Aspiration Pneumonitis

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Introduction

• Aspiration is an essential element of healthcare today, however, it is not without its complications. One major complication of anesthesia is aspiration pneumonitis.

• Inflammation of the lung tissue caused by aspiration of a foreign substance, such as food, vomitus, mucus, or secretions, can be referred to as aspiration pneumonitis (McCance, Huether, Brashers, & Rote, 2014).

• Anesthetic agents can cause reduced cough and gag reflexes, which in turn interferes with an individual's ability to handle oropharyngeal secretions and refluxed gastric contents (Matheny, 2016).

• “Anesthesia-related aspiration occurs when patients without sufficient laryngeal protective reflexes passively or actively regurgitate gastric contents” (Nason, 2015).

• Aspiration pneumonitis occurs in as many as 1 in every 2-3,000 surgical procedures requiring anesthesia, and consequently, anesthesia providers must be vigilant in identifying patients who aspire during their operation (Bartlett, 2018). Thus, anesthesia providers play a key role in preventing aspiration pneumonitis or pneumonitis (Nason, 2015).

• Complications stemming from aspiration pneumonitis can range in severity based on the content, quantity, and acidity of the aspirate, in addition to certain characteristics of the patient, such as host defense mechanisms. Severity can range from mild to life-threatening to fatal (Son, Shin, & Ryu, 2017).

• In order to reduce the occurrence of anesthesia-related aspiration pneumonitis, prevention and education is essential.

Signs and Symptoms

The primary sign of intraoperative aspiration is visualization of gastric contents in the oropharynx or passing into the airway during intubation (Nason, 2015).

Other signs of aspiration include persistent hoarseness, high airway pressures, bronchospasm, and abnormal breath sounds (Nason, 2015).

According to Dillibird and Wunderlink (2015), additional clinical features that can be seen with aspiration include:

- Fever
- Tachycardia
- Abnormal chest radiograph

Risk Factors

• Causes of aspiration pneumonia during the perioperative period can be divided into anesthesia-, surgery-, and device-related factors. The most consistent risk factors related to anesthesia are light anesthesia, general anesthesia, head-down positioning, and postural changes (Nason, 2015).

• Anesthesia-related aspiration occurs in patients who are at risk for aspiration by reducing level of consciousnes and by causing loss of protective reflexes (Nason, 2015).

Underlying Pathophysiology

As Bartlett (2018) explains, there are many extensive experimental animal studies on the pathophysiology of aspiration pneumonia, although the circulatory system must have a pH of 7.2 or 7.5, and a large amount must be used—approximately 1-1.5 L. This converts to an amount 25 mL of gastric acid in an adult human. Bartlett (2018) states that it is likely that when lesser amounts of gastric acid are aspirated in humans, the process of aspiration pneumonitis is more subtle to where it escapes clinical detection or causes a less severe form. This concept supports the notion that patients with GERD may suffer from bouts of recurrent pneumonitis more frequently than those who do not have GERD (Bartlett, 2018).

As Bartlett (2018) states, in the above-mentioned real cases, the pathophysiological changes that occur in aspiration pneumonitis occur rapidly. In as little as three minutes of aspirating, pathological processes such as alveolitis, bronchoconstriction, pulmonary edema, and degeneration of bronchial epithelial cells begin to take place. The alveolar sacs become filled with edema and fibrin by hour four. At this point, the alveolar consolidation occurs due to the lung’s mucus and epithelium. Causing further injury to lung tissue pathologies, including tissue necrosis factor (TNF) alpha and interleukin (IL)-8 are released. These findings have also been found on autopsy of patients who died from aspiration pneumonitis (Bartlett, 2018).

Implications for Nursing Care

The certified registered nurse anesthetist (CRNA) plays a large role in preventing anesthesia-related aspiration pneumonitis.

The CRNA should always conduct a preoperative risk assessment so that the anesthetic provider can make a determination as to the level of risk for aspiration pneumonitis (Nason, 2015).

The CRNA should utilize current preoperative medication and Practice Parameters currently allow:

• Preoxygenation, rapid administration of induction and paralytic agents, controlled ventilation, avoidance of bag mask ventilation, and tracheal intubation, in order to prevent aspiration of gastric contents (Bartlett, 2018).

• The CRNA may utilize the rapid sequence induction technique on patients who are considered high-risk cases to minimize the risk of aspiration during intubation (Nason, 2015). This technique includes:
  • Preoxygenation, rapid administration of induction and paralytic agents, cricoid pressure, avoidance of bag and mask ventilation, and tracheal insertion of an endotracheal tube using direct or video laryngoscopy (Nason, 2015).
  • In cases where cricothyroid pressure during intubation is contraindicated, other options to reduce the risk of aspiration during intubation include awake intubation and the use of 4F” head-up positioning during surgery (Sethi, K. R., Kurosawa, S., & Crystal, G. J. (2017). Cricoid Pressure Controversies. Anesthesiology, 126(6), 758-772. doi:10.1097/ALN.0000000000001489

Conclusion

Anesthesia-related aspiration pneumonitis is a potentially fatal consequence that complicates many cases. Understanding the pathophysiological process of aspiration pneumonitis is essential in preventing and treating its occurrence. In order to reduce its associated morbidity and mortality, anesthesia providers must be aware of the risk factors and utilize the most current prevention and treatment strategies.

Significance of Pathophysiology

• Understanding the pathophysiology behind anesthesia-related aspiration will aid in the prevention of its occurrence and minimizing of its harmful effects.

• If a patient has aspirated during surgery, the anesthesia provider will rely on his or her knowledge of pathophysiologic processes to decide whether or not to proceed with the case (Nason, 2015).

• One major element that will influence this decision is the severity of pathophysiological processes that may have occurred such as alveolitis, bronchopulmonary hemorrhage and pulmonary edema (Nason, 2015).

• Additional factors that will influence the provider’s decision include: the necessity of the surgery, the patient’s oxygen saturation and lung compliance, and how well the patient responds to interventions such as bronchodilators and positive end-expiratory pressure (Nason, 2015).

• Antibiotics are not typically recommended as they are not usually effective for aspiration pneumonitis, however, they are often given because it is hard to distinguish chemical pneumonitis from bacterial aspiration pneumonitis (Sethi, 2018).

• Depending on the volume of aspirated contents, mechanical ventilation should be considered when there is concern for the development of acute respiratory distress syndrome (ARDS) (G. J. (2017). Cricoid Pressure Controversies. Anesthesiology, 126(6), 758-772. doi:10.1097/ALN.0000000000001489

References


Figure 1: a patient undergoing anesthesia (“Types of Anesthesia,” n.d.)

Figure 2. CT scan from an individual with aspiration revealing nodular airspace infiltrates (arrow), focal air space consolidation (arrowhead) and contributary nodules with tree-in-bud changes (arrowheads) (Mehndad, 2009).