Original Article

Effect of Lidocaine Administration into Endotracheal Tube Balloon on Hemodynamics and Intraocular Pressure during Intraoperative Period

Sabir Khan, Faiza Liaquat and Hassan Jameel

ABSTRACT

Objective: To investigate the effect of lidocaine instillation into the endotracheal tube balloon during intraoperative period on intraocular pressure (IOP) and hemodynamics.

Study Design: A Randomize Control Trial.

Place and Study Duration: This study was conducted at the Department of Anaesthesia and Intensive Care, Hameed Latif Hospital, Lahore from 05 May 2016 to 04 April 2017.

Materials and Methods: After obtaining ethical approval from hospital ethical board and informed consent from patients regarding inclusion in clinical trial. Total 100 Patient were enrolled in study through non probability consecutive sampling and divided in two equal groups randomly by using lottery method. Data was collected by using preformed Performa and analyzed with SPSS 23. Quantitative continuous data was presented as mean and standard deviation age and IOP. Qualitative data was presented as numbers and percentages like gender. Student t-test and chi-square test was applied to see significance of variables. P value 0.05 was taken as significant.

Results: Numberof 100 patients were enrolled in this study, both genders. The patients were further divided into two equal group 50% (n=50) in each i.e. control and lidocaine. Mean IOP 2 min before intubation, IOP 2 min after intubation, IOP 5 min after intubation and IOP 10 min after intubationof the control patients was 10.80±3.48 minutes, 13.36±3.50 minutes, 13.04±2.09minutes and 10.30±2.32 minutes respectively. While, The mean IOP 2 min before intubation, IOP 2 min after intubation, IOP 5 min after intubation and IOP 10 min after intubation lidocaine patients was 13.12±2.12 minutes, 17.74±1.92 minutes, 15.44±1.96minutes and 13.54±3.01 minutes respectively. The differences were statistically significant.

Conclusion: The observations of our study revealed that the use of Lidocaine into the endotracheal tube balloon gives better hemodynamic control and intraocular pressure maintenance. And attenuate presser response due intubation.

Key Words: Endotracheal Tube, Lidocaine, Intubation, Intraocular Pressure

Citation of articles: Khan S, Liaquat F, Jameel H. Effect of lidocaine Administration into Endotracheal Tube Balloon on Hemodynamics and Intraocular Pressure during Intraoperative Period. Med Forum 2018;29(3):47-51.

INTRODUCTION

Raised intra ocular pressure (IOP) is an alarming sign for healthy and normal eyes similar increase in injured or traumatic eye is dangerous which can lead to blindness[1]. It is necessary to maintain intra ocular pressureat its normal level or below the normal given level. During intubation and extubationof endotracheal tube stress response activates the sympathetic system which increased the IOP[2.3]. Number of sensory receptors is located on lower portion of pharynx, epiglottis and larynx that respond to different type of thermal, chemical and mechanical stimuli received in different cases[4]. Among these mechanoreceptors are abundantly found in epiglottis lower portion of pharyngeal wall and on vocal cords[5]. Activation of these receptors at the time of intubation and extubation produce several body responses such as cough and hiccups due to reflux motor response[6], cardiovascular preser response due to activation of sympathetic reflex and also release of catecholamines from adrenal medulla into blood pressure stream (circulation)[7]. This adrenergic outflow is responsible for tachycardia, vasoconstriction and raised central venous pressure. These all pressures and their increase have close relationship with IOPin comparison with systemic pressure[8].

This whole mechanism enhances the outflow resistance of aqueous humor in mesh work of trabecular which located between Schlemm'scanal that can increase the IOP[9]. To overcome this situation more experienced hands for intubation and extubationare needed,

Department of Anaesthesia, Hameed Latif Hospital, Lahore.

