

Otterbein University

Digital Commons @ Otterbein

Nursing Student Class Projects (Formerly MSN)

Student Research & Creative Work

Summer 7-29-2017

COPD: Emphysema

Nicole Nuxol

Otterbein University, nicole.nuxol@otterbein.edu

Follow this and additional works at: https://digitalcommons.otterbein.edu/stu_msn



Part of the [Nursing Commons](#)

Recommended Citation

Nuxol, Nicole, "COPD: Emphysema" (2017). *Nursing Student Class Projects (Formerly MSN)*. 208.
https://digitalcommons.otterbein.edu/stu_msn/208

This Project is brought to you for free and open access by the Student Research & Creative Work at Digital Commons @ Otterbein. It has been accepted for inclusion in Nursing Student Class Projects (Formerly MSN) by an authorized administrator of Digital Commons @ Otterbein. For more information, please contact digitalcommons07@otterbein.edu.

COPD: Emphysema

Nicole Nuxol, RN BSN

Otterbein University, Westerville, Ohio

Introduction

Working in the Critical Care Unit at Grant Medical Center, many of our patients admitted to the unit have a history of Chronic Obstructive Pulmonary Disease (COPD), and the disease can complicate their course of treatment. Working with this patient population, it is common for these patients to experience prolonged time on the ventilator and increased length of stay. Many patients have multiple admissions throughout the year with COPD exacerbation, thus decreasing lung function and increasing risk for mortality.

Chronic Obstructive Pulmonary Disease is the third leading cause of death in the United States and is affecting more than 32 million Americans (Mosenifar, 2017). The prevalence of the disease continues to rise and many people are unaware they even have the disease. Prevention is essential in decreasing the incidence of the disease and Advanced Practice Nurses (APN) play a vital role. Chronic Obstructive Pulmonary Disease (COPD) is a lung disease characterized by progressive airflow limitation resulting from small-airway disease and parenchymal destruction (Burt & Corbridge, 2013). The inflammation further weakens and destroys the alveoli, thus decreasing gas exchange. This collapse of lung leads to air trapping and further damage to the alveoli and narrowing of the airway (Burt & Corbridge, 2013). There are two types of COPD, chronic bronchitis and emphysema. Emphysema is abnormal permanent enlargement of air spaces distal to the terminal bronchioles, accompanied by the destruction of alveolar walls and without obvious fibrosis (Boka, 2016). Being able to understand the pathophysiology of emphysema will allow for providers to accurately assess patients and diagnosis the disease. Educating patients and family members about the disease and providing preventative education such as risk factors to the disease will help prevent escalation of disease.

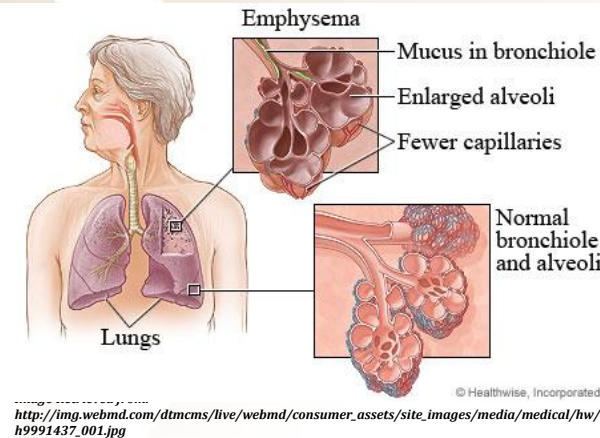


Image retrieved from: <https://s-media-cache-ak0.pinimg.com/736x/fb/d1/e3/fbd1e37e5350941d6050c211a0cd81e0.jpg>

Classifications of Emphysema

There are three classifications for emphysema. They are classified based off the region of injury. The three types include; centriacinar, panacinar, and paraseptal (King Han, Dransfield, & Martinez, 2017).

1. Centriacinar emphysema is mainly localized in the upper lung zone and is the most common type of emphysema (Boka, 2016). This emphysema is specific to the proximal respiratory bronchioles with focal destruction (Boka, 2016). Long term cigarette smoking and dust inhalation are the most common causes of this type
2. Panacinar emphysema is mainly located in the lower half of the lungs. This type of emphysema is usually present in individuals who are alpha1-antitrypsin deficient (King Han, Dransfield, & Martinez, 2017). In this type of emphysema, the entire alveolus is destroyed (Boka, 2016).
3. Paraseptal emphysema is mainly in the distal airway structures, alveolar ducts, and alveolar sacs (Boka, 2016). The process of destruction occurs near the septae of the lungs or pleura and is at risk for spontaneous pneumothorax (Boka 2016).



