tip take a fuller appearing character, which is possibly the outcome of increases in the density of sebaceous glands and may lead to the development of rhinophyma in male patients [9•]. Rhinophyma, which is the end stage of advanced rosacea, has a deep impact on patients’ self esteem and quality of life [10].

The fibroelastic attachments between the upper and lower cartilages of the nose fragment ossificate with aging. Because of maxillary alveolar hypoplasia, the columella shortens, resulting in a droopy tip appearance [9•,11]. Edelstein [4••] found significant increases in the nasolabial angle and decreases in the height of the nose with age. The lower nasal width showed a trend toward widening in subjects who were 50 to older than 80 years of age, but these changes were not statistically significant.

Nasal mucosa

Information about the effect of aging on the changes of the nasal ciliated epithelium is very limited. Toppozada [12] studied postmenopausal subjects and showed that, although the nasal mucosa remains normal, the number of goblet cells decreases, resilient structures atrophy, and the basement membrane gets thicker with aging. Getchell et al. [13] studied human respiratory and olfactory mucosa and noted an age-related decrement in the intensity and extent of immunoreactivity within the nasal cells. Edelstein [4••] found no significant age-related changes in gross and electron microscopic examination of the histopathology of the mucosa of either the septum or the turbinates.

Histologic analysis of the olfactory area in the elderly population reveals an increase in the number of patches of respiratory epithelium. This may represent a loss of primary olfactory receptor neurons [14]. Robinson et al. [15] showed age-induced changes in gene expression in the olfactory mucosa; this favored apoptosis of the olfactory neurons in older animals.
Aging and Nasal Physiology

Aging and nasal airflow

Few studies have addressed the impact of age on nasal airflow. Edelstein [4••] evaluated elderly subjects with rhinomanometry and determined a significant correlation between aging and increasing nasal resistance both before and after the administration of a decongestant agent. In a more recent study, Kalmvich et al. [16•] measured the minimal cross-sectional areas and endonasal volumes of healthy elderly subjects by acoustic rhinometry and showed that there was an increase of minimal cross-sectional areas and endonasal volumes with age. It is unclear why there is a difference between the two studies. It may due to differences in measurement techniques, or it may be that although the volume and area are increased, the mucosal functions less well and has increased resistance to airflow, despite its larger size. The aging mucosa has less estrogen and is, therefore, less soft and less elastic; perhaps this leads to increased resistance.

The results of studies on the effect of aging on nasal mucociliary clearance (NMCC) and nasal ciliary beat frequency (NCBF) are controversial. In two studies, no particular trend in regard to NCBF and advancing age were observed [4••,17]. However, Edelstein [4••] reported that the standard deviation of the intrasubject NCBF varied significantly with age, which he suggested as an explanation for the common complaint of fluctuating nasal symptoms among the elderly. On the other hand, in a more recent study, Ho et al. [18] showed that aging was associated with a decrease in NCBF and an increase in NMCC time, which negatively reflects the efficiency of NMCC.

Olfactory function

It is well known that the sense of smell diminishes with age. The prevalence of chronic olfactory problems from the National Health Interview Survey was estimated at 1.42%, or 2.7 million Americans. In the age groups of 55 to 64 years, 65 to 74 years, and 75 years or older, the prevalence rates were 1.99%, 2.65%, and 4.60%, respectively [19]. In a study by Murphy et al. [20•], the mean prevalence of disturbance of olfaction on a population of residents between 53 and 97 years of age was 24.5%. The prevalence increased with age, and 62.5% of 80- to 97-year-old subjects had olfactory impairment. In another study, Landis et al. [21] found gender and age to be the most important determinants of olfactory function, with women outperforming men, and olfaction decreasing dramatically with age.

The sense of smell comprises multiple sensations that are predominantly mediated by two independent neural systems—the olfactory and the somatosensory (trigeminal) [22]. Trigeminal afferents mediate sensations of touch, pressure, temperature, and nociception. It is suggested that older subjects not only show reduced olfactory sensitivities but they also exhibit reduced trigeminal sensitivity of the intranasal system, which responds to the irritation of the nasal cavity and protects the respiratory tract from inhalation of potentially harmful irritants [22,23].

Data on the changes of the trigeminal system with aging is sparse. Hummel et al. [24] have found that patients with olfactory dysfunction have lower trigeminal sensitivity compared with normosmic controls, independent of the cause of the olfactory loss. It was suggested that this observed decrease in trigeminal sensitivity could have been based on an interaction between the olfactory and intranasal trigeminal systems. They further suggested that in normosmic subjects, there is an age-related decrease in trigeminal sensitivity. According to Hummel, Livermore, and Frasnelli [22,23], and, based on electrophysiologic measures, age-related loss of intranasal trigeminal sensitivity seems to take place in the periphery of the intranasal trigeminal system.

Older individuals are susceptible to olfactory dysfunction, but it is imperative to remember that these symptoms may also be a signal of important underlying medical conditions. It is usually difficult to make a distinction between olfactory changes that result from losses due to the normal aging process and disease states and medication effects that occur more commonly in the elderly. The causes of clinically observed olfactory impairment include local nasal inflammatory diseases (allergic rhinitis, rhinosinusitis, nasal polyps), previous viral upper respiratory tract infections, neurodegenerative diseases, nutritional deficiencies, endocrine diseases, surgical interventions, head trauma, environmental pollutants, and smoking [25]. In a cross-sectional study of 2491 residents aged 53 to 97 years, stroke, epilepsy, current smoking, and nasal congestion at examination or having had a history of upper respiratory infection in the past week were associated with increased prevalence of olfactory impairment [20•].

Accurate detection and characterization of olfactory deficits are of vital importance because defects in olfactory function have been described in the early phase of a number of neurodegenerative diseases, including Alzheimer’s disease, Parkinson’s disease, and mild cognitive impairment [26–28]. Olfactory dysfunction in Alzheimer’s is thought to result from the damage of the olfactory bulb and the medial temporal lobe [26,27]. Olfactory dysfunction in Parkinson’s disease is independent of the disease severity, and duration and can be seen in 70% to 90% of non-demented patients with Parkinson’s disease [29,30]. Many researchers support the hypothesis that olfactory dysfunction is an early event in Parkinson’s disease and may precede the development of motor dysfunction [29,30].

All of the above-mentioned alterations of the nasal anatomy and physiology due directly to the normal aging process result in symptoms of postnasal dripping, nasal drainage, sneezing, olfactory loss, and gustatory rhinitis [4••]. Edelstein investigated some other common nasal symptoms, including nasal obstruction, headache, sinus