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EVALUATING THE EFFICACY OF SEVOFLURANE IN ATTENUATION OF SYMPATHETIC RESPONSES FOLLOWING ESSENTIAL RESUSCITATIVE PROCEDURE USING CONVENTIONAL HAEMODYNAMIC PARAMETERS

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ABSTRACT **Background:** The utility of Sevoflurane in controlling haemodynamic response following laryngoscopy and endotracheal intubation is not fully understood. The existing study was intended to evaluate the effects of Sevoflurane induction for hemodynamic responses as well as emergence features among patients undergoing elective surgery with general anaesthesia. **Methodology:** A randomized study was carried out among 60 patients of ASA –I category at tertiary care institute in Mumbai. All 60 patients were divided into two groups namely Group 1(experimental group) patients who were mask ventilated with 100% oxygen and 1% Sevoflurane whereas Group 2 (control group) patients were mask ventilated and received only 100% oxygen. The hemodynamic changes were assessed at different levels and data analysis was done in SPSS Software Version 20. **Results:** Among the study group treated with 1% Sevoflurane, the heart rate, systolic blood pressure, diastolic blood pressure and mean arterial pressure at 3 minutes interval showed statistically significant decrease as compared to control group. **Conclusions:** The study emphasized that 1% Sevoflurane is significant in controlling major haemodynamic parameters including HR, SBP, DBP and MAP as a result of stress response due to airway insertion.

KEYWORDS : Blood Pressure, General Anaesthesia, Heart Rate, Mean Arterial Pressure, Sevoflurane

INTRODUCTION

Instrumentation of the airway for intubation is likely to perpetuate the hemodynamic pressor response. Such stress response can be related to rise in heart rate, blood pressure and serum catecholamines.[1] The hemodynamic response which happens during endotracheal intubation (ETT) is centrally mediated sympathetic reflex as a result of stretching of laryngeal and pharyngeal tissue.[2]

The hemodynamic response to laryngoscopy and ETT is unavoidable, transient and frequently well tolerated by healthy persons.[1,2] However, it may show lethal effects on cerebral and coronary circulation predominantly in individuals with systemic illness. [2] It reiterates the need for attenuation of stress responses as well as rapid emergence which may be potential clinical challenge for practicing anaesthesiologists. Without satisfactory control of sympathetic response, there may be a possibility of upsurge in deterioration of the patient in the perioperative phase debilitating the rapid recovery of the patient.[3,4]

Sevoflurane is a novel inhalational anaesthetic agent which permits rapid emergence because of its less blood solubility.[5] Sevoflurane has been efficaciously utilized as a substitute to several anaesthetic drugs for numerous day care procedures. Nevertheless, the use of Sevoflurane in controlling haemodynamic response following airway insertion is not much assessed.

The present study was designed to assess the effects of Sevoflurane induction for hemodynamic responses as well as emergence features among patients undergoing elective surgery with general anaesthesia.

MATERIALAND METHODS

After an ethical approval from the research committee of the respective institute, a controlled randomized study was executed. A total 60 adult day care patients of ASA grade I, undergoing elective surgery under general anaesthesia were randomly categorized into two groups using a computer generated random number table. Group 1 (experimental group) patients were mask ventilated with 100% oxygen and 1% Sevoflurane whereas Group 2 (control group) patients were mask ventilated and received only 100% oxygen. Patients with any pre-existing morbidity, pregnancy, with need of emergency surgery or intubation and unwilling to participate in the study were excluded. For remaining patients, an informed consent was obtained.

The devices including electrocardiogram (ECG), non-invasive blood pressure (NIBP) and Pulse Oximeter were installed and baseline values of heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP), saturation were recorded. In both the groups (1& 2), Ringer lactate infusion was done with 40-60 ml/kg/hour. All patients were pre-medicated with Injection Glycopyrrolate (0.004 mg/kg) and Injection Fentanyl (1µg/kg IV). Subsequently, all patients were pre-oxygenated for 5 minutes and induction was performed with Injection Propofol (2 mg/kg) followed by Injection Rocuronium (1 mg/kg) to relax the muscles. After induction, Group 1 received mask ventilation with 100% oxygen and 1% Sevoflurane while Group 2 obtained mask ventilation with 100% oxygen only. It was followed by direct laryngoscopy and endotracheal intubation. Values of HR, SBP, DBP, MAP, ECG were noted at every stage namely after premedication, pre-oxygenation, induction, mask ventilation, laryngoscopy and after intubation at first, third and fifth minute.

