# Pneumothorax

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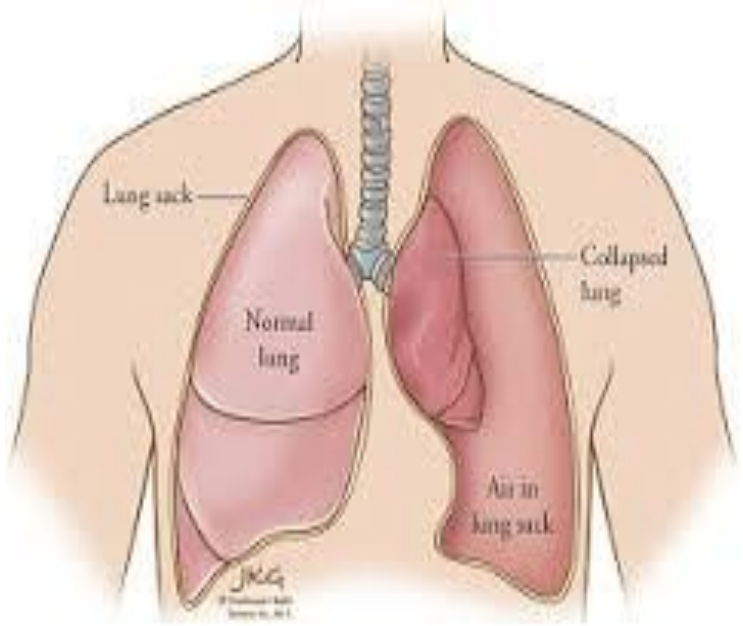
# Background Knowledge

- Pneumothorax Definition:

  The accumulation of air in the pleural space with secondary collapse of the surrounding lung



# Classification of Pneumothorax

- Spontaneous pneumothorax (SP)
  - Primary spontaneous pneumothorax (PSP):
    no immediately apparent lung disease
  - Secondary spontaneous pneumothorax (SSP):
    a complication of clinically apparent lung disease
- Nonspontaneous pneumothorax
  - Traumatic
    - Due to penetrating chest trauma
    - Due to blunt chest trauma
  - Iatrogenic
    - Due to transthoracic or transbronchial lung biopsy
    - Due to placement of central venous catheter
    - Due to thoracentesis or pleural biopsy
    - Due to barotrauma

# Incidence

- In the United States: > 20,000 new cases of SP per year
- Cost:  > 130 million dollars per year
- The incidence of SP:
  - 18 - 28 per 100,000 men per year
  - 1.2 - 6 per 100,000 women per year
- The age-adjusted incidence of PSP:
  - 7.4/100,000/year for males
  - 1.2/100,000/year for females

# Age

- PSP typically occurs in young men between 12 y/o and 30
- PSP rarely occurs after 40 y/o
- Although women have a much lower incidence of PSP, they tend to develop PSP 2 to 5 years earlier than men

# Smoking

- Tobacco smoking significantly increases the risk of SP
- Cigarette smoking increases the risk of first PSP
  - 9-fold in women
  - 22-fold in men
- The quantity of cigarettes per day and the length of exposure
  - ½ PPD: 20 times
  - 1 PPD: 100 times

# Physiology

- Intrapleural pressure is negative during the respiratory cycle
- Inherent tendency for the lung to collapse (elastic recoil) and the chest wall to expand.
- Intrapleural pressure is more negative at the apex than at the base
- 0.25 cmH2O between the apex and the base
- This pressure difference tends to favor a greater distention of the alveoli located at the apex

# Pathophysiology

- The exact pathophysiology of PSP remains unclear regarding the exact site of the air leaks, its underlying disease process, and its precipitating causes.

- Experimental overdistention of normal lungs results in rupture of subpleural alveoli.

- Peripheral dissection of air may result in an air-containing space within or immediately below the visceral pleura.

- PSP implies absence of underlying lung disease ➔ misleading

- Surgical intervention: emphysema-like changes (ELCs).

- Spontaneous pneumothorax: one or both of ELCs.
  - Bulla is lined partly by thickened fibrotic pleura and partly by fibrous tissue within the lung.
  - Bleb is situated entirely within the pleura.

- A pneumothorax may occur when these peripheral bullae or blebs become distended and rupture into the pleural space.

- The exact mechanism of ELCs formation remains speculative.

- Degradation of elastic fibers in the lung is induced by the smoking-related influx of neutrophils and marcophages.

- Respiratory bronchiolitis is found in more than 80% of smokers operated on for PSP and may contribute to the pathogenesis of ELCs.

- A difference in alveolar pressure in the upright human between the base and apex of the lung.

- The ectomorphic physique may affect intrathoracic pressure and drive ELCs formation.

# Etiology

- A strong etiologic association has been proposed between ELCs and the occurrence of PSP.
- Up to 81% of PSP patients have ELCs on CT scans.
- CT scans revealed that ELCs are often bilateral and located predominantly in the apical segments of the upper and lower lobes.
- ELCs in the contralateral lung are found in as many as 79% to 93% of patients.

# Recurrence of Pneumothorax

- Recurrence rates for PSP with a range of 16% to 52% (31.8%).
- Most recurrences in PSP patients not being treated to prevent recurrence are seen in the first 6 months to 2 years of follow up.
- The rate of recurrence may increase with each successive pneumothorax.
  - 60% after second pneumothorax.
  - 83% after third pneumothorax.

- Independence risk factors for recurrence pneumothorax include asthenic habitus, younger age, smoking, and increased height-to-weight ratio.

- ELCs on CT or VATS is not predictive of recurrence.

- CT demonstrating ELCs in the contralateral lung correlated with a slightly increased risk of contralateral recurrence (10-15%).

- No predilection for the right or left hemithorax of the initial episode.

- More than 75% of recurrences occur on the same side as the first pneumothorax.