Rhinitis and Sinusitis in the Geriatric Population

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KEYWORDS

• Allergic rhinitis • Nonallergic rhinitis • Acute rhinosinusitis
• Chronic rhinosinusitis without polyposis • Chronic rhinosinusitis with polyposis

KEY POINTS

- Changes in nasal anatomy and function in the elderly include decreased mucociliary clearance, decrease in immune function, and structural changes, which in turn lead to paranasal sinus disease.
- The geriatric population suffers from both allergic and nonallergic rhinitis, and both require specific pharmacotherapy in the setting of comorbidities and polypharmacy.
- Signs and symptoms of rhinitis may represent systemic, neoplastic, or other processes.
- Chronic rhinosinusitis in the elderly population may be unique in its pathogenesis in terms of host and microbial factors, but management is overall similar to the adult population.

INTRODUCTION

Rhinitis and sinusitis are among the most common medical conditions and are frequently associated. Rhinosinusitis can significantly affect a patient's quality of life (QOL), resulting in decreased productivity, poor sleep quality, and depression.[1,2] The geriatric population is increasing in the United States, representing 20% of the population.[3] According to the 2014 US Census, 83.7 million people will be older than 65 years by 2050.[3] The annual prevalence of chronic rhinosinusitis (CRS) is reported to be 13% to 16%.[4] The elderly represent a unique population to manage because of multiple medical comorbidities and polypharmacy.[5] The objective of this article is to discuss the diagnosis, treatment, and surgical options related to rhinitis and sinusitis for the geriatric population.

RHINITIS

Rhinitis refers to a heterogeneous group of nasal disorders characterized by symptoms of sneezing, nasal itching, rhinorrhea, and nasal congestion.[6] As per **Box 1**, rhinitis is divided into 2 major categories: allergic rhinitis (AR) and nonallergic rhinitis

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Box 1
Types of rhinitis

Allergic rhinitis

Nonallergic rhinitis types
- Drug induced
- Hormonal
- Infectious/systemic
- Nonallergic rhinitis with eosinophilia syndrome
- Vasomotor/nonallergic rhinopathy

(NAR), which is differentiated into additional variants. In the elderly, AR and NAR can coexist.[7] As there are no current guidelines specific for the geriatric population, the overall management of rhinitis is similar to that of the general adult population.

ALLERGIC RHINITIS

According to the Clinical Practice Guideline by the American Academy of Otolaryngology Head and Neck Surgery (AAO-HNS), AR is defined as a symptomatic nasal disorder mediated by immunoglobulin E (IgE)-mediated immune responses.[8] Allergens in the environment are taken up upon inhalation and deposited into the nasal mucosa. Subsequent inflammatory responses lead to an immediate allergic response and a late phase T-cell response.[9] Allergens include perennial allergens (dust mites, cockroach, pets) and seasonal allergens (grasses, trees, ragweeds). Coinciding with symptoms, physical findings on anterior rhinoscopy may show abundant clear mucus and enlarged turbinates with pale or boggy mucosa.

Diagnosis of Allergic Rhinitis

In addition to history and physical examination, current guidelines strongly recommend allergy testing for the diagnosis of AR.[8] Testing provides knowledge into the offending allergen, the total serum and specific IgE concentrations, and a target for immunotherapy. Although older adults have lower total IgE levels compared with younger patients, atopic disease is still present.[10]

Medical Treatment of Allergic Rhinitis

Similar to the general adult population, treatment of AR in the elderly includes environmental control, pharmacotherapy, immunotherapy, and potentially, surgery. For medical therapy, the AAO-HNS strongly recommends intranasal glucocorticosteroids and second-generation oral antihistamine drugs as first-line therapies.[8] Intranasal antihistamines are an option, especially in combination with intranasal steroids. Oral leukotriene receptor antagonists are not recommended as primary treatment.

