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Review

An Overview of Acute Bronchitis and Upper Respiratory Tract Infections

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Abstract

A variety of viruses and bacteria can cause upper respiratory tract infections. These cause a variety of patient diseases including acute bronchitis, the common cold, influenza, and respiratory distress syndromes. Defining most of these patient diseases is difficult because the presentations connected with upper respiratory tract infections commonly overlap and their causes are similar. Upper respiratory tract infections are characterized as self-limiting irritation and oedema of the upper respiratory tract, along with coughing and no evidence of pneumonia, in a patient without a background of chronic obstructive pulmonary disease, emphysema, or chronic bronchitis or any other disease that would contribute to their symptomology. A typical upper respiratory tract infection includes an organism directly invading the membrane of the upper respiratory tract. Acute bronchitis is a medical term that refers to a self-limiting pulmonary inflammation which is marked by cough but not pneumonia. It is believed that acute bronchitis is an inflammatory reaction to infectious diseases of the bronchial epithelium.

Keywords: *bronchitis, upper respiratory tract infection, common cold, influenza*

Introduction

Acute bronchitis (AB) is a medical term that refers to a self-limiting pulmonary inflammation which is marked by cough but not pneumonia. Each year, the condition affects about 5% of American adults with colder months showing increased prevalence than warmer months (1, 2). Upper respiratory tract infections (URTI) are characterized as self-limiting irritation and oedema of the upper respiratory tract, along with coughing and no evidence of pneumonia, in a patient without a background of chronic obstructive pulmonary disease (COPD), emphysema, or chronic bronchitis or any other disease that would contribute to their symptomology. Major passages such as the nose, sinuses, pharynx, and larynx are all affected by URTI.

Though viruses have only been identified in a small percentage of patients, they are typically believed to be the root of AB (2, 3). The influenza A and B viruses, parainfluenza viruses, respiratory syncytial viruses, coronaviruses, adenoviruses, and rhinoviruses are among those detected in AB. The responsible pathogen has been determined to be the human metapneumovirus (4-6). A viral etiology was found in 37% of 164 instances of severe bronchitis in a new French study which involved people who had received an influenza vaccination, with rhinovirus accounting for 21% of those cases (3). As a result, the output of pathogenic microbes fluctuates depending on a number of variables, such as the occurrence of an epidemic, the time of year, and the public's vaccination history for influenza. Bacterial species commonly implicated in community-acquired pneumonias are isolated from the sputum in a minority of patients with AB (2). However, the role of these species in the disease or its attendant symptoms remains unclear because bronchial biopsies have not shown bacterial invasion. In some cases, atypical bacteria are important causes, including *Bordetella pertussis*, *Chlamydophila* (Chlamydia) *pneumoniae*, and *Mycoplasma pneumoniae* (2). Some data have suggested that *B. pertussis* may underlie 13 to 32% of cases of cough lasting six days or longer, although in a recent prospective study, *B. pertussis* comprised only 1% of cases of AB.

Methodology

This study is based on a comprehensive literature search conducted on January 1, 2023, in the Medline and Cochrane databases, utilizing the medical topic headings (MeSH) and a combination of all available related terms, according to the database. To prevent missing any possible research, a manual search for publications was conducted through Google Scholar, using the reference lists of the previously listed papers as a starting point. We looked for valuable information in papers that discussed the information about an overview of acute bronchitis and upper respiratory tract infections. There were no restrictions on date, language, participant age, or type of publication.