The study outcomes were expressed in the form of number of occurrences, percentage (%) and mean±SD. For the analysis of categorical data, Chi square test was performed whereas for quantitative parameters, Mann Whitney test was utilized. The statistical analysis was accomplished using SPSS Software Version 20. A p-value < 0.05 was considered statistically significant.

RESULTS

In the present study, the age range of all 60 patients was 19 to 61 years. Group 1 comprised of 53.33 of males and 46.66% of female patients whereas in Group 2, 56.66% and 43.33% of patients were male and female respectively. However, there was no statistically significant difference between the groups with respect to age and gender of patients.

Table 1: Changes in Heart Rate at Various Levels of Intervention (n=60)

Heart Rate	Group	N	Mean	SD	p- value	Percentage Increase w.r.t Baseline
Baseline	2	30	82.00	13.99	0.63	NA
	1	30	80.43	10.71		NA
Pre- Medication	2	30	84.33	14.39	0.47	2.8%
	1	30	81.60	10.71		1.5%
Pre-Oxygenation	2	30	84.03	14.61	0.62	2.5%
	1	30	82.37	10.92		2.4%
Induction	2	30	88.13	13.85	0.373	7.5%
	1	30	85.13	11.96		5.8%
Mask ventilation	2	30	87.10	13.73	0.731	6.2%
	1	30	85.97	11.63		6.9%
Laryngoscopy	2	30	97.67	14.01	0.058	19.1%
	1	30	91.50	10.46		13.8%
1 min post Intubation	2	30	105.53	13.43	<0.01	28.7%
	1	30	95.17	9.83		18.3%
3 min post Intubation	2	30	108.27	11.46	<0.01	32%
	1	30	92.77	9.25		15.3%
5 min post Intubation	2	30	105.83	9.28	<0.01	29.1%
	1	30	89.60	9.13		11.4%

SD= Standard deviation, p<0.05= statistically significant, w.r.t= With respect to Table 1 depicts trends in values of HR at various levels of events. Mild increase in heart rate after pre-medication was noticed. However, there was no significant change after pre-oxygenation. In post-induction phase, a slight rise in HR was evident. Laryngoscopy significantly enhanced HR in both the groups. There was statistically significant improvement in HR after one minute of intubation but after third minute, HR escalated in Group 2 and reduced in Group 1. However, after 5th minute of intubation, HR significantly dropped down in both the groups.

Figure 1 summarizes changes in SBP in both the groups. No change in SBP was observed after premedication and pre- oxygenation. Fall in SBP was recorded following induction. However, following laryngoscopy, significant rise in SBP was detected in Group 1(study group) and 2 (control group).Significant increase in SBP due to pressor response was observed in both the groups after 1st minute of intubation. SBP in group 2 did not change significantly and mildly decreased in group 1 after 3rd minute of intubation, which was statistically significant (p<0.01). Following 5th minute of intubation, there was decrease in SBP in both the groups which was significant (p<0.01).

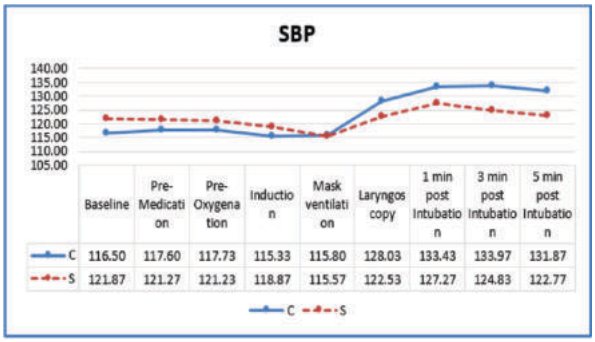

Figure 1: Changes in Systolic Blood Pressure at Different Levels of Intervention

On comparing mean DBP in both the groups, it was revealed that, DBP after pre-medication and pre-oxygenation had no significant change in both the groups. However after induction, there was mild decrease in DBP in both the groups. Upsurge in DBP was observed in both the groups after laryngoscopy, which was significant (p <0.05). After 1st minute of intubation, DBP significantly augmented in both the groups (p<0.05). DBP in group 2 had no significant change but showed mild decrease in group 1 after 3rd minute of intubation, which was statistically significant (p<0.01). Mild decrease in DBP was noticed in both the groups after 5th minute of intubation (p<0.05).

