Acute bronchitis is a self-limiting inflammation of the lower respiratory tract, specifically the bronchi. It is usually caused by a viral infection (90% of cases). A cough is the most prominent symptom of acute bronchitis. Symptoms may last up to three weeks. Children under 5 years of age are more likely to develop acute bronchitis, and 2 common differential diagnoses should be ruled out: bronchiolitis and pneumonia. Management is usually conservative: adequate hydration and non-steroidal anti-inflammatory drugs, if needed, for symptomatic relief. Antibiotics are usually not given as part of treatment unless the patient develops a secondary bacterial infection.

Definition of Acute Bronchitis

Acute bronchitis is an acute inflammation of the mucous membrane of the bronchi. Due to its pathogenesis, it is frequently accompanied by an upper respiratory tract infection. In cases where the trachea is also involved are referred to as tracheobronchitis. Bronchitis can be infectious or irritative acute, depending on the cause.
Epidemiology of Acute Bronchitis

Acute bronchitis is widespread

Acute bronchitis is a very common disease. It occurs frequently during the winter months and affects both genders equally. Children and adolescents are more prone to developing acute bronchitis than adults.

Because it is so common, diagnosis is often made prematurely or too quickly in the absence of laboratory parameters that could point practitioners in the right direction. Not every cough that accompanies an upper respiratory tract infection is caused by an inflammation of the mucous membrane of the bronchi.

Etiology and Pathogenesis of Acute Bronchitis

Viruses are the most common cause of acute bronchitis

In most cases, acute bronchitis is preceded by an upper respiratory tract infection. Approximately 90% of all cases of acute bronchitis are caused by viruses. Other pathogenic agents such as bacteria, fungi, or chemical irritants are rarely the primary cause of this disease.

Inflammatory causes of acute bronchitis

As a rule, the inflammation is caused by individual pathogens such as myxoviruses (influenza viruses or parainfluenza viruses), which are transmitted via droplets (through coughing).

Other viruses include the adenovirus, coxsackievirus, and echovirus. The most common virus in children is the respiratory syncytial virus (RSV).

Upon entering the system, the viruses make their way through the mouth or the nose and throat area, respectively, via the trachea into the primary bronchi. Once there, they attack the cells of the mucous membrane of the bronchi and impair ciliary function. Mucus and pathogens are then removed from the bronchi more slowly or to a lesser extent than usual, leading to increased mucus production. This results in mucus accumulation, which, in turn, leads to an irritation of the sensors along the airway prompting cough.

Coughing in the context of acute bronchitis is considered to be the body’s reaction to the expectoration of mucus—that is, a typical cough with acute bronchitis represents a
fallback mechanism to ensure mucociliary clearance that is no longer provided by the cilia under attack.

Figure A shows the location of the lungs and bronchial tubes in the body. Figure B is an enlarged, detailed view of a normal bronchial tube. Figure C is an enlarged, detailed view of a bronchial tube with bronchitis. The tube is inflamed and contains more mucus than usual.

Viral acute bronchitis turning into a secondary superinfection due to bacteria

As noted, only 10% percent of all cases of acute bronchitis are not caused by viruses. In these much rarer cases, primary bacterial bronchitis is likely to present, usually due to severe underlying disease. It is possible, however, that a viral infection is followed by a secondary bacterial infection (bacterial superinfection), meaning that the mucous membrane of the bronchi, which was previously attacked by viruses, is now being attacked by a bacterial infection.

The most common bacterial pathogens of acute bronchitis are:

- Streptococci
- Haemophilus influenzae
- Chlamydia
- Pneumococci
- Staphylococcus aureus
- Mycoplasma pneumoniae
Irritative causes of acute bronchitis

Acute bronchitis may also be caused by noxious agents that are not infectious in nature; these are referred to as irritative causes. In many cases, these included inhaled vapors or gases, but also smoke. Foreign body aspiration may also cause acute bronchitis.

- Ammonia
- Hydrochloric acid
- Sulfur dioxide
- Nitrous gases
- Ozone
- Fluorinated hydrocarbon
- Cadmium oxide
- Platinum salts
- Radiation treatment for cancer

Another important noninfectious cause of acute bronchitis is so-called congestive bronchitis, which results from advanced left ventricular insufficiency.

