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LITERATURE REVIEW

Rhinitis and sinusitis in the older population and its association with elderly asthma

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ABSTRACT

OBJECTIVES. As a person ages, the mucosal epithelium degenerates over time and the elderly often have complications due to dehydration. Nasal airflow decreases and nasal airway resistance increases. In this review, we discuss the relationship of rhinitis, sinusitis and asthma in elderly patients.

MATERIAL AND METHODS. The literature survey was performed using the search engines PubMed, Google, Proquest Central, and EBSCO at the Kırıkkale University Library.

RESULTS. With the aging process, allergic rhinitis decreases, whereas non-allergic rhinitis, such as drug-induced rhinitis can be observed more. Atrophic rhinitis is often seen in the elderly. Patients with geriatric rhinitis typically complain of constant sinus drainage problems, which may cause sinusitis. In addition, asthma prevalence has also been shown to be higher in elderly patients. Concurrent upper (rhinitis) and lower (asthma) respiratory tract symptoms are defined as Combined Allergic Rhinitis and Asthma Syndrome.

CONCLUSION. Rhinitis and asthma as well as sinusitis and asthma may be present in elderly patients. The incidence of allergic rhinitis has been shown to decrease with age. To achieve good results from treatment, the concurrent rhinitis and asthma as well as sinusitis and asthma should be kept in mind in elderly patients.

KEYWORDS: elderly, rhinitis, sinusitis, asthma, Combined Allergic Rhinitis and Asthma Syndrome, respiratory tract.

INTRODUCTION

Rhinitis is common in the elderly, and it is thought that a large amount of the general public has nasal symptoms[1-3]. It is thought that the morphological changes in the connective tissue, as well as the vessel walls, predisposes elderly people to a more significant level of chronic rhinitis compared to the general population[4].

Older people are known to have a lower whole body water content, degenerative mucus-secreting glands, decreased mucociliary clearance. Furthermore, blood flow reduction to the nasal cavity promotes mucosal membrane drying and atrophy. On a structural basis, upper and lower nasal cartilage weakening and distortion of the nasal tip result in the resistance of the airway[1,3]. All of these characteristics contribute to the nasal complications observed in the elderly.

In this review, we discuss the relationship of

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CHANGES IN THE AGED NOSE

Nasal structure

As people grow older, various nasal anatomic changes can result in an increased incidence of rhinitis. This is thought to be associated with the loss of nasal tip support as one ages. A drooped tip is often caused by the erosion of collagen and elastin or facial musculature reduction[5-7]. These structural modification as one ages can lead to nasal airflow reduction and nasal obstruction, ultimately contributing to sinus complications.

Mucus

Previously published reports have shown that the mucosal epithelium deteriorates as the body ages and elderly patients have a tendency to dehydrate[8,9]. Due to these factors, elderly patients frequently have an increase in mucus thickness. This characteristic combined with a reduction in mucociliary clearance has been thought to result in common nasal symptoms, such as cough and postnasal drip, all of which are associated with increased age[5].

Nasal dryness

Clinically, it has been shown that the elderly are more prone to nasal dryness. Previous reports have shown that nasal cavity humidity and temperature were drastically lower in older patients compared to younger patients[10]. Interestingly, decreased humidity and temperature can be caused by age-related morphological changes to the nasal vasculature. For example, nasal vessels overtime can become patent and do not hydrate and sustain temperature as those of a younger nose[9]. These findings indicate that older patients experience a higher amount of nasal dryness and irritation due to these alterations.

Nasal airflow

Kalmovich and colleagues showed that endonasal volumes and cross-sectional regions progressively change with age[11]. The reduction in estrogen content within the nasal mucosa contributes to hardening and increasing airway resistance. Due to the changes in estrogen levels, mucociliary modifications can also affect post-menopausal women[12]. Recent reports have shown that certain estrogen receptors of the nasal mucosa associate with rhinitic symptoms[13]. However, the exact mechanism(s) has (have) not been defined.