Pathophysiology

There are two types of emphysema, primary and secondary emphysema. Primary emphysema has a genetic component. Primary emphysema is an autosomal recessive trait of alpha-1-antitrypsin deficiency. Alpha-1 antitrypsin is a proteinase inhibitor and is made in the liver. This gene is a mutation in the *SERPINA1* gene located in the 14th chromosome. This protein helps protect the lungs from damage. If not enough is made, then damage can occur and lead to emphysema (Izaguirre Anariba, 2017). Secondary emphysema usually caused by environmental factors, mainly from cigarette smoke, occupational and air pollutants (Boka, 2016). Below discusses the pathophysiology behind emphysema.

- Foreign antigens infiltrate the lung epithelial cell barrier (Boka, 2016).
- Inflammatory immune cells respond. These include polymorphonuclear cells, eosinophils, macrophages, CD4, CD8 lymphocytes (Sharafkhaneh, Hanania, & Kim, 2008).
- The immune cells transport the antigens to the bronchial associated lymphatic tissue layer (Boka, 2016).
- Release of neutrophils, chemotactic factors occur (Boka, 2016).
- Proteolytic enzymes are released mainly by macrophages, which destroys the lungs epithelial barrier (Boka 2016).
- Proteases and free radicals are released from neutrophils to further damage the epithelial basement membrane (Boka 2016).
- T lymphocytes in the sputum are mainly CD8 cells. These cells release chemotactic factors to recruit more cells such as cytokines. This leads to structural change to the lungs (Boka 2016).
- Oxidative stress (produced from cigarette smoke and released from inflammatory cells) and protease (produced by inflammatory, macrophage, and epithelial cells) production further increases the inflammation (Boka 2016).
- Protease and anti-protease imbalance causes bronchiolar edema and breakdown of lungs elastin (Boka 2016).
- Thus, causing elastic fiber damage to the parenchyma, known as emphysema (Burt & Corbridge, 2013).

Significance of Pathophysiology

Understanding the importance of the pathophysiology and how it affects the individual will help providers to understand the disease of emphysema. Below is the significance of the pathophysiology of emphysema.

- Inflammation decreases the elastic recoil of the lung tissue and destroys alveolar attachments to small airways (Burt & Corbridge, 2013).
- Reduction in alveoli with septal wall destruction reduces gas exchange and causes the lung to collapse during expiration, thus limiting airflow (Berg, Joanne, & Wright, 2016).
- Bronchial inflammation increases pulmonary secretions, muscle contraction, loss of alveolar supporting structure and airway edema causes airway narrowing or obstruction (Burt & Corbridge, 2013)
- When the airway is narrowed or obstructed, expiratory flow is decreased causing hyperinflation of lung from small shallow breaths. (Burt & Corbridge, 2013)
- Dyspnea occurs because the lungs are being overworked. (Burt & Corbridge, 2013)
- Individuals will have the appearance of "barrel-chested" due to too much air being trapped in the lungs (The Cleveland Clinic Foundation, 2017).
- Further parenchymal destruction impedes gas exchange and leads to hypoxia. (Burt & Corbridge, 2013)

Signs & Symptoms

The main sign of Emphysema is dyspnea (shortness of breath). Many people who have emphysema may experience fatigue, increased mucous production, and wheezing in the early stages. By the time these symptoms appear, often much of the lung tissue has already been destroyed. These symptoms can often be misdiagnosed for other diseases or illnesses (Cleveland Clinic Foundation, 2017). The disease usually progresses where individuals will experience increasing shortness of breath that affects their daily activities, and eventually individuals will experience shortness of breath even at rest (Mayo Clinic Staff, 2017). Other symptoms include:

- Shortness of breath, especially during light exercise or climbing steps
- Ongoing feeling of not being able to get enough air
- Long-term cough or "smoker's cough"
- Wheezing
- Long-term mucus production
- Ongoing fatigue
- Chest tightness

