Allergic Rhinitis and the Unified Airway: A Therapeutic Dilemma

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KEYWORDS

• Allergic rhinitis • Unified airway • Immunotherapy • Asthma

Within evidence-based clinical medicine/surgery, there has been an increased awareness that inflammatory diseases of the upper and lower airways act not as individual entities but more as an integrated unit. The pathophysiologic mechanisms that activate inflammatory cascades and release of systemic mediators stimulate all components of the respiratory tree, that is, nose, sinuses, and lungs—a unified airway (**Fig. 1**).[1,2] The notion of a unified airway suggests that distinct clinical diseases are not mutually exclusive of one another in a vacuum but act as part of a spectrum of respiratory disequilibrium throughout the upper and lower pulmonary tree.[3,4] An international surgical panel convened several years ago and developed a consensus statement, "…when preparing patients for surgery…considering a diagnosis of allergic rhinitis, rhinosinusitis, or asthma, an evaluation of both the upper and lower airways should be made."[3] Treating the unified airway as an integrated unit may improve overall pulmonary function and health-related quality of life.[3,4]

The oral and maxillofacial surgeon sees patients who present with an array of airway comorbidities concurrently with oral and maxillofacial diseases. Three most frequently seen disease entities are AR, maxillary sinusitis (rhinosinusitis), and asthma. The following scenario is often presented:

> *A patient has rhinorrhea, sneezing, nasal congestion, and itchy watery eyes in the spring, similar symptoms have occurred annually. Over-the-counter allergy pills have failed to improve symptoms and, when administered, cause dry mouth and somnolence. On physical examination, conjunctivae are injected and nasal mucous membranes are pale, wet, and boggy, and, on auscultation of lungs, there is significant bronchial hyperactivity.*

The role/pathogenesis of AR in the unified airway is the focus of this article. The author attempts to provide an overview of AR and its association with upper and lower airway diseases in order to provide a further understanding of how AR acts as a catalyst supporting the unified airway concept. Allergic rhinitis (AR) is described in terms of its epidemiology, pathophysiology, and recent options for successful treatment that can be applied in everyday practice. (Rhinosinusitis and asthma are briefly addressed, and the reader is referred to the references throughout this text for further reading.)

EPIDEMIOLOGY

Within the United States, numerous epidemiologic studies have shown AR to be a significant public health problem.[5] Prevalence rates have ranged between 15% and 40%, and the condition has been estimated to affect 20% of the adult population and 40% of the pediatric population.[5,6] There are approximately 17 million physician office visits annually with prescriptions, either by doctors or over the counter, that cost in excess of $4.5 billion per year.[7] When health-related quality of life is measured, an estimated 3.8 million lost work and school days have been tallied and there is a statistically diminished quality of life when compared with the control, that is, the normal population.[4,8] It is evident that AR has a significant impact on societal production and everyday health in both adults and children.

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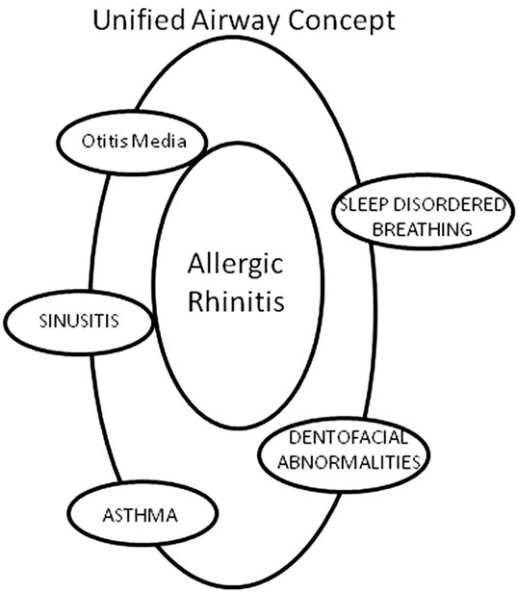

Fig. 1. Unified airway and AR.

There exist epidemiologic links among AR, rhinosinusitis, and asthma—an AR-rhinosinusitis-asthma cascade.[9,10] Rhinosinusitis affects 30 million people in North America. It accounts for an estimated $2 to $3 billion in health care costs annually, and patients spend approximately 150 million for products prescribed or recommended.[11] Yet, sinus infections are among the most frequently misdiagnosed and misunderstood diseases in clinical practice. Studies that have measured immune responses to various allergens and subsequent histopathologic sequelae in the nasal and paranasal sinuses hypothesize a model of pathogenesis of rhinosinusitis to be predicated on previous bouts of AR.[12,13]

The correlation of AR and asthma is significant. Asthma affects approximately 7% of the US population.[6] It has a significant economic impact annually of $16 billion, of which $11.5 billion are in direct costs, with $5 billion as prescriptions. Indirect costs due to lost productivity account for greater than $1.7 billion annually.[14,15] Asthma and AR occur together at a greater rate than each individually. Rates of patients who have both diseases range from 19% to 38%.[11] Multiple clinical studies using retrospective chart reviews have shown that AR is present in 50% to 85% of patients examined with asthma symptoms. In one study of 1245 patients, 52% of patients with asthma also were diagnosed with either seasonal or nonseasonal AR.[9,10] AR as a risk factor for asthma has been further tested within the *United States and globally.[16] A study in Finland using questionnaires over 3 decades found that patients who reported hay fever in 1975 had a 4-fold increased risk for asthma 15 years later. There was a sexual predilection, with women reporting a 6-fold increased risk for developing asthma 15 years after initial diagnosis with hay fever.[17] Halpern and colleagues[18] studied a claims database (n = 27,398) of patients with asthma and concomitant AR. The presence of rhinitis was associated with more asthma medication and prescription costs. Dixon and colleagues[19] correlated the relationship among AR, sinusitis, and asthma using a database from the American Lung Association—Asthma Clinical Research Center. The investigators found that AR and rhinosinusitis were the 2 most common comorbid associated sequelae observed in patients with poorly controlled asthma. These 2 disease entities significantly influenced the symptoms of asthma as measured by histopathologic markers that were common to both diseases (see the section "Pathophysiology").

It is being examined if clinically diagnosed AR is more common in patients with asthma or if there is a more severe disease complex with both diseases. Although the epidemiologic databases mentioned earlier suggest compelling evidence linking AR to sinusitis and asthma, more prospective studies are needed to support this premise.

PATHOPHYSIOLOGY

The pathophysiology of AR is a result of the immunologic response to 1 or more aeroallergens that interact with genetic factors. This may begin in utero and continue throughout the life of the individual. Shinohara and colleagues[20] suggested that symptoms of AR in women during early pregnancy are associated with a higher prevalence of AR in their offspring. Seasonal AR occurs as such during seasons of pollen production, tree blooming, and ragweed growing. This condition is characterized as hay fever. All 3 incite inflammatory cascades, eliciting specific symptoms (see sections on diagnosis and treatment). Nonseasonal AR or perennial AR is the result of exposure to animal dander, cockroaches, mold, and dust mites. This is the more chronic form of AR occurring annually.

Most aeroallergens are sized between 10 and 100 μm and can be captured by the nasal mucosa.[21,22] The nose provides an effective filtering system for aeroallergens whose particles are 10 μm in size. This effectiveness decreases when particles are between 1 and 2 μm. It is not just the deposition of aeroallergens on the mucosa but the cascade of immunologic events that leads to the clinical expression of AR. Allergic sensitization and subsequent steps occur in a specific