Discussion

It is believed that AB is an inflammatory reaction to infectious diseases of the bronchial epithelium. After influenza, it has been shown that epithelial-cell desquamation and depleting of the respiratory tract to the scale of the basement membrane occur in conjunction with the existence of a lymphocytic cellular infiltration. Microscopic analysis of a tracheobronchitis revealed thickness of the bronchial and tracheal mucosa in accordance with the inflamed regions (7). These pathologic results are compatible with observations of AB identified by positron-emission tomography with the tracer 18F-fluorodeoxyglucose and proximal lower inflammatory processes restricted to the bronchi (8). The anatomic spread of numerous microorganisms that can trigger AB, nevertheless, varies greatly. For instance, in an investigation includes volunteers who had been revealed to a rhinovirus, the virus was found in samples of stimulated sputum taken from all the participants, in about one-third of bronchial tissue biopsies, in almost a fourth of bronchoalveolar lavage samples, and in over one-third of bronchial brushing samples (9). The association between rhinovirus infection (and other alleged upper respiratory viral infections) and asthma aggravation may be explained by such findings, which point to viral infection of the lower passages (10). Accordingly, based on the extent of viral inclusion of the major and minor air passages, AB may be associated with a variety of manifestations, despite the term suggesting exclusively large-airway condition.

A typical URTI includes an organism directly invading the membrane of the upper respiratory tract. Infected droplets are typically inhaled in order to contract the pathogen. The pathogen-trapping hair lining and the organism-trapping mucus are two obstacles that keep the microbe from adhering to the mucosa, ciliated epithelium in the terminal air passages which return the microorganisms to the pharyngeal mucosa, the angle between the pharynx and nose that stops microorganisms

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from entering the passages, and the pharynx and nose angle.

In addition, the tonsils and adenoids have immune system cells that fight off viruses.

Influenza

The duration between the beginning of symptoms and the incubation time for influenza is believed to be three to four days. One day prior to the appearance of manifestations, the virus may shed its coat. Influenza is thought to spread between people by immediate communication, indirect contamination, aerosols, or airborne contaminants. The typical need for touch and droplet transfer between the origin individual and the vulnerable person is close proximity (1 meter). Transmission using airborne means can happen at greater distances (>1 m). The majority of evidence-based information points to immediate communication and droplet transmission as the primary techniques of influenza spread (11).

Common Cold

Rhinoviruses, adenoviruses, parainfluenza viruses, respiratory syncytial viruses, enteroviruses, and coronaviruses are some of the microorganisms that cause the common cold (CC). The most likely source of CC and up to four-fifths of all respiratory illnesses in seasonal peaks is the rhinovirus (12). Detection, characterization, and elimination of rhinoviruses are difficult because of the numerous rhinovirus serotypes and rapid antigenic variations between them. Rhinovirus proliferation and transmission are assumed to start following mucociliary transfer to the rear nasopharynx and adenoids after lodging in the anterior nasal membrane. Complaints could start as soon as ten to twelve hours after the vaccination. Although clinical manifestations last between seven and ten days on average, they can last up to three weeks. Vasodilation and enhanced vascular permeability are brought on by a nasal mucosal invasion and the following inflammation of the organism. While cholinergic excitation triggers mucus generation and sneezing, these actions cause nasal blockage and rhinorrhea.

The early stages of an illness make it difficult to differentiate between AB and mild URTI. The findings of lung function tests may turn out to be aberrant throughout the extended duration when cough lasts for over than five days with AB. As evaluated by bronchial stimulation, 40% of patients experience substantial drop in forced expiratory volume in one second (i.e., a value below 80% of the expected value) or bronchial hyperresponsiveness, which improves over the course of the next five to six weeks (13). Cough after AB typically persists for 10 to 20 days but occasionally may last for four or more weeks. In a recent report on a clinical trial of the efficacy of an acellular pertussis vaccine involving 2781 healthy adults, the median duration of cough from AB due to all causes was 18 days (mean, 24) (14). In addition, around 50% of patients with AB report the production of purulent phlegm. In otherwise healthy patients, purulent phlegm usually indicates the presence of sloughed tracheobronchial epithelium and inflammatory cells, and its positive predictive value for the presence of alveolar disease is low (approximately 10%) (15). Statistics on short term or long-term effects are scarce, but one investigation discovered that up to 20% of patients had returned to their doctors within a month after the original appointment due to lingering or reoccurring problems (2). AB episodes may have protracted effects on a patient's pulmonary health. In one investigation, after three years of follow-up, 34% of patients with AB were given a fresh label of chronic bronchitis or asthma (16). In a different study, 65% of individuals with recurring incidences of AB had minor bronchial asthma identified either on spirometry or bronchial provocation (17). These investigations appeared to lack comparison groups; thus, it is unknown if the AB caused the chronic condition or whether the chronic illness or the predisposition for its onset existed at the point the major tract was inflamed.

