Original Research

Comparison Of Two Anesthesia Methods With And Without The Use Of Lidocaine Spray On The Incidence Of Laryngospasm After Extubation In Children Undergoing Tonsillectomy: A Descriptive-Analytical Study

Seyedbabak Mojaveraghili[1], Ali Jabari[2], Avasadat Mirkatouli[3], Mansour Deylami[4*]

1. Assistant Professor of Anesthesiology, Department of Anesthesiology and Critical Care, Faculty of Medicine, Golestan University of Medical Sciences, Gorgan, Iran. Orcid: 0000-0002-3624-2031
2. Assistant Professor of Anesthesiology, Department of Anesthesiology and Critical Care, Faculty of Medicine, Golestan University of Medical Sciences, Gorgan, Iran. Orcid: 0000-0003-3075-8616
3. Student Research Committee, Golestan University of Medical Sciences, Gorgan, Iran. Orcid: 0000-0002-8045-8278
4. Assistant Professor of Anesthesiology, Department of Anesthesiology and Critical Care, Faculty of Medicine, Golestan University of Medical Sciences, Gorgan, Iran. Orcid: 0000-0002-5933-3219

Corresponding Author: Mansour Deylami. Assistant Professor of Anesthesiology, Department of Anesthesiology and Critical Care, Faculty of Medicine, Golestan University of Medical Sciences, Gorgan, Iran. Email: mansour.deylami@gmail.com

Abstract:

Background: Controlling complications after tonsillectomy surgery is one of the important issues of anesthesia in these patients. Laryngospasm is one of the most serious complications that can lead to hypoxia and arterial hypercarbia following airway obstruction, and if not treated correctly and on time, it can cause dangerous and irreparable consequences for the patient. Therefore, this study was conducted with the aim of comparing two anesthesia methods with and without the use of lidocaine spray on the incidence of laryngospasm after extubation in children undergoing tonsillectomy surgery.

Method: In this descriptive-analytical study, 140 children referred for tonsillectomy surgery in the operating room of 5 Azar Hospital in Gorgan and Amiralmomenin Hospital of Kordkuy in 2021 were randomly selected. Patient were anesthetized by one of two methods of anesthesia using lidocaine (in the form of local spray) or without using lidocaine.

Results: In this study, 66 patients who were anesthetized with lidocaine and 74 patients who were anesthetized without lidocaine. 12 patients (8.57%) had laryngospasm. 12 patients, 10 cases (13.5%) were in the anesthesia group without lidocaine, and 2 cases (3.03%) were in the anesthesia group with lidocaine, which according to the prevalence of laryngospasm in these two groups (13.5% compared to 3.03%) The difference between these two groups was significant ($P<0.05$).

Conclusion: The results of the present study showed that the effect of lidocaine on the occurrence of laryngospasm and the occurrence of straining on the tube had a significant difference between the two groups and was less in the group where lidocaine was used. But regarding the incidence of cough, despite its lower incidence in the lidocaine group, it was not statistically significant.

Keywords: Lidocaine, Tonsillectomy, Laryngospasm, Children.

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Introduction

The occurrence of nausea, vomiting, and laryngospasm following a surgical procedure is a well-documented complication. This is particularly prevalent in head and neck surgeries, with reported rates of post-anaesthesia nausea and vomiting ranging from 20% to 30%. Additionally, laryngospasm after extubation is reported to occur in approximately 1% to 5% of cases (1). Also, laryngospasm occurs in 12-25% of children who undergo throat and larynx surgery (2). Controlling postoperative complications in patients undergoing tonsillectomy surgery is a crucial concern in the field of anaesthesia. Among these complications, laryngospasm stands out as one of the most severe, as it can result in hypoxia and arterial hypercarbia due to airway obstruction. Failure to promptly and accurately address this issue can lead to perilous and irreversible consequences for the patient (3). The application of local lidocaine and the removal of pharyngeal secretions through suctioning have the effect of diminishing the inducing elements of laryngospasm and decreasing the likelihood of laryngospasm manifestation (4). Advances in intraoperative patient monitoring technology, the availability of safe medications, and evidence-based guidelines for anesthesiologists' have all led to a dramatic reduction in postoperative adverse events and mortality (5). However, perioperative respiratory adverse events remain a major cause of death for pediatric patients and cause 30% of all cardiac arrests during anesthesia in children (6). To manage and control the non-occurrence of PRAES in intubated children, pediatric anesthesiologists traditionally use lidocaine in the airway (7). Researches, though, yields contradictory findings. Application of lidocaine locally in the airway reduces postoperative cough, irritation, and laryngospasm, according to some studies that have reported positive and appropriate effects (8). Intravenous lidocaine was found to have an effect that lasts less than ten minutes in the study conducted by Erb and colleagues. Two minutes after intravenous lidocaine administration, the incidence of laryngospasm in their study dropped from 38.5% to 15.4%. Ten minutes after intravenous lidocaine was administered in this study, its protective effect vanished. This indicates that the timing of drug administration five minutes prior to the patient being extubated plays a significant role in the preventive effect of intravenous lidocaine (9). In order to compare the use of lidocaine with two different techniques using glottis spray or an endotracheal tube cuff—Boussellmi and his colleagues conducted a study. This study demonstrated that while lidocaine spray was useful in lowering these cases, lidocaine inside the tracheal tube cuff was unable to lessen the severity of cough or soreness in the throat in surgeries lasting less than 120 minutes (10). There is an urgent need for treatment because laryngospasm is a serious and potentially fatal complication following tonsillectomy, and its likelihood is great. As a result of the numerous research projects on the management or avoidance of laryngospasm that have been undertaken, we examined the potential therapeutic benefit of averting laryngospasm in tonsillectomy patients in this investigation.