Correspondence: Dr. Sabir Khan, Consultant Anaesthesiologist, Department of Anaesthesia, Hameed Latif Hospital, Lahore.
Contact No: 0333 6365383
Email: drsabirkhan44@gmail.com

Received: October, 2017; Accepted: December, 2017

intubation procedure is well studied and improved but extubation is not[10]. It is a well known fact that short time period after extubation can cause aspiration, laryngeospasm, ineffective pulmonary masaageand short opening can cause raised in IOP. Patients of coronary artery disease may develop myocardial ischemia. In this aspect drugs (atropine,epinephrine, lidocaine and nalaxone) can be administered through endotracheal tube where they absorb more rapidly due to excessive blood supply[11]. It is necessary to avoid these complications by control of IOP[12]. Aim of our study is to examine the effect of lidocaine administration into endotracheal tube to overcome the increase in IOP.

MATERIALS AND METHODS

Study was conducted in Hameed Latif Hospital, Lahore from 05 May 2016 to 04 April 2017,after ethical approval from hospital ethical board and obtaining detailed consent after information about study purpose and procedure. Study was conducted on 100 patients of either gender and ASA status I and II. Patients were between age of 20 to 40 years who were selected for any ophthalmic surgery (squint, position and cataract). Non probability consecutive sampling technique was used and sample size was calculated by using 95 percent confidence interval 80% and P1 (IOP 2 minutes before surgery in case group 11.10 ± 1.7611) P2 (IOP 2 minutes before surgery in control group 11.56 ± 1.4012) and patients were divided into two groups, 50 patients in each group. Patients of hypertension, glaucoma, difficult airway, diabetes and obesity were excluded from the study. Patients were monitored for Noninvasivepulse oximetry, tidal volume, two large bore cannulas were inserted on both limbs in operative room and 1.0 micrograms per kg fentanyl was given. Propofol was given with dose of 1 to 2 mg per kg for induction and neuromuscular blocker atracurium bromide was given 0.5 mg per kg. Before insertion of endotracheal tube patients were ventilated with 100% oxygen and sevoflurane for three minutes.Patients were intubated with standard size endotracheal tube. After confirmation of proper placement balloon of endotracheal tube was inflated with 2% Lidocain solution and fixed for Lidocain Group and Normal saline was used to inflate the balloon of endotracheal tube for control group, endotracheal tube was connected to ventilator on positive intermittent mandatory ventilation mode. Anesthesia was maintained using atracurium and sevoflurane. Non operated eye was used measure IOP. Intra ocular pressure was measured before 2 min of intubation andthen measured at two minutes, five minutes and ten minutes duration with tonometer (schiotz tonometer). All hemodynamic parameters blood pressure systolic and diastolic, heat rate and IOP was measures and recorded.

Patient'sdata was analyzed with statistical package for social sciences. Quantitative continuous data was presented as mean and standard deviation age and IOP. Qualitative data was presented as numbers and percentages like gender. Student t-test and chi-square test was applied to see significance of variables. P value 0.05 was taken as significant.

RESULTS

Overall, 100% (n=100) patients were enrolled in this study, both genders. The patients were further divided into two equal group 50% (n=50) in each i.e. control and lidocaine. The mean age, weight and operative time of the controls was 28.12±2.68 years, 63.88±3.11 kg and 45.18±3.24 minutes respectively. There were 70% (n=35) males and 30% (n=15) females. While, the mean age, weight and operative time of the lidocaine patients was 28.02±2.69 years, 64.08±3.31 kg and 49.58±2.16 minutes respectively. There were 70% (n=35) males and 30% (n=15) females. ASA I and II was observed as 80% (n=40) and 20% (n=10) respectively in controls. While, ASA I and II was observed as 56% (n=28) and 44% (n=22) respectively in lidocaine patients. Operative type distribution noted cataract, ptosis and squint as 36% (n=18), 42% (n=21) and 22% (n=11) respectively, in controls. While, in lidocaine patients, operative type distribution noted cataract, ptosis and squint as 42% (n=21), 36% (n=18) and 22% (n=11) respectively.The differences were statistically insignificant except ASA (p=0.010) and operative time (p=0.000). (Table. 1).

