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Pneumothorax

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Introduction

Pleural Abnormalities/ Pneumothorax

- "Pneumothorax is the presence of air or gas in the pleural space caused by rupture in the visceral pleura of the parietal pleura and chest wall" (McCance & Huether (2019).
- Despite the high incidence rate of pneumothorax there is not one set way to diagnose, treat and prevent reoccurrence
- This poster aims to identify the best management of a pneumothorax by understanding the pathophysiology and epidemiology of the disease

Types of Pneumothorax

Primary Spontaneous Pneumothorax

- Spontaneous rupture of blebs (blister-like formations) on the visceral pleura
- Occurs in patients without an underlying lung disease

Secondary (Traumatic) Pneumothorax

- Chest trauma- rib fractures, stab or bullet wounds, or surgical procedures
- Rupture of bleb or bulla caused by underlying lung disease (COPD, asthma, pneumonia) or mechanical ventilation especially if it includes positive end-expiratory pressure (PEEP)
- Flying or diving

Iatrogenic

- Commonly caused by thoracic needle aspiration (biopsy)

(McCance & Huether, 2019)

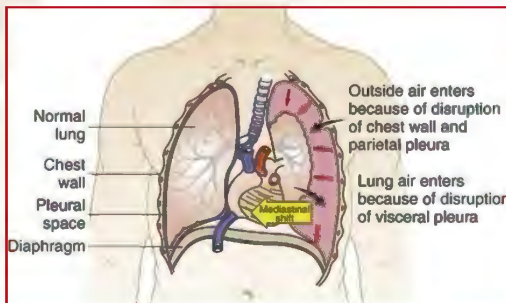
Pathophysiology

- Normal pressure within the pleural space is negative compared to atmospheric pressure
- Blebs are usually located in the apexes of the lungs
- Blebs can rupture and can damage to the visceral pleura by creating a conduit (bronchopleural) for air to travel into the pleural space
- Pneumothorax occurs when air or gas enters the pleural space destroying the negative pressure
- Without that pressure the lung recoils and collapses toward the hilum

Open vs Tension

- Open (communicating)- air is forced in during inspiration and and is forced back out during expiration
- Tension- the rupture site acts as a one-way valve. Air enters during inspiration but cannot escape during expiration
- Air pressure pushed against the collapsed lung and causes compression atelectasis
- The heart, great vessels and trachea are displaced
- Tension pneumothorax are life-threatening (McCance & Huether, 2019)

Tension Pneumothorax- ruptured visceral pleura acts as one-way valve, allowing air to enter during inhalation and is unable to escape. As more air enters the space the more compression there is on the lung and surrounding structures.



(McCance & Huether, 2019)

Epidemiology

Primary spontaneous pneumothorax (PSP)

- Mostly occurs in 20-30 years of age (McKnight & Burns, 2022)
- One of the most common thoracic diseases affecting adolescents and young adults
- Majority of reoccurrence occurs in first year
- Highest reoccurrence rate is in the first 30 days (Mendogni et al. 2020)

Incidences rates in PSP

- 7 per 100,000 men per year
- 1 per 100,000 women per year (Mendogni et al. 2020)

Secondary spontaneous pneumothorax (SSP)

- Seen in an older population 60-65 years (McKnight & Burns, 2022)

Incidences rates in SSP

- 3:1 male to female ratio
- 26 per 100,000 patients with COPD
- Heavy smokers are 102 times higher than non-smokers

Iatrogenic Pneumothorax

- Leading cause is transthoracic needle aspiration (biopsies)
- Second leading cause is central venous catheterization (CVC)