Progression of Acute Bronchitis

The progression of uncomplicated acute bronchitis

**First signs of acute bronchitis**

As a rule, acute bronchitis is noticeable from 1 to a few days after an individual has become infected. The incubation period is strongly dependent on the pathogen, however. Viruses have a relatively short incubation period, whereas bacterial pathogens take longer to incubate. The first signs of acute bronchitis include flu-like symptoms such as fever and fatigue, as well as upper respiratory tract complaints. Bronchial symptoms generally manifest themselves only after the bronchi have become infected.

**Typical bronchial symptoms include:**

- Dry, often nagging cough that later becomes productive
- Rattling sounds, or whistling and wheezing during auscultation

**Other symptoms that are caused by a viral infection with bronchial involvement include:**

- Sore throat, headache, and body aches
- Hoarseness
- Retrosternal burning pains
- Night sweats

**Symptoms during the progression of uncomplicated acute bronchitis**

A few days after the disease takes hold, the dry cough usually turns into a productive cough with thick, mostly clear discharge. A cough may, however, remain dry over the entire progression of the disease.

**Key symptoms of bronchitis are:**

- A nagging cough
Soreness in the thorax area
A red throat
Enlarged lymph nodes in the Waldeyer’s ring area

As a rule, uncomplicated acute bronchitis heals within 1 to 3 weeks without further complications or any after-effects.

The progression of obstructive (spastic) acute bronchitis

Acute bronchitis may be complicated by bacterial superinfection. The key symptoms for an existing bacterial secondary infection are an acute, often nagging dry cough, and yellow or, sometimes, green discharge. This discharge is not present in a purely viral infection. In addition, there are significantly pronounced breathing sounds such as wheezing and rattling and, in some cases, dyspnea and expiratory stridor. Should any of these symptoms exist, the probability of obstructive or spastic bronchitis is high.

Note: The key symptom is an acute, often nagging dry cough.

Diagnosis of Acute Bronchitis

Medical history and clinical signs as key pieces in diagnosing acute bronchitis

Uncomplicated acute bronchitis is usually diagnosed by reviewing the patient’s medical history and performing a physical examination. Laboratory tests are only required in rare cases.

The patient's medical history and physical examination will show the following:

- Acute onset of the disease
- Accompanying flu-like symptoms
- Cough (frequently nagging)
- Retrosternal pains
- Unremarkable auscultation findings
- Occasionally, regionally enlarged lymph nodes

Further diagnostic tools for acute bronchitis

If the patient’s medical history and clinical signs do not lead to a clear diagnosis, the following diagnostic procedures should be considered:

- Laboratory tests (erythrocyte sedimentation rate, C-reactive protein, leukocytes)
- A test to detect viral pathogens (only necessary in rare cases)
- *Chest X-rays* (if pneumonia or a tumor is suspected)
- Microbiological sputum test
- Bronchoscopy (in cases of possible hemoptysis)
- Tests to detect thrush and *Candida albicans* in cases of immunosuppression or immune deficiency, respectively

Note: As a rule, diagnosis is made via the patient’s history and physical examination.
Differential Diagnosis

Diseases similar to acute bronchitis

As a rule, acute bronchitis is easy to diagnose and does not require any far-reaching considerations with regard to differential diagnoses. It is important, however, to differentiate between acute bronchitis and the following conditions:

<table>
<thead>
<tr>
<th>Differential diagnoses</th>
<th>Exclusion measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asthma bronchiale</td>
<td>Immunoglobulin test, pulmonary function test, allergy tests</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>Chest X-rays</td>
</tr>
<tr>
<td>Influenza</td>
<td>Detecting viruses</td>
</tr>
</tbody>
</table>

Close attention should be paid to cases of recurrent bronchitis, as these may point toward chronic bronchitis but also toward diminished immunological defense. Further considerations regarding differential diagnoses should include the following:

