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Incidence of postoperative laryngospasm in adults and its management

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Abstract

To determine the incidence of post-operative laryngospasm in throat surgical procedures under general anesthesia. Cross Sectional study was conducted in DHQ Hospital Timergara, district LOWER DIR, Khyber Pakhoonkhwa, Pakistan. Samples were collected through convenience sampling which is a non-probability technique for sample collection. Total study sample size was 398. Patients having ASA physical status I and II, presented for elective throat surgical procedures were included while emergency cases, age less than 15 and greater than 40 were excluded. The incidence of laryngospasm was 0.76% (3/398) out of 398 patients. Individuals who were presented for tonsillectomy under GA were 364, among them 1 (0.54%) patient developed laryngospasm and 34 patients were presented for Thyroidectomy, among them 2 (2.94%) patients developed laryngospasm. We assumed from this study that low age population were more prone to the development of laryngospasm and if reported then should diagnosed early and should be treated for the appropriate cause. Suctioning, deepening the level of anesthesia with propofol and applying continuous positive pressure ventilation with 100% oxygen were the successful techniques for treating laryngospasm.

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Introduction

Laryngospasm is one of the complication seen in the perioperative period particularly during induction of anesthesia or during extubations (Roy, W. L., 1988). It is a protective reflex closure of epiglottis, as a result of unusual stimulus (Alalami, Baraka, and Ayoub 2020, Alalami, Ayoub, and Baraka 2008, Roy and Lerman 1988). This complication of general anesthesia is commonly occurring in pediatric population (Nagaprasad Yerramilli and Kumar Cherukuri 2016). The incidence of laryngeal spasm in pediatric population ranged from 0.04 to 4% (A and M 2015). Mostly laryngospasm occurs during the emergence of anesthesia which is 48%, 28% occurs during induction and 24% occurs during the maintenance of anesthesia (Laryngospasm R3 王智弘 N.D.). In most of the cases prolonged hypoxia and hypercapnia may abolish this spastic reflex of laryngeal muscles and becomes self-limited. Though, in few cases as the stimulus remains, the spasm may continue for long time which further leads to many of the following conditions such as pulmonary edema, bronchospasm, arrhythmia and cardiac arrest (Alalami, Ayoub, and Baraka 2008). The overall incidence has been reported by Olsson and Hallen at just under 1% in both adult and pediatric practice. The incidence of laryngospasm has been reported in the literature as high as 25% in patients undergoing tonsillectomy and adenoidectomy (Gavel and Walker 2014). If managed poorly this may lead to cause morbidity and mortality in some patients (Visvanathan *et al.* 2005).

Laryngospasm is defined as “a complication of general anesthesia occurring within two minutes after extubations, described by the following findings”: closure of epiglottis with no air movement, inspiratory stridor and cyanosis (Kalloghlian, Pittappilly, and Matthews 1999). This type of complication requires an intense and rapid response from the anesthesia and surgical team and also requires monitoring in postoperative period at the same time (Orestes *et al.* 2012). In children up to 9 years of age this complication of GA may involve with higher incidence, 17/1000 anesthetics and may increase in children with obstructive pulmonary disease and in those having acute upper respiratory tract infections 64/1000 and 96/1000, respectively (Hampson-Evans, Morgan, and Farrar 2008). In 11 years follow-up study of 136929 patients, OLESSON *et al* found the incident of laryngospasm 7.9/1000 anesthetics or 8.7/1000 patients (D *et al.*, 2012). Olsson also demonstrated the incidence of laryngospasm in children and with highest incidence in infants of 1-3 months 1.7% and 2.8% respectively (Roy and Lerman 1988). Another researcher says that laryngospasm is also one of the most important complication facing to anesthesiologists, having 0.78% to 5% incidence and may also depends on patient age, type of surgery, preexisting condition and anesthetic technique (D *et al.*, 2012). Laryngospasm can rapidly result in hypoxemia and bradycardia (Spijkerman 2017). However, this is self-limiting because during hypoxia carbon dioxide retention occurs which stop the reflex (D *et al.*, 2012).