The AAO-HNS guidelines do not discuss decongestants, nasal irrigations, intranasal anticholinergics, or cromolyn sodium for the treatment of rhinitis. However, the Allergic Rhinitis and its Impact on Asthma (ARIA) guidelines do examine these medications, but not as first-line therapy.[11] Intranasal decongestants may be used for a short duration in patients with severe nasal obstruction. Oral decongestants may be indicated for symptom relief, but is strongly advised against in patients with cardiac conditions. Nasal irrigation with isotonic sodium chloride is indicated in patients with nasal dryness.[12] Topical chromones are modestly effective and safe. Topical anticholinergics are effective in controlling watery rhinorrhea, but not effective with sneezing or nasal obstruction. Further descriptions of these medications can be examined in **Table 1**.

Table 1
Pharmacotherapy for allergic rhinitis

Medication	Mechanism of Action	Side Effect	AAO-HNS Guideline	ARIA Guideline	Additional Comments
Intranasal steroids	Potently reduce nasal inflammation Reduce nasal hyperreactivity	Minor local side effects (burning, epistaxis)	Strongly recommend	Most effective pharmacologic	Maximal effect after a few days with daily compliance
Oral antihistamines	Blockage of H_1 receptor	First generation: sedation is common with anticholinergic effect Second generation: fewer side effects, limited by renal and liver function	Strongly recommend second generation	Second-generation oral antihistamines preferred	Effective in combination with intranasal steroids; rapidly effective (<1 h) on nasal and ocular symptoms
Nasal antihistamines	Blockage of H_1 receptor Some anti-allergic	Minor local side effects; bitter taste	Option, especially in combination with intranasal steroids	Effective	Rapidly effective (<30 min) on nasal or ocular symptoms
Leukotriene antagonists	Block CystLT receptor	Excellent tolerance	Recommend against as primary option	Effective on rhinitis and asthma, but inferior to intranasal steroids	

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Table 1
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Medication	Mechanism of Action	Side Effect	AAO-HNS Guideline	ARIA Guideline	Additional Comments
Intranasal anticholinergic	Blocks almost exclusively rhinorrhea	Minor local side effects Almost no systemic anticholinergic activity	Not addressed	Effective on rhinorrhea	Does not affect sneezing or nasal obstruction
Intranasal chromones	Mast cell stabilization	Minor local side effects	Not addressed	Modestly effective	Intranasal chromones are less effective and the effect is short lasting
Oral decongestants	Sympathomimetic effect	Hypertension Palpitations Restlessness Agitation Tremor Insomnia Headache Dry mucous membranes Urinary retention Exacerbation of glaucoma or thyrotoxicosis	Not addressed	Use oral decongestants with caution in patients with heart disease; do not regularly use	Oral H1-antihistamine–decongestant combination products may be more effective than either product alone but side effects are combined
Intranasal decongestants	Sympathomimetic effect	Same as oral decongestant, but to less degree; rhinitis medicamentosa	Not addressed	Act more rapidly and more effectively than oral decongestants; do not regularly use	Limit duration of treatment to <3 d to avoid rhinitis medicamentosa

Pharmacotherapy of Allergic Rhinitis in the Geriatric Population

The literature shows no specific differences in the pharmacotherapy of AR for the geriatric population. However, the main concern is interactions between medications or between medications and comorbidities. Bozek[7] examines differences in pharmacotherapy of AR in the geriatric population. For intranasal steroids, no studies suggest increased side effects. Antileukotrienes, intranasal antihistamines, and intranasal anticholingerics are generally well tolerated.

Bozek[7] further describes the potential adverse effects of antihistamines, mainly first-generation types, and decongestants and advises caution with their use. Oral decongestant drugs may cause arterial hypertension, headache, and aggravation of glaucoma. First-generation antihistamines can cause several adverse effects: confusion, sedation, arrhythmias, and coordination problems. Second-generation antihistamines, although generally safer, should be cautiously used in patients with liver or kidney impairment.