Table No.1: Demographic characteristics among the study groups

Variables	Control (n=50)	Lidocaine (n=50)	Test of Sig.
Age (years)	28.12±2.68	28.02±2.69	t=0.186, p=0.853
Gender	M=70%, F=30%	M=70%, F=30%	χ^2 =0.00, p=1.0
Weight (kg)	63.88±3.11	64.08±3.31	t=-0.311, p=0.757
ASA (I/II)	I=80% (n=40), II=20% (n=10)	I=56% (n=28), II=44% (n=22)	χ^2 =6.61, p=0.010
Operative time (min)	45.18±3.24	49.58±2.16	t=-0.7.97, p=0.000
Operative type (cataract ptosis/squint)	36% (n=18)/ 42% (n=21)/ 22% (n=11)	42% (n=21)/ 36% (n=18)/ 22% (n=11)	χ^2 =0.462, p=0.794

The mean SBP 2 min before intubation, SBP 2 min after intubation, SBP 5 min after intubation, SBP 10

min after intubation, DBP 2 min before intubation, DBP 2 min after intubation and DBP 5 min after intubation of the control patients was 112.88±5.45 minutes, 131.76±2.45 minutes, 114.38±3.19 minutes, 111.66±3.75 minutes, 69.16±3.18 minutes, 74.90±2.03 minutes, 71.22±2.39 minutes, 67.86±3.31 minutes respectively.

Table No. 2: Comparison of hemodynamic changes before and after tracheal extubation among the study groups

Variables	Control (n=50)	Lidocaine (n=50)	Test of Sig.
SBP 2 min before intubation	112.88±5.45	112.50±4.22	t=0.386, p=0.698
SBP 2 min after intubation	131.76±2.45	118.36±2.19	t=28.79, p=0.000
SBP 5 min after intubation	114.38±3.19	113.38±3.65	t=1.45, p=0.148
SBP 10 min after intubation	111.66±3.75	110.28±4.39	t=1.68, p=0.095
DBP 2 min before intubation	69.16±3.18	65.58±2.57	t=6.18, p=0.000
DBP 2 min after intubation	74.90±2.03	68.72±3.18	t=11.55, p=0.000
DBP 5 min after intubation	71.22±2.39	66.22±1.98	t=11.37, p=0.000
DBP 10 min after intubation	67.86±3.31	63.48±3.86	t=6.08, p=0.000
HR 2 min before intubation	80.80±2.05	76.80±1.64	t=10.76, p=0.000
HR 2 min after intubation	85.22±2.36	81.94±3.49	t=5.49, p=0.000
HR 5 min after intubation	80.86±3.11	76.26±1.99	t=8.78, p=0.000
HR 10 min after intubation	83.40±3.60	77.90±3.22	t=8.04, p=0.000

While, the mean SBP 2 min before intubation, SBP 2 min after intubation, SBP 5 min after intubation, SBP 10 min after intubation, DBP 2 min before intubation, DBP 2 min after intubation and DBP 5 min after intubation in lidocaine patients was 112.50±4.22 minutes, 118.36±2.19 minutes, 113.38±3.65 minutes, 110.28±4.39 minutes, 65.58±2.57 minutes, 68.72±3.18 minutes, 66.22±1.98 minutes, 63.48±3.86 minutes respectively.The differences were statistically significant except SBP 2 min before intubation (p=0.698), SBP 5 min after intubation (p=0.148) and SBP 10 min after intubation (p=0.095). (Table. 2).

Table No.3: Comparison of intraocular pressure changes before and after tracheal extubation among the study groups

Parameters	Control (n=50)	Lidocaine (n=50)	Test of Sig.
IOP 2 min before intubation	10.80±3.48	13.12±2.12	t=-4.01, p=0.000
IOP 2 min after intubation	13.36±3.50	17.74±1.92	t=-7.73, p=0.000
IOP 5 min after intubation	13.04±2.09	15.44±1.96	t=-5.91, p=0.000
IOP 10 min after intubation	10.30±2.32	13.54±3.01	t=-6.02, p=0.000

The mean HR 2 min before intubation, HR 2 min after intubation, HR 5 min after intubation and HR 10 min after intubation of the control patients was 80.80±2.05 minutes, 85.22±2.36 minutes, 80.86±3.11 minutes and 83.40±3.60 minutes respectively. While, the mean HR 2 min before intubation, HR 2 min after intubation, HR 5 min after intubation and HR 10 min after intubation lidocaine patients was 76.80±1.64 minutes, 81.94±3.49 minutes, 76.26±1.99minutes and 77.90±3.22 minutes respectively. The differences were statistically significant. (Table. 2).

