EFFICACY OF INTRAVENOUS LIGNOCAIN VERSUS SEVOFLURANE IN PREVENTION OF COUGHING AND DESATURATION AT EXTUBATION IN CHILDREN

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ABSTRACT

Objective: To compare the efficacy of intravenous lignocain versus sevoflurane in prevention of coughing and desaturation at extubation in children less than 6 years of age.

Study Design: Randomized controlled trial.

Place and Duration of Study: This study was carried out at Combined Military Hospital Nowshera, from May 2013 to May 2016.

Material and Methods: This randomized controlled trial study was conducted at Combined Military Hospital Nowshera from May 2013 to May 2014 after obtaining approval from the hospital ethics committee (IREC-0003/5/13/Aneas). Sample size (n=710 patients) was calculated by using WHO Sample Size calculator with confidence level of 95%, level of significance 5%. Children aged three months to six years undergoing surgical procedures requiring the placement of definitive airway were randomly assigned into two groups. Patients were anaesthetized by standardized balanced anaesthesia technique. In group-A (n=355), three minutes prior to extubation lignocain 2% was used intravenously. In group-B (n=355), isoflurane was switched off, breathing circuit changed and sevoflurane started at minimum alveolar concentration (MAC 3-4%) for 3 minutes prior to extubation. Assessment for extubation was clinical. Oxygen saturation and severity of coughing were noted for 5 consecutive minutes, after extubation. Data were analysed by using statistical package for social sciences (SPSS) version 20. A *p*-value ≤0.05 was considered as statistically significant.

Results: In group-A, 156 patients were less than 2 years of age while in group-B, 135 patients were less than 2 years old. In group-A, 199 and in group-B, 220 children were 2-6 years of age respectively. Post stratification the *p*-value for weight was 0.17 (*p*-value>0.05) and t-statistic was 1.36. Post stratification *p*-value for gender was 0.12 (*p*-value>0.05) and chi square statistic was 2.49. Demographic comparison described in table-I. Group A had more eventful extubation with 270 cases of cough (76%) as compared to group-B where it were noted in 199 cases (56%). Similarly desaturation was observed in 85 cases in group-A (24%) as compared to 28 cases (8%) in group-B. The difference between the groups was satistically significant as shown in table-II & III.

Conclusion: Sevoflurane based anaesthetic vapor mixture results in statistically significant prevention from events like coughing episodes and desaturation in post-extubation in children less than six years of age undergoing elective surgery.

Keywords: Intravenous lignocaine (IV), Laryngospasm, Post extubation, Sevoflurane.

INTRODUCTION

Inadvertent coughing and desaturation are the most commonly faced and feared respiratory complications in post–anesthesia period[1]. These occur either due to the lack of inhibition of glottis reflexes resulting from inadequate central nervous system depression or because of increased local stimuli. Closure of the glottis occurs as afferent fibers of the internal branch of the superior laryngeal is stimulated, initiating laryngeal muscle contraction[2]. Desaturation due to coughing is not uncommon in patients undergoing endotracheal based general anesthesia, upper airway surgery, and otolaryngology procedures. It can be potentially life threatening causing negative pressure

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pulmonary edema, abrupt increase of intra-cavitary pressures (intracranial, intraocular, intrathoracic and intraabdominal) which could jeopardize patient's outcome. Children are more prone to airway problems due to peculiar anatomic differences whereby oedema of small diameter airways cause tremendous obstruction, equated as halving the diameter increases resistance of flow by 16 times[3,4]. The precipitating factors can be patient related[5,6] (asthma, respiratory tract infections), surgery related[5-8] (head and neck surgeries) and anaesthesia related[5-12] (airway catheters and drugs).