It is important to distinguish between AB and acute inflammation of the air passages, such as asthma or bronchiolitis, which frequently manifests as a worsening cough followed by patient experiencing wheeze, becoming. tachypneic and hypoxemic and undergoing respiratory distress. It must also be recognized from bronchiectasis (18), a separate condition characterized by persistent bronchial dilatation and persistent cough. The diagnosis of chronic bronchitis is only given to patients with coughing and sputum production over most days of the month for at least three months of the year for two years consecutively. A thorough account recording that includes details about interactions with an ill person and a physical assessment may point to a particular reason. A two- to three-week-long cough in an adolescent or young adult is a typical pertussis manifestation; pyrexia is less typical of it than of viral infection (17, 19). The positive predictive value (PPV) of early age, persistent coughing, or the lack of fever for pertussis is, nevertheless, minimal in the lack of

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an epidemic. The presence of both a cough and a fever were found to have a 79% PPV for flu during an outbreak (20).

It is enough to identify the common cold when the basic symptoms of rhinovirus infection are present and there are no indications of bacterial infection or a serious respiratory illness. Since the common cold may be diagnosed clinically, no additional clinical test is required. When screening for influenza, collect samples as soon as feasible after the symptoms begin. The best samples to collect when evaluating newborns and small children are nasal aspirates and swabs. Nasopharyngeal swabbing and aspiration are preferable for older children and adults. To exclude bacterial pharyngeal infection, rapid strep swabs can be utilized, that could reduce the amount of medicines needed for these illnesses.

Coughing suggests bronchitis rather than pneumonia when there is no temperature, tachycardia, or tachypnea. In addition, the chance of pneumonia is reduced to the degree at which additional clinical testing is typically avoided by the presence of healthy vital signs and the lack of rales and egophony on pulmonary inspection (21). Old people with coughing, though, are an exception; pneumonia in geriatric persons is frequently marked by a lack of recognizable symptomatology. Only 30% of patients with community-acquired pneumonia who were 75 years of age or older had a temperature higher than 38°C, and only 37% had a heart rate of more than 100 beats per minute (22). For a number of the microorganisms connected directly to AB, rapid diagnostic tests are available. However, not all rapid testing is generally accessible, and frequent usage of them in an outpatient context is not economical. When the presumed microorganism is remediable, the illness is known to spread across the community, and the patient exhibits indicative complaints or indications, rapid testing should be employed in most cases (e.g., testing for influenza during influenza season in patients with cough and fever). As an alternative to culture or monoplex PCR, multiplex polymerase-chain reaction (PCR) screening of nasopharyngeal swabs or aspirates is being established to identify infections caused by *B. pertussis*, *M. pneumoniae*, or *C. pneumoniae* with better therapeutic sensitivity and specificity (23).

Treatment

The majority of AB cases do not call for the use of antibacterial drugs. Systematic reviews of medical studies have indicated that antimicrobials may, albeit only little, shorten the length of complaints. In particular, a meta-analysis of eight trials including individuals with AB found that erythromycin, doxycycline, or trimethoprim-sulfamethoxazole usage reduced severity by a small percentage every day. Although therapeutically insignificant, the findings were statistically significant (24). After the completion of the meta-analysis, the outcomes of a randomized, double-blind study studying a five-day course of azithromycin in 112 patients with vitamin C in 108 patients (total dose of each agent, 1.5 g) revealed no differences among groups in the health-related life quality at seven days (the main finding) or in the number of participants who went back to work, school, or daily tasks at home on day three or seven (25). A significant but slight decrease in the length of cough was also observed in one review (26). The number of days spent experiencing ill health decreased nonsignificantly, while the number of antibiotic-related side-effects increased nonsignificantly. When a curable organism is discovered, antibiotic treatment may be more advantageous than when one is not. For instance, in individuals with illnesses brought on by viruses that are vulnerable, anti-influenza medications (such as oseltamivir and zanamivir) lead to a quicker return to regular activity (by 0.5 day) and a reduction in complaint durations of about one day. It is recommended that whooping cough patients receive antibiotics as soon as possible to prevent further propagation, but there is currently no persuasive evidence to suggest that this will lessen the severity or length of coughing (with the possible exception of treatment started within the first week of symptoms). Similarly, it is unknown if antimicrobial treatment of bronchitis caused by *M. pneumoniae* or *C. pneumoniae* affects results, despite the fact that multiple families of antimicrobials have in vitro action against these pathogens.

