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Abstract

A laryngospasm (Figure 1) is the involuntary partial or complete closure of the airway. It can lead to a variety of life-threatening issues, including pulmonary aspiration, cardiac arrest, hypoxemia, bradycardia, and negative-pressure pulmonary edema (5). Perioperative complications of airway management are by far more common in pediatric surgeries than adult surgeries, with laryngospasms being twice as likely to occur (8). Not only are laryngospasms extremely dangerous for the patients, but they also cause an increase in aerosols, which increases the overall risk of health care providers to contract the SARS CoV-2 virus. The purpose of this literature review is to determine if the administration of intraoperative IV lidocaine or propofol would be more effective in preventing postoperative laryngospasms in pediatric patients. The past study results show that the patients who received lidocaine had the smallest number, likely 0, laryngospasms occur, leading to the conclusion that lidocaine should be given to pediatric patients prior to extubation in order to keep both patients and practitioners safe.

Introduction

Laryngospasms can be extremely detrimental as respiratory events can lead to 27 percent of all pediatric perioperative cardiac arrests, with laryngospasms being the most likely of such respiratory events to occur (8). There is an average annual incidence of in-hospital pediatric cardiac arrest of over 15,000 cases a year in the United States (7). These issues have the potential to cause higher healthcare costs and, more significantly, could increase the risk of mortality in pediatric patients. Furthermore, airway complications such as coughing and laryngospasms increase aerosol production, which allows any patient viruses that disperse through droplet transmission to spread around the operating room (OR). With the prevalence of the SARS CoV-2 infection during the COVID-19 pandemic, it is critical to decrease the risk of transmission of the virus to health care providers (9). The SARS CoV-2 virus is transmittable through respiratory droplets and contact as it can remain on surfaces for up to days at a time. Smaller particles that are less than 5µm in diameter, also called aerosols, can travel over 2 meters away from their source. Laryngospasms can cause an increase in aerosols, which increases the overall risk of health care providers to contract the SARS CoV-2 virus if they are within range of the patient experiencing a laryngospasm. Multiple studies have been conducted in order to determine which drugs could be provided by the anesthesia care team to best decrease the risk of laryngospasms in the pediatric population. Intraoperative intravenous (IV) lidocaine and intravenous propofol were both determined to be effective in preventing pediatric laryngospasm after extubation. Past research shows that both propofol and lidocaine make a positive impact in decreasing pediatric laryngospasms. The results of past research display that there is potentially a bigger benefit in utilizing lidocaine as the lidocaine trials had a slightly larger percent decrease in the number of laryngospasms observed, but there has never been any direct research to determine which drug is definitively more beneficial. This leads to the question: Is intraoperative intravenous lidocaine or intravenous propofol more effective in preventing pediatric laryngospasm after extubation?

Literature Review

This literature review covered five different studies regarding the efficiency of multiple pharmaceuticals in the treatment of laryngospasms, particularly for pediatric patients. These studies focused on the use of either propofol or lidocaine postoperatively. One study found that IV lidocaine provided prior to the patient waking up following surgery decreased laryngospasms by 19.5% compared to a placebo. This study used lidocaine 2 minutes prior to extubation and then graded the laryngospasms that occurred on a scale of 0 (no laryngospasm), 1 (stridor during inspiration), 2 (total occlusion of cords), or 3 (cyanosis) (Aljonaieh, K. I., 2018). A second study was conducted in a similar manner, but with 74 pediatric patients. Pediatric coughing and laryngospasm were decreased by 29.9% and 18.92% with IV lidocaine, respectively (Bhat & Sanikop, 2010). Figure 2 displays the results of these 2 studies. A database review focused on similar studies and involved an electronic search of six databases. It involved 9 studies with 787 patients, and determined a risk ratio of 0.39, which displays that there is a 61% decrease in the risk for a pediatric laryngospasm when utilizing intraoperative IV or topical lidocaine. When focusing on IV lidocaine use, there was a 0.34 risk ratio shown or a 66% decrease in the risk of the occurrence of postoperative pediatric laryngospasms (Mihara et al., 2014). Other studies were similarly conducted with propofol instead of lidocaine. One study split 118 pediatric patients into three groups. One group received propofol, the second received ketamine, and the third received a placebo of normal saline. The group that received propofol had the best outcomes with a 19% reduced rate of coughing. This study focused solely on coughing rather than quantifying the number of laryngospasms (Pak et al., 2011). As coughing risk tends to be more frequent than laryngospasm risk, this study would need to be more focused on the rate of laryngospasms in order to create more significant findings. Another study focused on whether IV propofol administered after a tonsillectomy and adenoidectomy would be effective in preventing postoperative laryngospasms in pediatric patients. 120 children between the ages of 3 and 14 years old participated in the study, and they were blindly split into a control group that received saline and a second group that received propofol. Laryngospasms occurred in only 6.6% of the pediatric patients in the propofol group and yet 20% of patients in the control group. This represents a 13.4% direct decrease in pediatric laryngospasms with the use of propofol prior to the patient awakening.

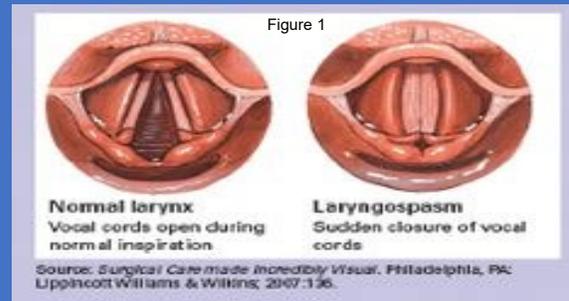
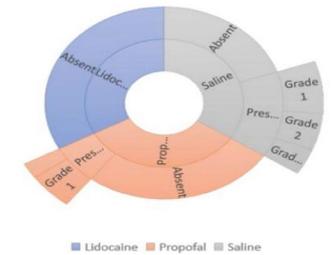


Figure 2

Presence & Grade of Laryngospasms



Discussion & Conclusion

The purpose of this study was to determine if the administration of intraoperative IV lidocaine or propofol would be more effective in preventing postoperative laryngospasms in pediatric patients. Propofol was more effective than the use of a placebo of saline in past studies and lidocaine has shown even more promising results. This study indicated that it would be most effective in the prevention of postoperative laryngospasms if pediatric patients were treated with lidocaine prior to extubation. This is due to the past study results viewed in the literature review that showed lidocaine can prevent up to 66% of pediatric laryngospasms while propofol was only estimated to have a direct 13.4% decrease in pediatric laryngospasms. It is critical to prevent laryngospasms as they create a much larger risk to the patient's life and spread the SARS CoV-2 virus to medical providers. Therefore, this study has the potential to save the lives of both patients and medical professionals. Repeated trials would be beneficial in order to gain further knowledge of various drugs effects on the prevention of pediatric laryngospasms, and new trials could include other types of pediatric surgical cases.

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