<table>
<thead>
<tr>
<th>Differential diagnoses</th>
<th>Exclusion measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuberculosis</td>
<td>Detecting mycobacteria/ chest X-rays</td>
</tr>
<tr>
<td>Diphtheria</td>
<td>Pseudomembranes, swab</td>
</tr>
<tr>
<td>Pseudocroup</td>
<td>Hoarseness, strong stridor, swab</td>
</tr>
<tr>
<td>Chronic bronchitis</td>
<td>Patient’s history, pulmonary lung function</td>
</tr>
<tr>
<td>Bronchogenic carcinoma</td>
<td>Patient’s history, chest X-rays</td>
</tr>
<tr>
<td>Pulmonary metastases</td>
<td>Chest X-rays</td>
</tr>
<tr>
<td>Pulmonary embolism</td>
<td>Scintigraphy, X-ray CT</td>
</tr>
</tbody>
</table>

Therapy of Acute Bronchitis

Treating acute bronchitis

If the disease progresses without complications, only the symptoms should be treated and antibiotic pharmaceuticals should not be prescribed.

Symptomatic treatment should include secretolytic therapy, such as avoiding the inhalation of noxious agents like cigarette smoke and, if necessary, administering antitussive agents such as codeine or noscapine. In cases of increased, simultaneous flu-like symptoms, analgesics, and antipyretics may also be administered.

Medications for acute bronchitis

In cases of bacterial superinfection with protracted progression or fever, or purulent, yellowish or green sputum, antibiotics should be administered. A more targeted approach includes pathogen detection and an antibiogram.

Note: In most cases, treatment is symptomatic.

Progression and Prognosis of Acute Bronchitis
Mostly good prognosis of acute bronchitis

Acute bronchitis usually spontaneously heals after 1 week without any complications. In most cases of protracted progression with bacterial involvement, acute symptoms do not last longer than 2 to 3 weeks. The cough may extend past the acute stage, however, and last some time longer due to existing a bronchial hyperreactivity.

Complications

While the progression of acute bronchitis is, in most cases, uncomplicated and does not pose any health consequences, it can sometimes turn into a more serious disease with consequences for at-risk patients, including:

- Bed-ridden, elderly individuals
- Smokers
- Patients with chronic obstructive pulmonary disease (COPD)

Among these groups, there is a risk of exacerbating acute bronchitis, and the resulting complications may take a life-threatening turn. The following diseases may result from complications of acute bronchitis:

- Bronchopneumonia
- Chronic bronchitis
- Bronchiolitis obliterans
- Bronchiectases

Individuals who frequently suffer from acute bronchitis (in children, more than 6 to 10 bronchitis episodes per year; in adults, more than 3 to 4 episodes per year), should have their pulmonary function tested, as frequent episodes of the disease may be an indicator of immune deficiency, asthma bronchiale, or, sometimes, bronchial tumor.

Acute Bronchitis in Children

Diseases in children such as measles, pertussis, and mumps may also cause acute bronchitis. As the lower respiratory tract in babies, infants, and children has not yet fully developed, a viral infection of the bronchial area can quickly lead to an inflammation of the bronchioles (bronchiolitis). In severe cases, this may lead to massive obstruction of the lower airways.

The most common cause of acute bronchitis in children is RSV. The most common bacterial pathogens are:

- Chlamydia pneumoniae
- Streptococcus pneumoniae
- Haemophilus influenzae
- Mycoplasma pneumoniae
- Moraxella catarrhalis

Review Questions

The answers are below the references.

1. Decreased lung volume during expiration is supported by:
A. Flow resistance in the lumen of the respiratory bronchioles.
B. The surface tension of the alveoli.
C. The formation of surfactant.
D. Activating the scalene muscles (mm. scaleni).
E. Bronchoconstriction in early expiration.

2. Which statement is not true? The following are involved in the design of the blood-air-barrier:

   A. Cytoplasm of the endothelial cells of the capillaries.
   B. Merged basal membranes of the capillaries and the alveolar epithelium.
   C. Cytoplasm of the alveolar epithelial cells.
   D. Alveolar macrophages.
   E. Surfactant.

3. Which statement regarding the pulmonary surfactant is NOT true?

   A. It is a mix of surface-active substances of the alveolar epithelium.
   B. It increases surface tension in the alveoli.
   C. It is produced by alveolar cells.
   D. It contributes to the prevention of atelectasis.
   E. It contains lipids.

References


Correct answers: 1B; 2D; 3B

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