Implications for Nursing

- Education: The biggest risk factor is smoking. Smoking cessation is the only intervention shown to reduce the rate of the disease progression and related to mortality (Dolan, 2014). Providing patient education about smoking cessation is crucial to in advancing the stages of emphysema and causing further damage. Also, it is important to educate patients about proper nutrition, exercise, correct ways to use inhalers, and signs and symptoms of exacerbations (Rennard & Drummon, 2015).
- Providing annual influenza vaccinations to prevent exacerbation (Spencer & Hanania, 2013).
- Patient diagnosing and monitoring: Understanding many patients with emphysema are older adults who have many co-morbidities that can complicate the management and treatment of emphysema (Spencer & Hanania, 2013).
- Prescribing appropriate medications for patients with emphysema: Long-acting bronchodilators are the recommended therapy for patients with moderate to severe COPD (Spencer & Hanania, 2013). Corticosteroids are also another drug therapy added to patients with moderate to severe COPD. It is important to educate the patients on side effects from their medications they are prescribed (Spencer & Hanania, 2013).
- Evaluating treatment and how adherence to treatment: Making sure patients are following their treatment plan and have appropriate knowledge of disease is crucial. Patients may be discouraged about disease, it is important for APN to provide patients with realistic expectations of treatment outcome and provide support to patients and family members (Spencer & Hanania, 2013).

Conclusion

APNs can play an important role in the management of emphysema. It is crucial for APNs to understand the pathophysiology of the disease and the significance it plays in individuals to better diagnose, treat, and manage patients. Educating individuals about disease and staying up to date on treatment options will benefit both the APN and patient.

References

- Berg, K., & Wright, J. L. (2016). The pathology of chronic obstructive pulmonary disease. *Archives of Pathology & Laboratory Medicine*, 140(12), 1423-1428.
- Boka, K. (2016, August 31). Emphysema. Retrieved June 28, 2017, from <http://emedicine.medscape.com/article/298283-overview#a5>
- Burt, L., & Corbridge, S. (2013). COPD exacerbations: evidence-based guidelines for identification, assessment, and management. *American Journal of Nursing*, 113(2), 34-3. <https://doi.org/10.1097/01.NAJ.0000426688.96330.60>
- Dolan, P. L. (2014). Preventing and treating COPD. *Medical Economics*, 91(5), 54-58.
- Izaguirre Anariba, D. E. (2017, February 10). Alpha1-antitrypsin deficiency. Retrieved June 23, 2017, from <http://emedicine.medscape.com/article/295686-overview#a5>
- King Han, M., Dransfield, M., & Martinez, F. (2017, March 20). Chronic obstructive pulmonary disease: definition, clinical manifestations, diagnosis, and staging. Retrieved June 23, 2017, from http://www.uptodate.com/contents/chronic-obstructive-pulmonary-disease-definition-clinical-manifestations-diagnosis-and-staging?source=search_result&search=emphysema&selectedTitle=1~150#H263049416
- Mayo Clinic Staff. (2017, April 28). Emphysema. Retrieved June 26, 2017, from <http://www.mayoclinic.org/diseases-conditions/emphysema/symptoms-causes/dxc-20317007>
- Madell, R. (2013, March 26). Emphysema stages. Retrieved June 20, 2017, from <http://www.healthline.com/health-slideshow/emphysema-stages#2>
- Mosenifar, Z. (2017, March 02). Chronic obstructive pulmonary disease (COPD). Retrieved May 30, 2017, from <http://emedicine.medscape.com/article/297664-overview#a3>
- Rennard, S. I., & Drummond, M. B. (2015). Early chronic obstructive pulmonary disease: definition, assessment, and prevention. *Lancet (London, England)*, 385(9979), 1778-1788. [https://doi.org/10.1016/S0140-6736\(15\)60647-X](https://doi.org/10.1016/S0140-6736(15)60647-X)
- Sharafkhaneh, A., Hanania, N. A., & Kim, V. (2008). Pathogenesis of emphysema: from the bench to the bedside. *Proceedings of the American Thoracic Society*, 5(4), 475-477. <https://doi.org/10.1513/pats.200708-126ET>
- Spencer, P., & Hanania, N. A. (2013). Optimizing safety of COPD treatments: role of the nurse practitioner. *Journal of Multidisciplinary Healthcare*, 6, 53-63. <https://doi.org/10.2147/JMDH.S35711>
- The Cleveland Clinic Foundation. (2017, May 26). Emphysema symptoms & treatment | COPD. Retrieved June 28, 2017, from <https://my.clevelandclinic.org/health/articles/emphysema>



OTTERBEIN
UNIVERSITY