Incomplete upper airway obstruction can often be relieved with one of several therapeutic maneuvers. The first thing in the management of Laryngospasm is to eliminate the irritant stimulus e.g. irritant inhalational anesthetics, second by removing surgical stimulus from visceral nerve endings or by removing debris from the larynx and third is to deepen the level of anesthesia. The fourth step in the management of laryngospasm is to improve ventilation strategy through applying gentle Continuous Positive Airway pressure with 100% oxygen and tight fitting face mask (A and M 2015, Shaban 2016). A single dose of propofol with 0.8mg/kg have successfully reduced coughing during emergence. They also suggest that NMDA receptors inhibition of propofol is less likely to be the main suppressing mechanism of coughing and should need more experimental studies (Shaban 2016). Non-irritant inhalational anesthetics, e.g. sevoflurane, deep anesthesia before intubation are the most important prevention techniques (Laryngospasm R3 王智弘 N.D.). Isoflurane, because of an irritant to airway, showing greater incidence of laryngospasm among inhalational agents (Shimelis Legesse and Nega Desalegn 2015). Laryngospasm is not common but most critical issue perioperatively. There are very less studies on post-operative laryngospasm after throat

surgical procedures in adults. We specifically want to make aware people of anesthesia and to take this complication serious in order to manage it on time. Through this study we are alarming anesthesia persons about laryngospasm after Throat surgeries under General Anesthesia. This study will also make the readers becomes aware regarding the incidence of laryngospasm. To determine the incidence of post-operative laryngospasm in Throat surgical procedures having Surgery under General Anesthesia.

Materials and methods

Study Settings

For this cross sectional study, conducted in District Head Quarter Hospital Timergara, samples were collected through convenient sampling method which is a type of non-probability sampling technique. Total duration of this study was 05 months. During collection of data every participant was familiar with the aims and objectives of this study, by the researcher. Every participant was assured of their data confidentiality, and oral or written informed consents were taken from every participant.

Patients selection

After approval from ethics committee of hospital and taking patient consent, data collection was started by the following important questions of designed questionnaire: investigating the anesthetic record of patients, patient age, induction agents used, type of anesthesia technique, ASA Physical status, type of surgery, and history of concurrent diseases. All patients with ASA physical status I and II presented for Elective thyroidectomy and tonsillectomy procedures having age 15-40 years were included while children's, emergency cases and smokers or other drug addicts were excluded.

Approval from Institute

This study was approved from the undergraduate research comity IPMS (Institute of Paramedical Sciences), Khyber Medical University Peshawar, Pakistan.

Data Analysis

For data analysis, SPSS Version 22 was used to calculate mean age, standard deviation and frequency distribution. Data were then represented through tables.

Results

Total of 398 patients were selected and were studied for postoperative laryngospasm. Among them 3 (0.76%) patients developed laryngospasm (Table 3). Both male and female genders presented for throat surgical procedures were examined postoperatively for the presence of laryngospasm in them.

Out of them 203 were male patients having 51.0% and 195 were female having 49.0% (Table 1).

Table 1. Gender Distribution of the research individuals.

	Gender	
	Frequency	Percent (%)
Male	203	51.00
Female	195	49.00
Total	398	100.0

The maximum age participants were 40 years old while minimum age participants were 15 years old. The subjects of this study having age with mean of 23.75 and standard deviation 6.445. This clearly indicates that age was not more than 40 and not less than 15 (Table 2).

Table 2. Maximum and Minimum Age Patients included in the research.

	N	Minimum	Maximum	Mean	SD
Age	398	15	40	23.75	6.445

When we studied and obtained data from the research population we found that 3 patients of them developed laryngospasm at time of endotracheal extubations. After analyzing the data, we get result of 0.76%, while all other patients successfully recovered and do not suffered from laryngospasm which was about 99.24% (Table 3).

Those individuals who were suffered from laryngospasm were successfully recovered by deepening the level of anesthesia with propofol injection, tight fitting oxygen face mask with 100% oxygenation and gentle positive pressure ventilation. All of the patients also received dexamethasone injections with good improvement in the airway clearances.

Table 3. Patients Suffered from Laryngospasm.

Laryngospasm	Frequency	Percent (%)
Yes	3	0.76
No	395	99.24
Total	398	100.0

Those individuals who were presented for Tonsillectomy under General Anesthesia were 364 (100%) among them 2 patients (0.54%) developed Laryngospasm and 362 (99.46%) of them were successfully recovered, while on the other hand those of Thyroidectomy were 34 (100%) among them 1 patient (2.94%) developed laryngospasm and 33 (97.06%) of them were successfully recovered and were free from laryngospasm (Table 4). From this result we assumed that the individuals who were presented for thyroidectomy surgery under GA were more prone to develop laryngospasm in them as compare to the individuals having Tonsillectomy surgery.