Methods

In this descriptive and analytical study, 140 children referred for tonsillectomy surgery in the operating room of 5 Azar Hospital in Gorgan and Amiralmomenin Hospital of Kordkuy in 2021 were randomly selected. The sample size according to the study of Staffel (11) in 1991 and the incidence of laryngospasm in the groups without and with lidocaine recipients respectively P1= 0.12, P2=0.03 with 0.95 confidence level and 80% statistical power were estimated with 140 samples in each group. The inclusion criteria include: age group 2 to 12 years, weight between 6 and 65 kg. Exclusion criteria include: cardiopulmonary diseases, liver failure, kidney failure, brain diseases and abnormalities, neuromuscular disease, airway problems or malformations of the respiratory tract and chest. The patients were prepared to enter the study after

visiting the hospital and examining their diseases and the patient's clinical conditions and the expert doctor's diagnosis of performing tonsillectomy surgery by checking the conditions for entering the study and obtaining informed consent from the patient in writing. Anesthesia (intubation and extubation) was performed by a resident anesthesiologist in the operating room. Patients are subjected to induction after entering the operating room and receiving basic demographic and medical history information and registering in the checklists. Patients are anesthetized in one of two ways, using a lidocaine spray or without a spray. In the first anesthesia method, atropine 0.02 mg/kg, fentanyl 2 µg/kg, and propofol 2.5 mg/kg and Cisatracurium with a dose of 0.2 mg/kg is used for induction of anesthesia. After induction and initial laryngoscopy in the first method, 10% lidocaine spray (each puff contains 10 mg of lidocaine) with a dose of 4 mg/kg was given as a spray in the supraglottis and glottis area. After making sure that the patient is completely relaxed and at least 3 minutes have passed after using the lidocaine spray, the patients are intubated with a Macintosh laryngoscope with a cuffed tube suitable for intubation and a cuff of 15 cmH2O. In the second method, the same drugs were used with the same dose for induction, but lidocaine spray was not used. At the end of the extubation procedure, the patient is extubated, following the conditions of extubation. All events during intubation, during operation and after extubation are recorded by the researcher. The results were analyzed with independent t-tests and its non-parametric equivalent, logistic test, chi-score test or Fisher's exact test in SPSS18 software.

Results

In this study, 140 patients (64 boys and 76 girls) were included in the study. The average age of all patients was 5.98 years. There were 66 patients who were anesthetized with lidocaine and 74 patients who were anesthetized without lidocaine. The average age in the group that underwent anesthesia with lidocaine was 6.03 years, and in the group without lidocaine it was 5.94 years. (Table 1). Of these patients, a total of 12 out of 140 patients (8.57%) had laryngospasm. Of these 12 patients, 10 cases (13.5%) were in the group under anesthesia without lidocaine, and 2 cases (3.03%) were in the group under anesthesia with lidocaine (Table 1). According to the prevalence of laryngospasm in these two groups (13.5% compared to 3.03%), the difference between these two groups was significant (P-value<0.05). According to gender, among the 12 patients who had laryngospasm, 4 out of 64 male patients (6.25%) and 8 out of 76 girls (10.52%) had laryngospasm. The difference between these two groups was not significant (P-value>0.05) (Table 2). The average age of the patients who had laryngospasm was 5.16 years and the average age of the patients who did not have laryngospasm was 6.06 years, which difference was not significant (P-value>0.05). The rate of bucking in two groups was compared. In the group under anesthesia with lidocaine, 6 patients (9.09%) and in the group under anesthesia without lidocaine, 19 patient (25%) had bucking, and this difference was statistically significant (P-value<0.05). (Table 3). The incidence of residual cough in two groups was compared. In the group under anesthesia with lidocaine, 3 patients (4.54%) and in the group under anesthesia without lidocaine, 10 patients (13.15%) had severe and persistent cough. However, despite its lower incidence in the anesthesia group without lidocaine, this difference was not statistically significant (P-value>0.05). (Table 4).