Immunotherapy for Allergic Rhinitis in the Geriatric Population

According to the AAO-HNS guidelines, immunotherapy is strongly recommended for patients with AR who have persistent symptoms despite maximal pharmacologic therapy.[8] Immunotherapy allows for allergy desensitization and is given subcutaneously with shots or sublingually with drops. Maintenance of therapy requires regular intervals up to 3 to 5 years.[13]

Few studies have shown the efficacy and safety of immunotherapy in the geriatric population.[14,15] Immunotherapy does have its limitations in the elderly. For example, patients who regularly take β-blockers or ACE inhibitors are at higher risk of anaphylaxis.[16] Prolonged therapy makes it difficult for compliance in the elderly.[7]

Surgery for Allergic Rhinitis

The AAO-HNS recommends inferior turbinate reduction surgery in AR patients with nasal airway obstruction and enlarged inferior turbinates who have failed medical management.[8] There are no specific data on inferior turbinate reduction outcomes in geriatric patients. There are several different methods of turbinate reduction: turbinate out fracture, radiofrequency reduction, submucosal resection, and partial/complete resection. There are many different considerations that might lead a surgeon to choose one technique over another. However, the literature supports submucosal turbinate resection as having the longest efficacy.[17] For geriatric patients unable to tolerate general anesthesia, radiofrequency ablation can be done safely with good results in the office under local anesthesia.

NONALLERGIC RHINITIS

NAR is characterized by intermittent or persistent symptoms of nasal symptoms that are not due to an IgE-inflammatory response. As shown in **Box 1**, there are various forms of NAR that make diagnosis difficult based on symptoms alone. Two forms of NAR in the elderly are vasomotor rhinitis (VMR) and medication-induced rhinitis.

VASOMOTOR RHINITIS/NONALLERGIC RHINOPATHY

VMR/nonallergic rhinopathy is a form of NAR that is an idiopathic variant, generally thought to be caused by autonomic nervous system dysfunction.[18] The hallmark

symptom is clear watery rhinorrhea, less often with congestion and sneezing. Potential triggers include temperature changes, gustatory stimuli, strong odors, passive tobacco smoke, and emotional factors.

The proposed pathophysiology is thought to be caused by autonomic dysfunction.[19] For example, rhinorrhea is a common symptom of patients with Parkinson disease.[20] VMR is a diagnosis of exclusion and is generally thought to be more prevalent in the elderly. However, there are few data suggesting clinical differences in the geriatric population. VMR responds particularly well to intranasal ipratropium bromide, which is generally considered to be safe.[19] However, narrow-angle glaucoma is a relative contraindication to the use of ipratropium.[21]

In terms of surgical options, vidian neurectomy may be offered as a last resort to patients with persistent, disabling symptoms refractory to medical therapy. The surgery's goal is disruption of the nasal cavity's autonomic supply to reduce nasal secretions.[22] Although studies have shown the safety and efficacy of vidian neurectomy,[23] there are no specific data in the geriatric population.

MEDICATION-INDUCED RHINITIS

Rhinitis can be caused by use of oral and topical medications (**Table 2**), which is important in the setting of polypharmacy. *Rhinitis medicamentosa* results from an overuse of topical α-adrenergic decongestant sprays. Chronic use causes rapid intolerance and severe rebound nasal congestion. Patients present with rhinorrhea, chronic sniffling, and sometimes debilitating nasal obstruction. Treatment is based on identification of the offending medication and substitution, if possible, with nasal irrigation and steroid sprays. For rhinitis medicamentosa, no data specifically studied the geriatric population.

OTHER CAUSES OF NONALLERGIC RHINITIS

Systemic diseases may present with symptoms of rhinitis and must be in the differential for NAR. Rheumatologic diseases, such as Wegener granulomatosis and sarcoidosis, are common considerations and require specific testing and treatment. Infectious rhinitis, most commonly, is due to a viral infection from rhinovirus. Other microbial causes include tuberculosis, rhinoscleroma, and fungus. Hormone imbalance, such as in menopause, can lead to rhinitis.[24] Last, malignancies may present with symptoms of rhinitis and should be investigated with nasal endoscopy and potentially imaging modalities. Unilateral symptoms or symptoms refractory to medical therapy should be further evaluated.