Intravenous lignocain has the advantage of blunting the pressor response during laryngo-scopy, intubation and at extubation. Numerous studies[10-12] on the prevention of such events have been carried out in paediatric population, but still the evidence is lacking on the effectiveness. Amongst the halogenated agents new and relatively more expensive agents like isoflurane and desflurane have lost popularity in peadiatric anaesthesia, for being severely irritant to airways[12]. Sevoflurane is a versatile sweet smelling agent best suited for induction and emergence for paediatrics, although in an editorial in 2010, Dr. Eger[13,14] stated that the unit cost of sevoflurane is higher than desflurane as a maintenance anaesthetic agent. In our setup considering the cost in-effectiveness of sevoflurane, we improvised a regime wherein sevoflurane was used before extubation for three minutes rather than throughout the entire procedure.

The aim of our study was to evaluate the comparative efficacy of intravenous lignocain 1.5mg/kg versus sevoflurane vapors started at MAC 3-4%, in terms of coughing and desaturation at extubation.

PATIENTS AND METHODS

This study was conducted at Combined Military Hospital Nowshera from May 2013 to May 2016 after obtaining approval from the hospital ethics committee (IREC-0003/5/13 /Aneas). Sample size (n=355 patients) was calculated using WHO Sample Size calculator with confidence level of 95%, level of significance 5% and power of test 80, anticipated population proportion-1 (P1) equal to 0.174 (incidence of severe coughing/desaturation with sevoflurane)[2] and anticipated population proportion-2 (P2) equal to 0.260 (incidence of severe coughing/ desaturation with lignocaine)[3].

Sampling technique was consecutive non-probability. Children were randomly divided into group-A and group-B (each having 355 patients) by random number table. Inclusion criteria were all children aged 3 months to 6 years, ASA I-II status, and due for all sorts of elective general surgical, ENT and Ophthal-mologic procedures requiring definitive airway placement. Patients with difficult airways, congenital defects, patients on steroids and having respiratory tract infections were excluded. Anaesthetists and surgical team members remained the same. All monitoring standards as dictated by the American society of anaesthe-siologists (ASA) were followed considering the co-morbidities, planned procedures, availability and expertise of the anaesthetist.

The anaesthesia was induced by either "Pedi mask technique" using 100% oxygen in sevoflurane vapors or standardized balance intraveoustecniques; injection nalbuphine 0.1mg/ kg as analgesic, injection atracurium 0.50mg/kg for intubation and muscle relaxation was used. Maintenance of anaesthesia was carried out with 100% oxygen in isoflurane vapors, titrated to clinical effects with conventional paediatric circuits of ventilation. The neuromuscular blockade was antagonized with glycopyrrolate 0.01 mg/kg and injection neostigmine 0.05 mg/ kg was administered at the end of surgical procedure.

Three minutes prior to the reversal of anaesthetics, the study drug (group-A) lignocain 1.5 mg/kg was administered, and in group-B isoflurane was switched off, breathing circuit changed and 3-4% sevoflurane started. Once the patient fulfilled clinically the extubation criteria,

extubation was done. Following extubation, coughing was defined as an act with or without apnea or cyanosis. Similarly desturation was defined as oxygen saturation on pulse oximeter less than 90%. Data for each patient was collected on a proforma and was analysed using SPSS-20.

Table-I: Groups under study* Age of the patient* Gender of the patient crosstabulation.

Gender of the patient			Age of the patient		Total Freq(f)	Percentage (%)	*p*-value
			Less than 2 years	2 To 6 years			
Male	Groups under study	Coughing/ Desaturation with sevoflurane	56	113	169	47.61	0.92
		Coughing/ Desaturation with lignocaine	62	128	190	53.52	
	Total		118	241	359	-	
Female	Groups under study	Coughing/ Desaturation with sevoflurane	100	86	186	52.39	
		Coughing/ Desaturation with lignocaine	73	92	165	46.48	6.08
	Total		173	178	351	-	

Table-II: Comparison of coughing.

	Coughing		No-coughing		Marginal Row Totals	
Group-A	270	(76%)	85	(24%)	355	
Group-B	199	(56%)	156	(44%)	355	
Marginal Column total	469		241		710	(Grand Total)

The chi-square statistic is 31.66. The *p*-value is 0.001.

Table-III: Comparison of desaturation.