The mean IOP 2 min before intubation, IOP 2 min after intubation, IOP 5 min after intubation and IOP 10 min after intubation of the control patients was 10.80±3.48 minutes, 13.36±3.50 minutes, 13.04±2.09minutes and 10.30±2.32 minutes respectively. While, The mean IOP 2 min before intubation, IOP 2 min after intubation, IOP 5 min after intubation and IOP 10 min after intubation lidocaine patients was 13.12±2.12 minutes, 17.74±1.92 minutes, 15.44±1.96minutes and 13.54±3.01 minutes respectively. The differences were statistically significant. (Table 3).

DISCUSSION

It is necessity to avoid increase of IOP in perioperative and post-operative time to limit the complications and its dangerous effects (vitreous humor expulsion). Most important thing in this aspect is choice if anesthetic agent. In our study we use non operated eye instead of operated eye to minimize the bias. We include patients of 18 to 40 years as hypothesized that airway reflexes are associated with age[13]. In our study we found

remarkable decrease in mean IOP in case group as compared control group.

In a study conducted by Hassaneina A [14]concluded the similar results that use of Lidocain 2% instillation five minutes before end of surgery is an effective method which reduce the incidence of raised IOP with complete hemodynamic stability both during and after extubation. This study is identical to our study and can be compared with our results. In another study Bidwaskiet al[15] use similar variables and evaluate role of lidocaine instillation in endotracheal tube to reduce IOP and found that use of 2% lidocaine in tube reduce the laryngeospasm and laryngeal reflux. But intravenous lidocaine is not inferior to that technique both are equally effective.

Another study was conducted by Gefkeet al[16] in 1983 and reported significant decrease in HR values. He also observed that there was not any difference in anesthesia duration and dizziness in both groups (Lidocain group and placebo group). SBP in his study was also significantly lower in lidocaine group at 2 min before extubation. This study is also comparable with our finding as in our study HR is lower in lidocaine group as compared placebo.

In a study Ebrahim N et al[17] also observed that at the time intubation and extubation IOP raised to a significant level, its peek value were at the one minute after intubation and extubation. Furthermore IOP was higher at extubation as compared to intubation. It takes about 10 minutes to return at baseline values. This study can be compared with our study.

In another study conducted by Pandya Malti J et al[18] was compared laryngeal mask airway and endotracheal for the evaluation of IOP. He reported that endotracheal extubation is the cause of increase in IOP and that can be controlled with use of lidocaine in endotracheal tube which has significance reduction in IOP and its side effects. Findings of this are study also similar our study.

In a study by Tavakkolet al[19] use 5 ml of 2% lidocaine in endotracheal tube and compared number of coughs and laryngeospasm with placebo. Observations of his study revealed that number coughs and incidence of laryngeospasm is much lower in case (lidocaine) group as compared to control (placebo) group. This study is also strengthen our study as its results identical to our results.

CONCLUSION

The observations of our study revealed that the use of Lidocaine into the endotracheal tube balloon give better hemodynamic control and intraocular pressure. And attenuate presser response due intubation.

Author's Contribution:

Concept & Design of Study:	Sabir Khan
Drafting:	Sabir Khan, Faiza Liaquat
Data Analysis:	Faiza Liaquat, Hassan Jameel
Revisiting Critically:	Faiza Liaquat, Sabir Khan
Final Approval of version:	Sabir Khan

Conflict of Interest: The study has no conflict of interest to declare by any author.