Olfaction

It is known that the olfactory sense deteriorates with age, and abundantly declines after the age of 70[14]. For this reason, the olfactory function over time may associate with rhinitis. One report showed that multiple study participants (71%) had a dysosmia and a positive allergy skin test association[15]. Olfactory complications in allergic rhinitis (AR) patients have generally shown to associate with nasal obstruction. However, recent data has shown that the etiology may be associated with olfactory cleft inflammation[16].

RHINITIS IN ELDERLY

Rhinitis causes nasal mucosa inflammation and its symptoms include rhinorrhea, congestion, postnasal drip, itchy nose and sneezing[17]. In older people, these symptoms are exacerbated by the excessive drainage, olfactory sensory loss and dryness[5,18,19].

The aging nose becomes dry for multiple reasons: 1 - dehydration; 2 - degenerative mucosal gland, and 3 - blood flow reduction in the nose. Isotonic saline lavage can be used to reduce nasal dryness and enhance mucosal clearance[1,20].

Rhinitis has been classified as follows: allergic and nonallergic rhinitis (AR and NAR)[19]. AR is an IgE-mediated inflammatory complication triggered by multiple allergens including dust, pollens or molds. Symptoms of AR can be considered seasonal or persistent. According to the Allergic Rhinitis and its Impact on Asthma (ARIA) guidelines, intermittent AR is defined as those symptoms that last less than four successive weeks. Persistent AR is when symptons last greater than four successive weeks. Symptom severity is considered either 'mild' or 'moderate/severe' and both are based on interference with everyday tasks[21].

NAR is a non-IgE-mediated complication as associated with congestion and clear rhinorrhea, but with a prominent reduction in other symptoms[22,23]. The symptoms associated with NAR can be perennial or sporadic and may be triggered by food, odors, environmental changes, or even emotion[21,24,25]. NAR can present itself in older patients and typical symptoms include atrophy, vasomotor impairment, gustatory and medication-related allergies[4,26].

Epidemiology

Interestingly, there is not a lot of research on the incidence of NAR when compared to AR in elderly patients. Approximately 19 million people suffer in the U.S. from NAR[27]. The occurrence of NAR is higher in females and the frequency enhances by age[28-30]. More than sixty percent of patients over 50 are diagnosed with the NAR subtype[19,25].

Rhinitis on quality of life

Benninger and colleagues discovered, using the

Rhinosinusitis Disability Index (RSDI), that AR can cause sleep disturbance[31]. Poor sleep habits have been well documented in elderly[32], and thus AR may vastly contribute to these complications. The poor sleeping habits can contribute to other crucial physiologic processes, including cognition, endocrine function, glucose metabolism and appetite control as well as lower self-reported health status, depression and increased mortality[33-38]. The effect of AR on these processes may hamper the ability to perform everyday tasks[17].

Pathophysiolgy

The aging process can affect many physiological processes including T-cell responsiveness, lymphocyte response, cytokine production and receptor expression[39,40]. Interestingly, this is a paradox due to the fact that the occurrence of AR declines as age increases. The reduction in immune response may be affected by the level of malignancy or infection in the elderly[39,41], and the cytokine bursts may clarify the questions concerning chronic rhinitis.

Other immune responses change with age as well[39,42]. This may explain why the elderly are more susceptible to infection[39,41,43]. These alterations may also result in the milder symptoms of AR as well as its decreased incidence in the older population.

Types of rhinitis in elderly

Allergic rhinitis

The peak occurrence of AR is 37 per 1,000 persons and it is reported between 10 and 15 years of age. The occurrence of AR in people over 65 years is 3 per 1,000 persons[44]. In fact, the National Center for Health Statistics report (2005) indicated that people between 45-64 years, 65-75 years, and older than 75 were struck by AR at 10.7%, 7.8% and 5.4%[45]. Along with the non-specific immune changes, anatomic and morphologic changes of the nose have been thought to contribute to AR in older people[39].

Non-allergic rhinitis (idiopathic, vasomotor)

Idiopathic rhinitis, or vasomotor rhinitis (VR), is defined as a persistent inflammation of the nasal membrane with no known allergy, infection, structural lesions or systemic disease[1,46].