Table 2
Medications that can cause nonallergic rhinitis

Oral Medications	Topical Nasal Sprays/Drugs
Acetylsalicylic acid/nonsteroidal anti-inflammatory drugs	Oxymetazoline/Afrin
α-Blockers	Ephedrine
ACE inhibitors	Phenylephrine/Neo-Synephrine
β-Blockers	Amphetamines
Calcium channel blockers	Cocaine
Diuretics	
Phosphodiesterase 5 inhibitors	
Psychotropics	

SINUSITIS IN THE GERIATRIC POPULATION

The International Consensus Statement on Allergy and Rhinology (ICAR) and European Position Paper on Rhinosinusitis and Nasal Polyps (EPOS) provide clinical guidelines for acute sinusitis and chronic sinusitis for the adult population.[25,26] The management of sinusitis in the geriatric population will be similar to that of adults, with special consideration for potential drug interactions and side effects and medical comorbidities.

Managing CRS in the geriatric population can have a significant impact on QOL and should not be neglected. The health care costs of CRS[27] and the effects on QOL are well studied in the general adult population. Although these studies do not specifically focus on the elderly, the effect of CRS on QOL does have significant implications in the geriatric population. For example, depression has been linked with worse QOL metrics and with increased reliance on health care usage.[28]

ACUTE RHINOSINUSITIS

Per ICAR and EPOS, acute rhinosinusitis (ARS) is defined as sudden onset of 2 or more of the symptoms of nasal obstruction, purulent nasal drainage, reduction or loss of smell, and facial pain/pressure for less than 12 weeks.[25,26] Acute viral rhinosinusitis is usually characterized by mild symptoms less than 10 days; it is usually self-limiting without the need for prescription medications.

Acute bacterial rhinosinusitis (ABRS) is described as symptoms lasting beyond 10 days with unilateral pain, fever, elevated ESR/CRP, and deterioration after an initial milder phase. The most common bacteria are *Streptococcus pneumoniae*, *Haemophilus influenzae*, and *Moraxella catarrhalis*.[29] *Staphylococcus aureus* and *Streptococcus pyogenes* have a higher propensity to cause intracranial or orbital complications.[30]

Management of Acute Rhinosinusitis

Medical therapy is the mainstay for ARS. According to guidelines, initial therapy is nasal saline irrigation, analgesics, and topical nasal steroids. Antihistamines and systemic steroids are strongly not recommended. In ABRS, antibiotic therapy is recommended. Amoxicillin is considered first-line therapy.[29] For patients with penicillin allergy, trimethoprim-sulfamethoxazole or macrolide antibiotics can be used. Special consideration should be taken for medical therapy in the geriatric population. Antibiotic side effects (gastrointestinal upset, dizziness, and fatigue) may be increased in the elderly.[31] Radiologic imaging is generally not recommended unless an alternative diagnosis is suspected, the illness is severe, or concern for orbital or intracranial sequelae is present.[29]

CHRONIC RHINOSINUSITIS

Definition and Diagnosis

According to guidelines, CRS is defined by symptoms (nasal obstruction, nasal drainage, facial pain/pressure, and decreased sense of smell) for greater than 12 weeks.[25,26] Evaluation with nasal endoscopy or computed tomographic imaging is required in the current guidelines. Findings such as mucopurulence, nasal polyposis, or mucosal edema on endoscopy, or sinus opacification on imaging differentiate the symptoms from rhinitis or other conditions.

CRS is divided into CRS without nasal polyps (CRSsNP) versus CRS with polyps (CRSwNP). Patients with CRSwNP may require additional specialized care and long-term treatment to prevent polyp regrowth. Screening for allergic symptoms

should be performed because allergy management plays an important role. Polyps, specifically unilateral disease, can be indistinguishable from neoplasms or encephaloceles, which should be in the differential diagnosis.[32]

Aging Impact on Pathogenesis of Chronic Rhinosinusitis

The pathogenesis of CRS consists of a complex inflammatory and infectious process. Microbial imbalance in the sinonasal mucosa may play a role in disease persistence.[33] Limited studies in the geriatric population have shown increased proportions of *S aureus* with decreased levels of *Corynebacterium* and *Propionibacterium*.[34] The data on the aging nasal microbiome are limited.