	Desaturation	No-Desaturation		Marginal Row Totals	
Group-A	85 (24%)	270	270 (76%)	50	355
Group-B	28 (8%)	46	327 (92%)	50	355
Marginal Column Total	113	84	597	100	710 (Grand Total)

The chi-square statistic is 34.19. The *p*-value is 0.001.

Mean and standard deviation was calculated for quantitive variable i.e. weight etc. Frequency and percentages were calculated for qualitative variables like gender. Effect modifiers like age, gender and weight were controlled by stratification. Chi-square test was applied post stratification for age and gender and independent sample t-test was applied to weight. A *p*-value ≤0.05 was considered to be statistically significant.

RESULTS

In group-A, 156 (43.94%) patients were less than 2 years of age while in group-B, 135 (138.03%) patients were less than 2 years old. In group-A, 199 (56.06%) and in group-B, 220 (6.97%) children were 2-6 years of age respectively.

The male to female ratio of children was less than 2 years old in group-A and group-B was 56:100 and 62:73 respectively while from 2-6 years old it was 113:86 and 128:92 as shown in table-I.

The mean weight in group-A was 11.8 kgs & S.D ± 4.88 (Range: 3.5-20.8 kgs) while in group-B it was 11.3 kgs & S.D ± 4.72 (range: 3.8 to 19.5 kgs). Post stratification the *p*-value for weight was 0.17 (*p*-value >0.05) and t-statistic was 1.36. Post stratification *p*-value for gender was (*p*-value>0.05).

Group A had more eventful extubations with 270 cases of cough (270/355=76.05%) as compared to group-B where it were noted in 199

cases (199/355=56.05%). Similarly desaturation was observed in 85 cases in group-A (85/355=23.94%) as compared to 28 cases (28/355=7.88%) in group-B. The difference between the groups was satistically significant as shown in table-II & III.

DISCUSSION

Exaggerated laryngeal or respiratory reflexes resulting in coughing and desaturation are considered as significant complications in post-anesthesia phase. Reducing the incidence of these is of paramount vitality in peri-operative period. Sevoflurane is widely used in children, not only due to a sweet taste but also due to its ability to obtund airway reflexes. The results of our study suggest that incidence of coughing and desaturation are decreased significantly after sevoflurane as compared to intravenous lignocain; however, the timing of administration must be carefully planned to obtain optimum effects. We administered the study drug by selecting three min prior to extubation considering the studies conducted by Mikawa et al[15] and Bidwai et al[16] where it were described as increase of 20% from baseline in the haemodynamic parameter readings; and Sanikop et al[17] who found that heart rate, blood pressure and oxygen saturation were maintained at 1,2,3,5 and 10 minutes following administration of intravenous lignocain. The results of Orliaguet et al[18] did not show any significant difference in post-extubation scenarios in children under-going tonsillectomy. Tsui et al[19] also concluded the effectiveness of 'No touch' extubation technique on the incidence of coughing, oxygen desaturation, or laryngospasm in children undergoing adeno-tonsillectomy using sevoflurane as anaesthetic agent. Our studies were somewhat comparable to lliar et al[20], where 8% sevoflurane was used throughout anesthesia rather than at 3-4% MAC as was in our case, and showed promising effects to propofol. We consider this as a cost ineffective regimen. We switched over to sevoflurane at the end of surgery 4 minutes prior to a likelyhood of extubation; however, exact calculation of cost was not done except the fact that our monthly stock of sevoflurane lasted longer by (9 days ± 1.0 day) keeping in view the average number of patients in month. However, we felt few limitations worth mentioning such as a small sample size, use of nalbuphine altering airway reflexes and inter-individual variation in clinical assessment of depth of anaesthesia.

CONCLUSION

Sevoflurane based anaesthetic vapor mixture results in statistically significant prevention from events like coughing episodes and desaturation in post-extubation in children less than six years of age undergoing elective surgery.

CONFLICT OF INTEREST

This study has no conflict of interest to declare by any author.

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