Discussion

Coughing excessively, laryngospasm, and saturation lower than 95% are examples of preoperative respiratory adverse events. It is the primary cause of pediatric morbidity and accounts for 30 % of cardiac arrests during pediatric anesthesia (12). To avoid PRAE in children while they are under anesthesia, various methods have been used. Conversely, the most popular technique for pediatric anesthesia is the application of topical lidocaine. A number of studies have demonstrated the beneficial effects of

topical lidocaine on the airway in preventing coughing, agitation, and laryngospasm in children (13). Furthermore, we observed in our study that spraying lidocaine on the glottis had a beneficial effect. Compared to children who received saline, children who received topical lidocaine on the airway prior to intubation exhibited a significantly lower rate of PRAE. 53 % of surgical complications are related to PRAE, one of the main risks associated with pediatric anesthesia. According to Tay and colleagues' study, children who have increased airway sensitivity due to factors like asthma, a recent upper respiratory infection, or passive smoking seem to be more vulnerable to developing PRAE (12). The prevalence of laryngospasm in children has been reported between 1.7% and 25% (14). Laryngospasm causes complete airway obstruction, decreased blood oxygen concentration, negative pressure pulmonary edema, and death. In the study of Erb and his colleagues, they reported that 2 minutes after intravenous administration of lidocaine with a dose of 2 mg/kg, the incidence of laryngospasm decreased from 38% to 15% (2). Also, in our study, the incidence of laryngospasm in the group that was anesthetized without lidocaine (13.5%) compared to the group that was anesthetized with lidocaine (3.03%) was significantly different (P-value<0.05). Of course, only 40 patients were included in Erb's study, and the high prevalence of laryngospasm in this study was probably due to the small sample size. The incidence of cough when coming out of general anesthesia in the presence of a tracheal tube has been reported between 38 and 96%. In our study, the incidence of bucking in two groups was also compared. In the group under anesthesia with lidocaine, 6 patients (9.09%) and in the group under anesthesia without lidocaine, 19 patients (27.67%) had bucking, and this difference was statistically significant (P-value<0.05). The patients who had laryngospasm had an average age of 5.16 years, while the patients who did not had an average age of 6.06 years. However, there was no statistically significant difference between the two groups (P-value>0.05). Of course, the fact that laryngospasm occurred in patients whose average age was lower can also indicate that there is a higher likelihood that it will occur in younger children. Therefore, it might be preferable to perform this kind of surgery later in life, or in cases where children have this kind of surgery early in life, we should think about taking the necessary precautions to avoid laryngospasm or provide the tools and medications needed to rule out the possibility of laryngospasm.

Conclusion

The results of the present study showed that the effect of lidocaine on the occurrence of laryngospasm and bucking had a significant difference between the two groups and was less in the group that used lidocaine. However, regarding the incidence of cough, despite its lower incidence in the group with lidocaine, it was not statistically significant, and considering the dose that was used (4 mg/kg), we did not observe any case of toxicity caused by the drug, so with In addition to maintaining patient safety, this dose can prevent consequences such as PRAE.

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Conflicts of interests

Nothing to declare.

Ethical considerations:

In this investigation, we made an effort to adhere to the established guidelines of the ethical code, ensuring that the confidentiality of the data contained within the files remained intact. Each phase of the study meticulously adhered to the ethical principles outlined in the Helsinki declaration and gained the necessary approval from the ethics committee of Golestan University of Medical Sciences

Author contribution:

All authors met the four criteria for authorship contribution based on recommendations of the

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Table & Figure:

Table 1: Prevalence and incidence of laryngospasm in two groups with lidocaine and without lidocaine

Group	The incidence of laryngospasm	Prevalence
Anesthesia with lidocaine	2	3.03
Anesthesia without lidocaine	10	13.5
Total number	12	8.57

Table 2: Prevalence of laryngospasm in two groups of boys and girls

Group	Number	Prevalence of laryngospasm in each gender	P-value
Boy	4	6.25	**0.54**
Girl	8	10.52	

Table 3: Comparison of the incidence of bucking on the tube in two anesthesia groups with and without lidocaine

Group	The number of occurrences of bucking	Prevalence	P-value
Anesthesia with lidocaine	6	9.09	0.01
Anesthesia without lidocaine	19	25.67	
Total number	25	17.85	

Table 4: Comparison of residual cough in two anesthesia groups with and without lidocaine

Group	The number of occurrences of severe cough	Prevalence	P-value
Anesthesia with lidocaine	3	4.54	**0.11**
Anesthesia without lidocaine	10	13.15	
Total number	13	28/9	