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Acute Respiratory Distress Syndrome

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Acute Respiratory Distress Syndrome (ARDS)

What is the Topic?
- Acute Respiratory Distress Syndrome (ARDS)

Presentation of Case/Process

Hospital day 1: A 57 year old male presents to the emergency room complaining of shortness of breath, a productive cough, and chest pain. His total input stood 7/18, BP 115/70, O2 saturation 86% on room air, RR 26. The patient is placed on bipeds and admitted to the stepdown unit. He is diagnosed with community acquired pneumonia.

Hospital day 2: The patient has a worsening respiratory status and altered mental state overnight. Vital signs stood HR 110, BP 90/54, O2 saturation 84% on 100% SpO2, RR 32. Respirations are labored and the patient is using accessory muscles to breathe. Bilateral crackles are present upon auscultation. The patient was moved 1L L-R to an ICU level and intubated. The nurse must understand that the patient is tachypneic and is having a difficult time oxygenating the patient. Over time, the patient’s oxygen saturation remained in the 80’s. The patient’s vital signs stood HR 120, BP 86/41, O2 saturation 87%, RR 20. The patient is started on a Levophed drip to maintain blood pressure. The patient’s ventilator settings are TV 400PEEP 10/40 20 100% O2. The patient’s ABG results are: pH 7.33, PO2: 47, PCO2: 39, HCO3: 27. Following this ABG, the nurse practitioner increased the PEEP to 12 and the FiO2 to 100%. An ABG is obtained 30 minutes later and the patient is still tachypneic with a PaO2 of 61 and his O2 sat are 87%. A chest X-ray shows worsened bilateral infiltrates. The patient classifies as having severe ARDS with a PaO2/FiO2 ratio of < 200. The decision is made to place the patient on pressure control ventilation to prevent lung injury. After being prone for 20 minutes, the patient’s O2 saturation is 92%. An ABG is obtained and the results are: pH 7.36, PO2: 44, PCO2: 72, PaCO2: 25. The patient is left in the prone position for 24 hours before trialling supine position. Once the patient tolerates supine position, the ventilator settings are beginning to be weaned.

Underlying Pathophysiology
- ARDS results from a direct or indirect injury to the lungs (Drahnak, 2015)
- Direct causes include: Inactive surfactant leads to:
  - Decreased lung compliance
  - Refractory hypoxia
  - Respiratory failure
  - Impaired gas exchange
  - Edema in the interstitial fluid compromises the alveolus and leads to alveolar collapse (Drahnak, 2015)
  - Alveolar collapse and damage to the alveolar capillary membrane leads to difficulty oxygenating and ventilating the patient adequately (Nagelhout & Plaus, 2014)
- Indirect causes include: Septus
  - Blood transfusion
  - Shock
  - Burns
  - Drug overdose
  - Cardiopulmonary bypass
  - Severe trauma
  - Hypercapnia
  - Interstitial cell infiltration (Drahnak, 2015)
- Septus is the most common cause of ARDS (Keddissi, Youness, Jones, & Kinasewitz, 2019)
- There is injury to the alveolar epithelium and pulmonary vasculature (Drahnak, 2015)
- This leads to increased permeability causing oozing around the alveoli (Drahnak, 2015)
- Damage to the type II alveolar cells causes surfactant to be rendered inactive (Drahnak, 2015)
- Inflammatory cells (macrophages and neutrophils) accumulate in the interstitium (Drahnak, 2015)
- Interleukin-1 has been identified as the main chemotactic factor for neutrophils (Nagelhout & Plaus, 2014)
- Proliferative alveolar cytokines and tumor necrosis factor are released into the lung (Fujiishima, 2014)
- Phospholipids are converted into prostaglandins and leukotrienes by the enzyme cyclooxygenase and lipoygenase (Nagelhout & Plaus, 2014)
- Prostaglandins are believed to mediate pulmonary vasoconstriction and can cause airway constriction (Nagelhout & Plaus, 2014)

Significance of Pathophysiology
- Inactive surfactant leads to:
  - Decreased lung compliance
  - Refractory hypoxia
  - Respiratory failure
  - Impaired gas exchange
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Signs and Symptoms
- Signs and symptoms of ARDS include:
  - Dyspnea
  - Hypoxic respiratory failure
  - Often patients require mechanical ventilation (Nagelhout & Plaus, 2014)
- Pathophysiology:
  - Radiographic infiltrates on chest X-ray (Keddissi et al, 2019)
  - Consolidation with abnormal filling shown on a chest CT scan (Keddissi et al, 2019)
  - Signs and symptoms must be shown within one week of known clinical insult or new or worsening respiratory symptoms
  - Edema is present that cannot be explained by a cardiac origin (Drahnak, 2015)
- P/F ratio criteria as follows:
  - PEEP 0-40
  - Midline 200-400
  - Moderate 160-200
  - Severe 100-160

References

Additional Sources
- Acute Respiratory Distress Syndrome (ARDS) - St. Louis, MO: Mosby, 2004
- Acute Respiratory Distress Syndrome (ARDS) - Dallas, TX: University of Texas Southwestern Medical School, 2015
- Acute Respiratory Distress Syndrome (ARDS) - Stedman’s Medical Dictionary, 2007

Conclusions
- In conclusion, acute respiratory distress syndrome is a medical and nursing condition that patients develop. Managing a patient with ARDS requires a thorough understanding of the patient and the different treatment modalities available.
- ARDS is a prevalent disease that affects many Americans each year and has a mortality rate. Early identification of the signs and symptoms is key to managing this patient. It is very important in the critical care setting to monitor the patient and pay close attention to nursing interventions when managing a patient with ARDS.

A normal alveolus (left) and a damaged injured alveolus in the acute phase of acute respiratory distress syndrome (right). Retrieved from http://www.davidlidinginfo.com/encyclopedia/A/acute_respiratory_distress_syn drome.html