Mucociliary function is crucial in maintaining healthy sinuses, and thus, dysfunction is often a precursor to CRS.[35] In the geriatric population, there is decreased mucociliary clearance and thinning of nasal mucosa.[36] There is also a decrease in percent water per body weight in the elderly, leading to thicker mucus secretion.[37]

Aging effects on the immune system may predispose the elderly to CRS. For innate immunity, epithelial integrity is a key factor in impeding inhaled pathogens and allergens.[38] In the sinonasal tissue of patients older than 60 years old, studies have shown a decrease in the S100 protein, which mediates inflammatory activity, defends against pathogens, and promotes epithelial repair.[39,40]

The geriatric population may have difficulty mounting adaptive immune responses because of *immunosenescence,* which is age-related changes that contribute to increased susceptibility to infections, malignancy, and autoimmunity.[41] Chronic and subclinical systemic inflammation associated with aging in the absence of infection has been described.[42]

In summary, most studies on CRS in the geriatric population show potential differences in the pathogenesis of sinusitis. Further research is required for examining the clinical impact of these differences in CRS in the geriatric population.

Management of Chronic Rhinosinusitis

According to guidelines, medical therapy is the mainstay for the initial management of CRSsNP and CRSwNP.[25,26] Topical corticosteroid sprays and saline irrigation are the 2 key and proven therapies. Intranasal steroids do carry a risk of epistaxis, which is a common complaint of geriatric patients and especially important in those who are taking blood thinners.[43]

Antimicrobials are not recommended for the treatment of CRS, unless there are symptoms related to an exacerbation. Longer courses of culture-directed antibiotics are generally recommended to treat acute exacerbations (>2 weeks). According to EPOS, there is some evidence of long-term antibiotic therapy (>12 weeks) benefit with low-dose macrolides in CRSsNP with normal IgE levels.[26] Topical and intravenous antibiotics are not generally recommended for patients with CRS, but can be useful in select cases.

Systemic corticosteroids for short-term management are primarily reserved for severe exacerbations of CRS.[44] The side-effect profile of oral steroids includes insomnia, acid reflux, and mood changes and is relatively contraindicated in patients with osteoporosis, diabetes, glaucoma, and psychiatric illness, which are prevalent in the elderly population.

Surgical Management of Chronic Rhinosinusitis

Endoscopic sinus surgery (ESS) is recommended for severe or recalcitrant CRS patients, especially those who have little to no improvement with medical therapy.[25,26] Studies have shown improvement in symptoms, QOL, and postoperative endoscopic

examination findings.[45] In the geriatric population, ESS is safe and efficacious in patients older than 60 years old with improvement in QOL metrics.[46,47]

Contributing Comorbidities in Chronic Rhinosinusitis

Comorbidities play a role in CRS development. Reflux of gastric acid into the nasopharynx has been shown to cause inflammation of the sinus ostium.[48] Gastroesophageal reflux disease is common in the elderly and is a diagnostic challenge given the absence of symptoms or presence of atypical symptoms, such as cough or voice changes.[49]

Smoking is a significant risk factor for the development of CRS and more importantly persistence of disease despite therapy.[50] Mucociliary clearance is impaired in cigarette smoke exposure. Smokers older than 60 years old are less likely than younger smokers to attempt quitting, and the benefits of cessation are somewhat less among the elderly.[51]

SUMMARY

Rhinitis and sinusitis are common medical conditions that affect the geriatric population and have a significant impact on their QOL. Because few studies examine differences in the clinical management between the geriatric and general adult population, therapies should be based on current guidelines as outlined by the AAO-HNS, EPOS, and ICAR. Special considerations should be made when treating these patients in regards to multiple comorbidities and the potential for drug interactions from polypharmacy. Further research on the pathogenesis of sinusitis in the geriatric population may provide specific differences in the clinical management in this population.

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