REFERENCES

1. Holló G, Katsanos A, Boboridis KG, Irkec M, Konstas AGP. Preservative-Free Prostaglandin Analogs and Prostaglandin/Timolol Fixed Combinations in the Treatment of Glaucoma: Efficacy, Safety and Potential Advantages. Drugs 2017;3:1-26.
2. Alvarez-Berdugo D, Rofes L, Casamitjana JF, Padrón A, Quer M, Clavé P. Oropharyngeal and laryngeal sensory innervation in the pathophysiology of swallowing disorders and sensory stimulation treatments. Ann NY Acad Sci 2016;1380:104–120.
3. Mazzone SB, Undem BJ. Vagal Afferent Innervation of the Airways in Health and Disease. Physiol Rev 2016;96(3):975-1024.
4. Ebihara S, Izukura H, Miyagi M, Okuni I, Sekiya H, Ebihara T. Chemical Senses Affecting Cough and Swallowing. Curr Pharm Des 2016; 22(15):2285-2289.
5. Cedborg AI, Sundman E, Bodén K, Hedström HW, Kuylenstierna R, Ekberg O. Pharyngeal function and breathing pattern during partial neuromuscular block in the elderly: effects on airway protection. Anesthesiol 2014;120(2): 312-25.
6. HårdemarkCedborg AI, Sundman E, Bodén K, Kuylenstierna R, Ekberg O, Witt Hedström H. Coordination of spontaneous swallowing with respiratory airflow and diaphragmatic and abdominal muscle activity in healthy adults. Experimental Physiol 2009;94(4):459-468.
7. Mohammad Waheed El-Anwar, Mohammad A, Hazem SA, Manar A. Early and Delayed Effect of Functional Endoscopic Sinus Surgery on Intraocular Pressure. Int Arch Otorhinolaryngol 2016;20(04): 359-363.
8. Puja J, Arun J, Rajesh R, Singh M, Puja P, Bhise PN. Comparative Study of Intraocular Pressure and Haemodynamic Responses to Laryngeal Mask Airway and Endotracheal Tube .Int J Sci Stud 2017;4(12):124-131.
9. Pacheco-Lopez PC, Berkow LC, Hillel AT, Akst LM. Complications of Airway Management. Respir Care 2014;59(6):1006-1019.
10. Nocon CC, Pinto JM, Blair EA, Small SD. Interdisciplinary Rotations in Residency Training:

Impact on Airway Management Experience. J Anesth Clin Care 2016;3:014.

11. Reichert C, Reichert P, Monnet-Tschudi F, Kupferschmidt H, Ceschi A, Rauber-Lüthy C. Seizures after single-agent overdose with pharmaceutical drugs: analysis of cases reported to a poison center. ClinToxicol (Phila) 2014; 52(6):629-34.
12. Jaichandran V. Ophthalmic regional anaesthesia: A review and update. Indian J Anaesthesiol 2013; 57(1):7-13.
13. Land W, Steven James M. Laryngospasm. In: Atlea John L, editor. Complications in anesthesia. 1st ed. Philadelphia: Sanders Co; 1999.p.623–625.
14. Hassaneina A. Effect of lidocaine instillation into endotracheal tube on intraocular pressure during extubation. Ain-Shams J Anesthesiol 2016;9:23–26
15. Bidwaski AV, Stanely TH. Blood pressure and pulse rate response to extubation with and without prior tracheal anesthesia. Can AnesthSoc J 1998; 416–441.
16. Gefke K, Anderson LW, Frisel E. Lidocaine given intravenously as a supressant of cough and laryngospasm in connection with extubation after tonsilectomy. Act Anesthesiol Scand 1983; 27:111–112.
17. Ebrahim N, Seved J. Comparative evaluation of intraocular pressure and hemodynamic changes during tracheal intubation and extubation. Res J Biol Sci 2007; 2:344–347.
18. Pandya Malti J, Agarwal G. Comparative study of intraocular pressure changes with laryngeal mask airway and Endotracheal tube. Nat J Commun Med 2012;3.
19. Tavakkol K, GhaffarianShirazi H. Effect of lidocaine injection into endotracheal tube on incidence of cough and laryngospasm. Iran J Crit Care Nurs 2009; 2:23–26.