

Efficacy of IV lidocaine in Prevention of Laryngospasm in Pediatric Patients Undergoing ENT Surgical Procedures

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Abstract

Laryngospasm is a well-known problem of the upper airway typically occurring during the peri-operative period most commonly during intubation or extubation. Risk factors should be managed pre-operatively in order to prevent laryngospasm occurrence, together with preventative drugs such as lidocaine, magnesium sulphate, propofol and laryngeal aspiration before extubation. Lidocaine is Local anesthetic and as known to inhibit airway reflexes. Pediatric laryngospasm is most commonly occurring phenomenon due to multiple factors.. A five months randomized placebo-controlled trial was conducted to study the effectiveness of intravenous lidocaine in the prevention of post extubation laryngospasm in children, following cleft palate surgeries. Children of age one month to sixteen years were randomly assigned into two groups. Group P placebo (saline) and Group L (Lidocaine), 1.5 mg/kg. A sample size of 126 with n = 63 in each group was selected. The anaesthetic procedure was standardized. At the end of the procedure, three minutes after reversal, the study drug, that is, intravenous lidocaine (1.5 mg/kg) or placebo (saline) was administered and two minutes later the child was extubated. Following extubation for 10 minutes, the haemodynamic parameters, that is, pulse, blood pressure, oxygen saturation, severity of coughing, and laryngospasm were noted. Significant alterations in haemodynamics and oxygen saturation were noted for 10 minutes, following extubation. Hence, intravenous lidocaine 1.5 mg/kg was effective in the prevention of post extubation laryngospasm in children undergoing pediatric surgeries.

Keywords: Laryngospasm, Lidocaine, Prevention, Pediatric Patients, Efficacy.

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Interoduction

Laryngospasm is a well-known problem of the upper airway typically occurring during the perioperative period, most commonly during intubation or extubation [1]. The incidence of laryngospasm during general anesthesia is between (1.7%) and (25%) in children[2, 3]. There is high incidence of laryngospasm (20%-26.5%) in children undergoing oropharyngeal surgery and adenotonsillectomy under general anesthesia [4]. The incidence rate is more in male than female. The adverse of laryngospasm is obstruction of the upper airway can lead to hypoxia (61%), hypercarbia, bradycardia (6%), arrhythmias, negative pressure pulmonary oedema (4%), pulmonary aspiration (3%) and cardiac arrest (0.5%), and this can be awful in pediatric patients [5]. A sizeable number of studies have been conducted to look into the causes of laryngospasm in which intubation or extubation of the trachea, age, upper respiratory tract infection, surgery of the upper airway (adenotonsillectomy, cleft palate), irritated volatile agent like Isoflurane, ketamine, foreign materials in the larynx (e.g. blood, secretions), light planes of anesthesia, surgical stimulation, poor anesthetic technique are in front line[6, 7]. Clinical signs of laryngospasm includes inspiratory striders, paradoxical respiratory movement, tongue drop, fall in SPO₂ and in severity bradycardia and cyanosis are most common. Laryngospasm is managed by providing positive pressure ventilation with 100% oxygen with face mask, jaw thrust maneuver, insertion of oral airway, and pharmacologically resolved with intravenous propofol, intravenous benzodiazepine, intravenous magnesium sulphate, suxamethonium, nitroglycerines and intravenous lidocaine[8]. Laryngospasm is especially common in children and their causes are multiple; the presence of local, mechanical, chemical or thermal stimuli occurring around the glottis, they stimulate the afferent fibers of the internal branch of the superior laryngeal nerve, the majority of the receptors are present around glottis and on the laryngeal surface of epiglottis [9, 10]. Superior laryngeal nerve innervate the supraglottic region while recurrent laryngeal nerve supply below the vocal cords. They plays a requisite roles in the origin of the upper airway reflexes [11]. Lateral cricoarytenoids, thyroarytenoids, and cricothyroid muscles (the first two are innervated by recurrent laryngeal nerve while the third one is supplied by extrinsic laryngeal nerve) are responsible for adductions of vocal cords. These muscles describe the stimulation of the upper airway mucosa[12]. During laryngospasm emergency, either true vocal cords alone or both true and false vocal cords can be involved [13]. Lidocaine is local anesthetic and as known to inhibit airway reflexes, lidocaine administration either intravenously (during anesthesia or before tracheal extubation) or topically (on airway devices), is used to prevent laryngospasm in pediatric patient. However, different studies shows quarrel results [14, 15]. Moreover, studies inspect the action of intravenous lidocaine on cough suppression during tracheal intubation and prevention of agitation [16]. Information is lacking on the effectiveness of intravenous lidocaine in the prevention of post extubation laryngospasm in Laryngospasm in Pediatric Surgery. Hence there is a need for the study.

Methods

After obtaining the approval from the hospital ethical committee and the written informed consent from the patients, the study was conducted at the Irfan General Hospital Peshawar.

A sample size of 126 children of both sexes between 1 to 16 years of age was divided into two equal groups of 63 children each. Patients with untreated upper respiratory tract infections, two or more attempts at intubation and patients requiring post-operative elective ventilation were excluded from the study.

Noninvasive monitors such as pulse oximeter, electrocardiogram, automated noninvasive blood pressure and end tidal CO₂ were used throughout the procedure.