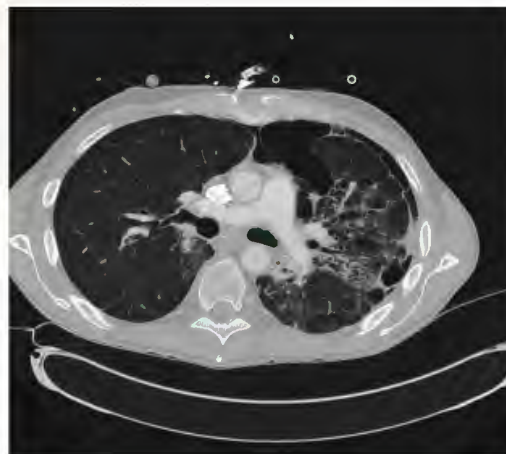
- Incidences rates are increasing
- 5 per 10,000 admissions (McKnight & Burns, 2022)

Diagnostic Films



The dark side of the chest (right side) is filled with air outside the lung tissue indicating a pneumothorax (Borke, 2021)

Chest radiography (CXR) is the first investigative film performed because it is simple, rapid and noninvasive. However, chest computed tomography (CT) is the most reliable imaging for the diagnosis of pneumothorax. CT scans can distinguish large bulla and a pneumothorax. They can also indicate emphysema like changes. (Daley, 2022)



CT scan demonstrating a SSP as a result of radiation/ chemotherapy for lymphoma (Daley, 2022)

Signs and Symptoms

- Sharp, stabbing chest pain during inspiration
- Shortness of breath
- Tachypnea
- Cyanosis
- Fatigue
- Tachycardia

(American Lung Association, 2020)

Risk Factors

- Smoking
- Tall, thin body habitus
- Pregnancy
- COPD/ emphysema
- Asthma
- Pneumonia
- Tuberculosis
- Cystic fibrosis
- Thoracic endometriosis
- Penetrating or blunt trauma
- Rib fracture
- Diving or flying
- Mechanical ventilation

(McKnight & Burns, 2022)

Implications for Nursing Care

Nursing Assessment

- Thorough respiratory auscultation
- Monitor oxygen requirements
- Pain control- assure pain does not limit chest expansion and increase risk for further complications
- Incentive spirometry
- Cough and deep breathing exercises
- Ambulation

Chest Tube Management

- Maintain a closed chest tube drainage system
- Appropriate suction v. underwater seal
- Monitor for an air leak or kinks within the system
- Presence of fluctuation
- Crepitus
- Characteristics of the drainage
- Occlusive dressing

(Pompili et al., 2017)

Treatments

Chest Tube Insertion

- Relieve pressure/ air within the pleural cavity or to facilitate drainage
- Chest tubes can be placed bedside, during surgery, or in Interventional Radiology

Chemical Pleurodesis

- Medication (talc and doxycycline) can be introduced to the pleural space through a chest tube to facilitate irritation and inflammation between the lung and pleural space
- This allows the lung and plural sac to re-adhere and prevent future complications and re-collapse

(Hallifax et al., 2018)

Surgery

- Video Assisted Thoracic Surgery (VATS)- less invasive form of surgery. A small incision is created between the ribs on the affected side of the chest, a video camera scope is inserted through the incision.
- Thoracotomy- traditional open approach to surgery. An incision is made across the back/ ribcage allowing access for the surgeon to visualize the thoracic cavity

(Puri et al., 2021)

Mechanical Pleurodesis

- Done during surgery, the parietal pleura is manually "ruffed up" to create inflammation
- The ultimate goal is to create scarring within the pleural space binding the membranes together and not allow air to reaccumulate

(Vuong et al., 2017)

Conclusion

- Pneumothorax "collapsed lung" is the presence of air or gas in the pleural space
- Sharp, stabbing chest pain, shortness of breath and tachypnea are common symptoms
- There are several types of pneumothorax including spontaneous, secondary and iatrogenic
- Tension pneumothorax can be life-threatening
- Men are 3:1 more likely to have a pneumothorax than women
- Most PSP occur between 20-30 years old
- CT scans are the most reliable for diagnosis
- One of the highest risk factors for developing a pneumothorax is smoking
- Several treatment options are available including chest tubes, surgery and pleurodesis

References



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