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Bronchiectasis: Pathophysiology and Management

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Bronchiectasis: Pathophysiology and Management

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Pathophysiology of Bronchiectasis

Introduction

Bronchiectasis is a chronic respiratory condition that can decrease the quality of life of patients with this disease. It is a critical and essential topic for discussion amongst health care professionals, especially nurse anesthetists, due to its increased risk of surgical complications and long-term effects. Health care professionals taking care of these patients need to know different techniques to manage and improve the quality of life with these patients. This poster seeks to educate and inform those in the medical profession about bronchiectasis and help increase awareness on this critical airway disease.

Underlying Pathophysiology

Bronchiectasis is a chronic disease characterized by irreversible thickening and bronchial dilatation, impaired mucociliary clearance, and repeated bronchial infections that lead to progressive lung damage (Corso et al., 2020).

The damage causing bronchial dilation is characterized by deficiency/loss of elastin and, in more advanced disease, by destruction of muscle and cartilage. There is variable bronchial wall fibrosis, atelectasis and parabrachial pneumonic change (King, 2009). Unfortunately, more studies need to be conducted to determine the cause of the loss of elastin and destruction of muscles.

Patients who are most at risk of developing bronchiectasis include:

- Those with abnormal lung anatomy
- History of childhood infections due to viruses (tuberculosis)
- Patients with immunodeficiencies such as HIV, lymphoma, myeloma, and immunoglobulin disorders
- Patients with Chronic Obstructive Pulmonary Disease (COPD) and Asthma
- Patients with Cystic Fibrosis have the highest risk

However, in some patients, there may be no clear initiating event or underlying cause (Pickstock, 2020).

Signs and Symptoms

the primary symptoms of bronchiectasis include:

- A persistent cough
- Trouble clearing mucus
- Reoccurring lung infections
- Shortness of breath
- Activity Intolerance/Fatigue
- Chronic Rhinosinusitis
- Weight loss

(Pickstock, 2020)

Once bronchiectasis is suspected, the main diagnostic features are:

- Internal diameter of a bronchus is wider than its adjacent pulmonary artery
- Failure of the bronchi to taper
- Visualization of bronchi in the outer 1–2 cm of the lung fields.

(King, 2009)

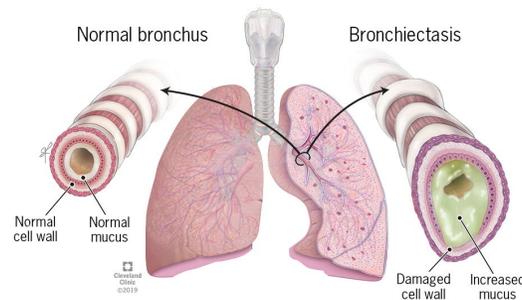
Diagnostic tests include:

- Sputum culture
- Chest x-ray
- High resolution computer tomography scan (HRCT)
- Spirometry

(Pickstock, 2020)

The majority of respiratory tract infections in primary care are self limiting, however patients presenting with persistent cough and daily production of a large volume of sputum with recurrent infections should alert clinicians to the possibility of Bronchiectasis

(Pickstock, 2020).



<https://my.clevelandclinic.org/health/diseases/21144-bronchiectasis>

Significance of Pathophysiology

Due to the differing causes of bronchiectasis, it is important for health care professionals to identify the possible causes and disease overlap in order to identify and treat patients with bronchiectasis effectively. According to a study by Uzel et al, (2020) "all patients with bronchiectasis should have sputum microbiological results in order to detect P. aeruginosa as soon as possible. As P. aeruginosa accompanies severe disease and mortality" (269).

Documentation of patient's history is very important and needs to be top priority to accurately be able to monitor and treat patients with this disease. Initial tests carried out in primary care might include a sputum culture to identify pathogens and enable targeted antibiotic treatment. (Pickstock, 2020).