Table 4. Association of Laryngospasm with type of surgery.

	Laryngospasm		Total
Procedure	Yes	No	
Tonsillectomy	2	362	364
	0.54%	99.46%	100.0%
Thyroidectomy	1	33	34
	2.94%	97.06%	100.0%
Total	3	395	398
Total in Percent	0.76%	99.24%	100.0%

We made two groups, Group A and Group B for comparison of laryngospasm by age. Group A was consisting of 212 (100%) patients with age less than 30 years and their surgeries was done under GA, among them 2 patients (0.94%) developed laryngospasm and 210 (99.06%).

Do not develop laryngospasm. Group B was comprising of individuals with age more than 30 years whose surgery was also done under GA were 186 (100%) among them 1 patient (0.53%) developed laryngospasm and 185 (99.47%) of them do not developed (Table 5).

From this study we founded "age" as the third confounder for the occurrence of laryngospasm.

Table 5. Effect of age on incidence of Laryngospasm

	Laryngospasm		Total
Age	Yes	No	
	2	210	212
Less than 30 Years	0.94%	99.06%	100.0%
	1	185	186
30 Years and above	0.53%	99.47%	100.0%
	3	395	398
Total	0.54%	99.46%	100.0%

Discussion

Results of this study shows that laryngospasm was occurred in 3 patients out of 398 and was not a common complication of general anesthesia. Diagnosing patient with laryngospasm was founded one of the most important technique in its management. We founded that, if the cause identified early then a patient can be treated for the cause and may not exacerbate the signs and symptoms of laryngospasm. We diagnosed all the patients for Postoperative laryngospasm by monitoring the patient partial pressure of oxygen (SPO_2) and end tidal carbon dioxide ($ETco_2$) after extubations. In both of the three victims, the SPO_2 was dropped to 40%, their lips were become bluish and they tried to reach their hands to the neck for removal of any spasm causing agent during these conditions. We applied different techniques for the management of laryngospasm in these patients, among them the most successful techniques were deepening the level of anesthesia with propofol injection and providence of 100% oxygen through tight fitting face mask.

Many other researchers also reported in their studies that laryngospasm throughout anesthesia for the period of an 11 year follow up study, originates an inclusive occurrence of 0.87% (8.7/1000) patients. Greater occurrence was founded in zero to nine years' children, which were 17.4/1,000 (1.74%) patients, and within this age group, infants aging 1 to 3 months were founded with the highest occurrences (Roy, W. L. 1988), which indicate that infants were more prone to develop laryngospasm as compare to other age group. This study reported 0.76% (3/398) incidence of laryngospasm which shows very slight difference with other studies. We founded some variables that was might increasing the incidence of laryngospasm, these variables were age, type of anesthetic agent,

type of surgery and light plan of anesthesia. As because light plan anesthesia was associated with higher incidence of laryngospasm. Individuals whose age was less than 30 were much more vulnerable to the development of laryngospasm in them as compare to the individuals with age greater than 30 years. By look after on results of tonsillectomy (0.54%) and thyroidectomy (2.94%), we assumed that thyroidectomy procedures were more vulnerable for laryngospasm development than that of tonsillectomy.

One of the other study published in pediatric anesthesia journal shows overall 0.87% incidence of laryngospasm (Alalami, Baraka, and Ayoub 2020). This slight difference in the result was due to the difference in selection criteria of study population. Our study participants were not less than 15 years but the above study was based on infants and children's. As other studies were also showing same results as ours, therefore we assumed from this study and many other previous studies that laryngospasm can be occur postoperatively with little incidence and if early identified and managed well, it cannot be fatal but may require post operatively care for many hours to few days. Another review article reported that if Laryngospasm in children worsens, may also contribute to the development of pulmonary edema in them. Though, in adolescents and adults the seven cases of pulmonary edema which show that they were less common reported due to laryngospasm (Alalami, Baraka, and Ayoub 2020). As because of the successful recovery and management of all the victims, our study victims didn't develop pulmonary edema.

Conclusion

At the conclusion we identified that laryngospasm was associated with higher incidence during emergence from anesthesia. Factors that were affecting the incidence of laryngospasm were age, type of surgery and level of anesthesia. When treating laryngospasm in our study victims all cases were successfully recovered within 5-10 minutes by applying the following techniques: continuous positive pressure ventilation with 100% oxygen delivery, suctioning of the airway, deepening the level of anesthesia with propofol administration by IV route, and IV administration of dexamethasone.

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