Table 2 illustrates that, MAP after pre-medication as well as pre-oxygenation had no significant change. After induction, there was mild decrease in MAP in both the groups. There was no significant change in MAP in group 2 and mild decrease in group 1 after mask ventilation was observed (p<0.05).Significant escalation was observed in MAP after laryngoscopy in both the groups. Increase in MAP due to pressor response was observed in both the groups after 1st minute of intubation. Conversely, no significant change was observed in group 2 and slightly declined in group 1 after 3rd minute of intubation which was statistically significant (p<0.01). Mild reduction in MAP was noticed in both the groups after 5th minute of intubation, which was statistically significant (p<0.01).

Table 2: Changes in Mean Arterial Pressure (MAP) at Various Levels of Intervention (n=60)

MAP	Group	N	Mean	SD	p- value	Percentage increase w.r.t. Baseline
Baseline	2	30	88.71	10.77	0.067	NA
	1	30	92.11	7.65		NA
Pre-Medication	2	30	88.93	9.94	0.041	0.3%
	1	30	93.69	7.54		1.7%
Pre-Oxygenation	2	30	88.60	9.64	0.041	-0.1%
	1	30	93.32	7.79		1.3%
Induction	2	30	87.27	8.28	0.098	-1.6%
	1	30	90.71	7.55		-1.5%
Mask ventilation	2	30	87.51	7.29	0.428	-1.4%
	1	30	88.99	7.05		-3.4%
Laryngoscopy	2	30	99.66	7.24	0.029	12.3%
	1	30	95.33	7.66		3.5%
1 min post Intubation	2	30	104.54	5.20	<0.01	17.8%
	1	30	98.84	7.97		7.3%
3 min post Intubation	2	30	105.81	5.77	<0.01	19.3%
	1	30	97.12	8.00		5.4%
5 min post Intubation	2	30	104.33	4.14	<0.01	17.6%
	1	30	95.23	7.74		3.4%

SD= Standard deviation, p<0.05= statistically significant, w.r.t= With respect to

DISCUSSION

During surgical procedures performed under general anaesthesia, it is essential to ensure an adequate haemodynamic control during the intraoperative stage and smooth initial extubation to achieve operation theatre time utilization and to expand the yield.[6] In the current study, we found out that, among study group patients, 1% Sevoflurane can effectively attenuate the haemodynamic parameters including HR, SBP, DBP and MAP in response to laryngoscopy and endotracheal intubation comparing to control group patients.

In our study, significant attenuation of heart rate was noted among patients in whom Sevoflurane was administered during mask ventilation. Shiro Tomiyasu et al. [7] reported that inhalation of Sevoflurane caused a stable HR (90/ minutes) in spite of decreased SBP. It might be due to Sevoflurane depress the baroreflex function to a great extent than other used drug like Isoflurane. Another study conducted by Hoda A et al.[8] indicated that, heart rate increased significantly by 22% after induction of anaesthesia in study group patients with Sevoflurane. The maximum rise was at one minute after tracheal intubation and it returned to baseline at six minutes post intubation. Laryngoscopy and endotracheal intubation (ETT) releases epinephrine that causes the haemodynamic variations.[9-11] The systemic haemodynamic changes do not pose a threat to healthy patients but can aggravate the morbidity and life threatening risk among patients with cardiovascular diseases, preeclampsia and cerebrovascular pathologies.[12-14] Consequently, numerous studies have been published regarding to the preclusion of unforeseen haemodynamic changes following ETT. [8-10] To counteract such condition, anaesthesiologists intend to apply various medications like calcium channel blockers, opioids, lidocaine, Propofol and beta-blockers.[15-16] However, there are limited studies explaining the utility of Sevoflurane in controlling unwanted haemodynamic responses secondary to airway insertion procedures. Besides different medications, diverse intubating skills and approaches can diminish haemodynamic changes.

The study Limitations included a small sample size and restriction of study as a single centre study. Subsequent studies are necessary for assessing the effect of Sevoflurane on haemodynamic parameters following intubation procedures in multiple settings.

CONCLUSIONS

The study showed that 1% Sevoflurane can be effective in attenuating the hemodynamic response as a result of laryngoscopy and endotracheal intubation. It can be an element of routine anaesthesia regimen and may be considered as a safe and effective method in attenuating the haemodynamic response resulting from intubation procedures.

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