The Purpose and Efficacy of Positive Pressure During Extubation Following General Anesthesia: An Integrated Research Review

Will Cobb, BSN, RN, SRNA Email: william.cobb@my.uu.edu
Faculty Advisor: Dr. TaMara Carter, DNP, CRNA, APRN
Union University

INTRODUCTION

- Perioperative respiratory complications are 3 times more likely to occur during extubation and recovery than any other time.
- Aspiration is a common complication that can occur, and it can lead to other sequelae as well.
- Evidence suggests that the occurrence of pulmonary aspiration has not decreased for 30 years.
- Common techniques used to prevent aspiration used alone or in conjunction with one another include:
  - Oral suctioning (OS)
  - Endotracheal suctioning (ETS)
  - Positive pressure (PP)
- Historically, PP is mentioned as being an effective method of preventing aspiration and other complications.
- Evidence from one survey suggests that only about 30% of anesthetists consistently perform this technique.
- Theories vary among providers as to whether PP is effective and exactly how it works.

Purpose: The purpose of this research is to review the evidence surrounding the use of PP as part of an extubation regimen to decrease post-extubation complications and to answer the following questions:

- Is PP effective?
- How does it work?
- When and how should it be performed?

RESULTS

Is PP effective?

- Positive pressure had an overall complication incidence of 65.5% as opposed to 76.9% with ETS. While the decrease in *overall* complications was not statistically significant, PP was statistically superior in preventing *major* complications.
- When compared with ETS, PP had less secretions leaking around the cuff in a laboratory model. The amount of leakage is inversely related to the amount of pressure applied during extubation.

How does it work?

- Simulates the cough reflex thereby blowing secretions out of the airway, and maintains an open airway after extubation, playing a role in decreasing atelectasis.
- Possibly allows for better cuff deflation by preventing adhesion to the tracheal wall, decreasing the risk of trauma by partially inflated cuff.

When and how should it be performed?

- Positive pressure ranging from 5-35 cmH_2O at the end of maximal inspiration.
- Using positive end-expiratory pressure (PEEP) on the ventilator is more effective than squeezing the bag.

ABSTRACT

Objectives: To review the purpose of positive pressure during extubation and determine its efficacy in preventing post-extubation complications among general anesthetic patients.

Background: Life-threatening respiratory complications can occur during all phases of anesthesia however, they are proven to be more frequent during the extubation and post-anesthesia recovery phases (Rassam, Sandbythomas, Vaughan, & Hall, 2005). These complications include laryngospasm, bronchospasm, aspiration, airway edema, and desaturation. These issues can lead to further complications such as negative pressure pulmonary edema, aspiration pneumonitis, pneumonia, hypoxic injuries, and death. Varying techniques of extubation are utilized to reduce the frequency of such complications. One such technique is the application of positive pressure during extubation. This technique is mentioned in multiple anesthesia textbooks and in anesthesia literature as playing a significant role in the extubation process. However, Rassam, Sandbythomas, Vaughan, and Hall (2005) found that approximately one-third of anesthesia providers consistently use positive pressure upon extubating their patients. Various theories and explanations exist as to its purpose, how to do it, and the exact mechanism of action that this maneuver entails.

Design: This is an integrative research review.

Methods: Databases including CINAHL, Ovid MEDLINE, PubMed, ScienceDirect, and Google scholar were searched for peer-reviewed articles discussing the use and efficacy of positive pressure upon extubation. Due to the lack of recent research, the search included articles published between 2000 and 2020.

Results: While studies surrounding positive pressure during extubation are relatively limited, the existing data suggests that this technique is a safe and effect practice that can be utilized to decrease the occurrence of post-operative respiratory complications. It accomplishes this by blowing secretions out of the airway. It may also play a role in decreasing the amount of atelectasis and maintaining a patent airway in the critical moments immediately following extubation.

Conclusions: Extubation techniques that employ some type of positive pressure are effective at preventing aspiration of secretions. More studies are needed to determine the best timing of positive pressure, the optimum amount of pressure needed, and the best way to achieve that pressure. More studies are also needed to determine the effects of positive pressure in patients with lung pathology and specific surgical procedures that may contraindicate its use. In the meantime, sound clinical judgement should be used during the use of this effective extubation technique.

IMPLEMENTATION

- A PowerPoint presentation containing the information and data surrounding the topic was presented to volunteers in the Union University School of Nursing (Nurse Anesthesia Track) Class of 2022 thru a scheduled Zoom meeting.
- Immediately following the presentation, an electronic, anonymous survey containing 6 subjective questions was sent to the 12 participants.
- 70% of the participants indicated they were somewhat familiar with the 3 most common extubation techniques.
- 60% indicated it is very likely that they will change their technique after hearing the presentation with 70% indicating they were very likely to use PP during extubation after hearing the presentation.

DISCUSSION

- Several of the studies reviewed involved ICU patients, not general surgery patients. While the objective of extubation is the same, pathologies can vary from ICU to surgery patients. However, there are still relevant implications for anesthetists to consider.
- PP can be particularly useful in patients with little or no reserve such as pregnant, obese, or pediatric patients.
- Varying fluid viscosities were not researched and could have an impact on the efficacy of PP, meaning oral suctioning is still imperative.
- PEEP can cause hemodynamic compromise however the transient nature of this technique limits these effects.
- PP has a place in the extubation regimen along with other considerations such as patient positioning, patient characteristics, and oral suctioning to prevent post-extubation respiratory complications.
- More research is needed to determine how to effectively perform positive pressure extubation in areas such as
  - Timing
  - Amount of pressure needed
  - Best way to achieve the pressure needed
  - Possible contraindications
    - Specific pathologies
    - Specific surgical procedures

References available upon request