VR is the most common form of NAR, and its occurrence increases with age[28]. Environmental stimuli (e.g., ozone, cigarette smoke) cause nasal inflammation and the triggering of neurogenic reflexes. Sensory nerves within the nose respond to these factors, which initiates sneezing by reflex[47,48]. VR in the elderly may be a deterioration in the regulation of neurological reactions on nasal physiology[19].

Drug-induced rhinitis

Interestingly, greater than 400 brand name drugs have rhinitis as a secondary effect. Elderly patients frequently administering these drugs for their ailments may result in drug-induced rhinitis. Because of this, older patients may be at risk due to thinning and dryness of the nasal mucosa[1].

A host of anti-hypertensive drugs may result in nasal obstruction and conjugated estrogens may also augment airway resistance[1].

Aspirin has been shown to trigger bronchospasm in those that have nasal polyps and asthma. However, it has been shown to be associated with severe rhinitis in asthmatics in the presence or absence of polyps[1].

Other drugs, like psychotropic drugs and viagra, which are used by the elderly, can also contribute to rhinitis[1].

Non-allergic rhinitis with eosinophilia

Non-allergic rhinitis with eosinophilia (NARES) is casued by eosinophil infiltration in the nasal passage. Typical symptoms are perennial nasal congestion and rhinorrhea. This can usually be treated by a corticosteroid[1].

Gustatory rhinitis

Gustatory rhinitis is a condition consisting of profuse rhinorrhea that is elicited by eating highly seasoned foods. Additionally, cold air may exacerbate this condition. Anticholinergic drugs may be useful in gustatory rhinitis reduction. Ipratropium bromide is also effective and safe[1].

Gustatory rhinorrhea is caused by the ingestion of certain foods and results in watery rhinorrhea. These symptoms can be socially debilitating and result in decreased consmuption of food and nutrition. Generally, alcohol and spicy or cold foods cause this condition. The capsaicin content in spicy foods elicits the response that triggers the parasympathetic nervous system[47].

Atrophic rhinitis

Atrophic rhinitis is often observed in the elderly and complications such as degeneration and/or crusting of the nasal mucous membrane occur[49]. It may also be caused by organisms such as *Klebsiella ozaenae*, on rare occasions. In some cases, secondary forms of atrophic rhinitis may be caused by nasal surgery[1,50].

Primary atrophic rhinitis is often called geriatric rhinitis due to the age-related changes in nasal physiology[51]. Histopathological changes have been shown to associate with geriatric rhinitis[52]. Garcia and colleagues showed that these changes lead to excessive evaporation of the mucus layer and decreased mucosal surface area, which result in thickened mucus and altered nasal airflow[53]. Recent reports have documented a role for apoptosis in rhinitis, and showed a decrease in caspase-3 activity, which is a key in the apoptotic cascade[54].

CHRONIC RHINOSINUSITIS IN ELDERLY

Chronic rhinosinusitis (CRS) is defined as an inflammatory condition of the nasal passages that continues for 12 weeks or longer[55].

There are four symptoms of CRS: mucopurulent drainage; nasal obstruction; facial pain, pressure and/or fullness; decreased sense of smell[56].

CRS consists of different disease entities. CRS without nasal polyps (CRSsNP) can be distinguished from CRS with nasal polyps (CRSwNP). CRSwNP patients have a higher total symptom score and generally suffer from nasal obstruction. CRSsNP have more headaches compared to CRSwNP patients[57-60].

Elderly patients may have multiple systemic diseases associated with rhinosinusitis. Several factors such as age, duration of symptoms, length between follow-up, and diabetes mellitus were found to influence the complication rate. Interestingly, diabetes mellitus patients showed an approximate 3-fold higher complication rate than patients without. The elderly patients controlled for these factors had less complications[61].

Patients with geriatric rhinitis generally had nagging sinus drainage, chronic throat clearing and nasal obstruction, which was exacerbated when lying down[62].

Chronic rhinosinusitis patients typically have a longer history of thick foul-smelling drainage, nasal obstruction, headaches and facial pressure. Conversely, the geriatric rhinitis patients have a dry, irritated nose. Chronic rhinosinusitis diagnosis can be confirmed by a CT scan of the sinus cavity[62].