Complaint alleviation is the main objective of therapy for the CC. Adults can reduce coughing, congestion, and other problems using decongestants and antihistamine/decongestant pairings (7). Avoid giving youngsters cough medicines (8). Adults who experience rhinorrhea and sneezing within the first two days of a cold may find that H1-receptor antagonists offer a little improvement (27). First-generation antihistamines are sedative, so caution should be used when taking them, according to the patient. In adults and adolescents, nasal decongestants (such as topical oxymetazoline and oral pseudoephedrine) offer a modest advantage in lowering nasal airflow resistance. Antimicrobial agents are not recommended for the management of the CC since they do not reduce symptoms or decrease the length of the

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sickness, according to evidence-based information (8, 27). Dextromethorphan's utility for treating acute coughs is likewise unconvincingly supported by the data (8, 27). A Cochrane Review found that vitamin C, taken as an everyday prophylactic at dosages of at least 0.2 grams, had a small but consistent impact on the length and intensity of CC manifestations (9). Large vitamin C concentrations have not, however, demonstrated a definite effect when administered clinically after the beginning of symptoms (9).

Prompt antiviral therapy (AVT) for influenza infection minimizes the duration of hospital admissions, the severity of repercussions, and the longevity of influenza manifestations. The Centers for Disease Control and Prevention regularly revise their guidelines for treating influenza depending on epidemiological information and antiviral resistance trends. Administer AVT for influenza in 48 hours (or sooner) of the appearance of symptoms, and if rapid testing is not available, do not postpone therapies for laboratory confirmation. Even 48 hours after starting AVT, pregnant women and other high-risk individuals can still benefit (10).

The most effective way to avoid getting influenza is through vaccination. In some circumstances or when vaccination is not accessible or not feasible, prophylaxis using antivirals should be taken into consideration as a supplement to vaccination (70% to 90% effective). Prophylaxis using antivirals is typically used in influenza for the following groups of people: (1) high-risk individuals who cannot obtain vaccination (due to contraindications) or in those who latest vaccination does not, or is not anticipated to, manage an adequate protective immunity; (2) attempting to curtail outbreaks in high-risk individuals in institutional contexts; and (3) high-risk individuals who have been exposed to influenza (13).

Conclusion

Based on the extent of viral invasion of the major and minor air passages, AB may be associated with a variety of manifestations, despite the term suggesting its exclusivity as a large-airway condition. It is important to distinguish between AB and acute inflammation of the air passages, such as asthma or bronchiolitis, which frequently manifests as a worsening cough followed by patient experiencing wheeze, becoming. tachypneic and hypoxemic and undergoing respiratory distress. On the other hand, a typical URTI includes an organism directly invading the membrane of the upper respiratory tract. Infected droplets are typically inhaled in order to contract the pathogen. The early stages of a respiratory illness make it difficult to differentiate between AB and mild URTI. In case of AB, the findings of lung function tests may turn out to be aberrant throughout the extended duration when cough lasts for over five days.

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Conflict of interest

There is no conflict of interest

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Non applicable

Data availability

Data that support the findings of this study are embedded within the manuscript.

Author contribution

All authors contributed to conceptualizing, data drafting, collection and final writing of the manuscript.

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