The children were pre-oxygenated with 100% O₂ for three minutes. They were then pre-medicated with Inj. glycopyrrolate 0.005 mg/kg and Inj. ketamine 5 mg/ kg intramuscularly 15 minutes prior to securing the intravenous line, with an appropriate-sized cannula. The children were induced with Inj. ketamine 1 mg/kg and Inj. suxamethonium 1 mg/kg. The oral intubation was done with an appropriate-sized R.A.E. tube. The maintenance was carried out with O₂ , N₂ O, Inj. vecuronium 0.1 mg/kg, and I.P.P.V. The neuromuscular blockade was antagonised with Inj. glycopyrrolate 0.01 mg/kg and Inj. neostigmine 0.05 mg/kg.

Three minutes after the reversal, the study drug (Lidocaine 1.5 mg/kg or normal saline) was administered and the children were extubated two minutes later.

After extubation, 100% oxygen was administered for three minutes. The following was noted for 10 minutes following extubation. Haemodynamic vitals, SpO₂ , colour of the child, breathing pattern and activity of the child.

- Coughing was evaluated using: The modified four point scale[17]

0 ⇒ None

1 ⇒ Slight

2 ⇒ Moderate

3 ⇒ Severe

Laryngospasm was graded using:- The four point scale [17]

0 ⇒ No Laryngospasm

1 ⇒ Stridor during inspiration

2 ⇒ Total occlusion of cords

3 ⇒ Cyanosis

Results And Discusioon

In this study 126 participant (male and female) were divided into two equal groups of 63 patients each, lidocaine group and placebo group. In placebo group laryngospasm male patients was 42.85% while female have 57.14% and in lidocaine group laryngospasm male patients was 47.61% while in female was 52.38 as mentioned in table 1. Lidocaine introduce greater efficacy for controlling laryngospasm. In other study 150 participant (male 69 and female 81) of age 5 to 12 years were divided into two equal groups of 75 patients each, lidocaine group and placebo group. In placebo group laryngospasm was existing in 20% and in lidocaine group laryngospasm was 8%. Effectiveness of lidocaine in controlling laryngospasm was 92% whereas success of placebo group was 80%. Lidocaine introduce greater efficacy for controlling laryngospasm[18].

Table 1. Gender distribution of the research individuals.

Gender	Group-P		Group-L	
	Frequency	Percentage	Frequency	Percentage
Male	27	42.85714	30	47.61905
Female	36	57.14286	33	52.38095
Total	63	100	63	100

In this study 126 participant different age patients were investigated. In placebo group laryngospasm 1-5 years, 6-10 years 11-15 years was 22.22%, 36.50 % and 41.26 % while in lidocaine group laryngospasm was 19.04%, 34.92% and 46.03% respectively as mentioned in table 2 . In this study 74 subjects (male 37, female 37) of age between 3 months and 6 years were divided into two equal groups of 37 each lidocaine group and control group, thereis no significant difference between the groups respect to sex, weight, and duration of anesthesia. The incidence of laryngospasm in control group was 24.32% and in lidocaine group was 5.71%. Depletion in the rate of laryngospasm was 18.92% on administration of intravenous lidocaine (1.5mg/kg) [19].

Table 2. Age distribution of the research individuals

Age (Years)	Group-P		Group-L	
	Frequency	Percentage	Frequency	Percentage
1-5 years	14	22.22222	12	19.04762

6-10 years	23	36.50794	22	34.92063
11-15 years	26	41.26984	29	46.03175
Total	63	100	63	100

The criterion for efficacy was taken as absence of laryngospasm. Efficacy in Group P was observed in 76.19% of the total group population, which means that in Group P laryngospasm was absent in 48 patients and present in 15 patients. Efficacy in Group L was observed in 88.88% of the total group population, which means that in Group L laryngospasm was absent in 59 patients and present in 7 patients as mentioned in table 3. In other study 40 children of age 3-6 years are randomly divided into lidocaine and placebo group, in the lidocaine group 2mg/kg was injected before extubation no laryngospasm was develop while in the placebo group 4 patients develop laryngospasm. The lidocaine is efficacious in laryngospasm prevention [20].

Table 3. Comparison of laryngospasm in research individuals between the groups.

Laryngospasm in Group-P				Laryngospasm in Group-L			
Yes		No		Yes		No	
Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
15	23.80952	48	76.19048	7	11.11111	56	88.88889

The incidence of laryngospasm Mild, Moderate and Severe in Group P was 33.33%, 46.66% and 20% while in Group L was 42.85%, 28.57% and 28.57% respectively as mentioned in table 4. In other study the incidence of laryngospasm in Group P was 24.32% and in Group L was 5.71%. Reduction in the incidence of laryngospasm was 18.92% on administration of intravenous lidocaine P value = 0.0031 was statistically significant [21]

Table 4. Incidence of laryngospasm severity

Laryngospasm severity	Group-P		Group-L	
	Frequency	Percentage	Frequency	Percentage
Mild	5	33.33333	3	42.85714
Moderate	7	46.66667	2	28.57143
Severe	3	20	2	28.57143

Total	15	100	7	100
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Conclusion

Intravenously or topically is effective in prevention of post-extubation laryngospasm in pediatric patients. According to various authors intravenous lidocaine at a dose of 1.5mg/kg, 3-5min before extubation is fruitful in laryngospasm prevention. This work can be extend to investigate the efficacy of lidocaine in prevention cough and sore throat. Moreover, the effect of topical lidocaine in recurrent laryngeal nerve palsy.

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