ASTHMA IN ELDERLY

Asthma is prevalent in older people and is more frequent than previously believed. Interestingly, the morbidity and mortality rates for elderly asthmatics are higher than younger patients[63]. Due to the aging of the world's population[64], the burden of asthma is expected to rise dramatically. However, the pathomechanisms of asthma in the older population have not been determined. Clinical observations indicate a role for several factors on adult or late-onset disease[63-65]. Several risk factors have been documented for elderly-associated asthma including smoking, obesity and SE-specific IgE sensitization[66-70].

RHINITIS AND ASTHMA ASSOCIATION

AR and allergic asthma often exist together. This has led to the concept that these conditions are quite possibly the same complication. When patients have either AR or allergic asthma, they are thoroughly examined. Often, observations of allergic inflammation and airway sensitivity throughout all of the airways is found[71].

Non-allergic diseases of the nose can result in the advancement or worsening of asthma, mainly in children. Even in patients with NAR, an increased risk that asthma will develop is possible[71].

Even though the upper airway and lungs share similarities, there are distinct differences. The upper airway and sinuses have large blood supply and, when inflamed (AR), can cause nasal blockage. On the other hand, the lungs respond to inflammation by spasming and become constricted and narrowed, causing chest tightness, wheezing and cough[71].

Common colds and other viral infections are often associated with asthma worse outcomes. People with allergies are more susceptible to developing asthma after a viral respiratory tract infection[71].

The upper airway performs as a multifaceted regulator of heat, humidity, resonance and filtration. Based on this, inhaled particles bigger than 5-6 microns are typically captured and retained in the upper airway[71]. This region of the lungs can ilicit an immunologic response to allergens, which generally leads to inflammation of the upper and lower airways. Even though an allergic individual seems symptom free, continuous inflammation in the airway still exists[71].

Upper or lower airway symptoms can be caused by specific allergens that an individual is exposed to. Larger allergens (~5 microns) such as grass or tree pollen, cause intermittent symptoms and are usually lodged in the nose and eye. Smaller antigens, such as animal dander or dust mites, are more likely to cause AR or asthma and are inhaled/captured in the lungs[71].

Combined Allergic Rhinitis and Asthma Syndrome (CARAS) is defined as simultaneous upper (rhinitis) and lower (asthma) respiratory infection[1]. Doctors suggest that patients with AR or sinusitis be tested for asthma due to the airway sensitivity[71]. Treatment of CARAS include:

- Topical corticosteroids can be used[71].
- Oral administration such as systemic corticosteroids, anti-histamines and anti-leukotrienes[71].
- Anti-IgE antibody therapy, which is a new class of anti-allergy[71].
- Allergen immunotherapy is important in the CARAS treatment[71].

SINUS DISEASE AND ASTHMA

Airway hyperresponsiveness in sinusitis is a result of the pharyngobronchial reflex activation[72]. This reflex may be exacerbated by infected drain-

age from sinuses that ooze into the throat[73]. In patients with CRS, the pharyngeal mucosa becomes damaged and the pharyngeal nerve fiber density increases[74].

It has been well documented that sinus diseases ilicit a plethora of inflammatory mediators such as eosinophils, lymphocytes and cytokines. These factors facilitate the recruitment of mast cells and basophils. Patients with AR generally have allergic inflammation. Furthermore, allergen induced activation of systemic responses can provoke inflammatory cell production and cause an augmentation of inflammatory cells that migrate to the airways[75-78].

Interestingly, approximately 70% of patients indicated rhinosinusitis symptoms in a study comparing corticosteroid-dependent versus independent asthmatic patients[79]. In another study, 24% of asthma and 36% of patients with small airway disease had CRS and were non-responders to medical treatment[79]. Also, approximately seven percent have nasal polyposis[80], and the percentages are much more for nonatopic asthma patients (13%)[81-84].

CONCLUSIONS

Rhinitis and asthma, as well as sinusitis and asthma, are problematic in elderly patients. CARAS is the simultaneuous upper and lower respiratory infection, which is related to nasal structural changes, nasal airflow decreases, and nasal obstruction often found in geriatric patients. The incidence of AR decreases with age, while drug induced rhinitis may be observed more in elderly patients and may be related to the drugs used for the treatment of geriatric diseases.

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