Treatment options for those with bronchiectasis include:

- Antibiotic treatment specific to bacteria found in sputum culture
- Surgery to remove the diseased parts of the lung
- Lung transplant
- Inhalers/home oxygen

(Uzel et al., 2020)

Nursing Implications

Nurses play a large role in helping those diagnosed with this disease. Some implementations that nurses can apply to their practice to help these patients include:

- Providing education about bronchiectasis to the patient and family members
- Teach patients different airway clearing techniques to help manage secretions
- Help with self-image by encouraging patients or advocating for a psychology consult
- Provide health promotion suggestions such as tolerable exercise to help maintain or improve lung function

Airway Clearing Techniques

Airway clearance techniques are utilized in patients with stable bronchiectasis and can account for improvement in sputum expectoration, and lung function.

Different techniques that can be used with these patients include breathing treatments, airway oscillatory devices, high frequency chest wall oscillation and positive expiratory pressure.

Nebulizer breathing treatments can help deliver medication deep into the patient's lungs which helps mobilize sputum and make it easier for the patient to expectorate.

There are many different airway oscillation devices that can help patients mobilize secretions as well. Incentive spirometers assist in opening patient's lungs and help decrease the risk of pneumonia. The flutter valve or Acapella is more commonly used for these patients. This plastic device puts positive pressure back into the airway and helps shake up mucus so that it is easier to clear out of the lungs.

Airway oscillatory devices are very helpful in the mobilization of mucus and can be very beneficial in loosening deep mucus. There are several types of devices, the most common being vests that create vibrations to loosen mucus. This technique should be avoided in patients who are elderly or frail.

- Educate patients on the importance of smoking cessation
- Promote healthy diets to prevent malnutrition.

(Uzel et al., 2020)

Some clinical manifestations of the disease that nurses may expect to find include fatigue, difficulty with daily activities and persistent cough.

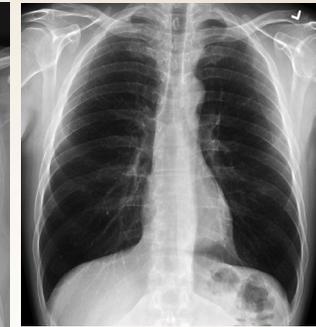
On clinical examination, there may be coarse crackles, wheeze, large airway rhonchi (low pitched snore-like sounds) on auscultation of the chest, and finger clubbing may be present. In addition, lower pulse oximetry readings may be common due to the increase of alveolar dead space and decreased sputum expectoration (Pickstock, 2020).

Airway with Bronchiectasis



<https://radiopaedia.org/articles/bronchiectasis>

Normal Airway



<https://radiopaedia.org/cases/normal-chest-x-ray>

Surgical Complications

Surgery of any kind can pose risks and complications to patients during and after surgery. Patients with bronchiectasis have an even higher risk of surgical complications due to the altered diameter of the bronchioles, the increased sputum production, and the fatigue accompanied by this disease.

A retrospective analysis performed by Yang et al. (2020) assessed whether bronchiectasis further increased the presence of postoperative pulmonary complications (PPC) following extra pulmonary surgery.

The PPC in this study is defined as:

- respiratory infection,
- respiratory failure
- pleural effusion
- Atelectasis
- Pneumothorax
- Bronchospasm

These complications were evaluated within the first seven postoperative days.

Bronchial dilation in bronchiectasis leads to impaired mucociliary clearance and failure to adequately clear mucus. Although the cause of PPC are not well known, the altered mucociliary clearance and mucus trapping probably cause atelectasis in bronchiectasis patients by hindering mucus expectoration (Yang et al., 2020).

Conclusion

Bronchiectasis is a condition that requires teamwork amongst all medical professionals, from inpatient surgical interventions to outpatient monitoring, to make sure that those living with bronchiectasis can have the best quality of life with this condition. Health care workers must understand the pathophysiology behind this condition to help reduce poor outcomes and anticipate the complications these patients may have, especially during and after surgery. Staying up to date on the current airway clearing techniques and management of these patients in the hospital can save lives and make a difference with patients suffering from this condition.

References



Additional Resources

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