



ORIGINAL RESEARCH PAPER

Anaesthesiology

COMPARATIVE EFFECTS OF SEVOFLURANE VERSUS PROPOFOL IN THE INDUCTION AND MAINTENANCE OF ANAESTHESIA IN ADULT PATIENTS

KEY WORDS:

Induction, Emergence, Anesthetic, Maintenance

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ABSTRACT

Background: It has been a great challenge for anaesthesiologist the need to maintain the hemodynamic parameters and rapid emergence after a surgery. The aim of the study is to compare the induction, maintenance, emergence and safety characteristics of propofol with those of sevoflurane anaesthesia in patients undertaking elective surgical procedures lasting upto 60-90 minutes. **Methodology:** This is a Non randomized study done in the Department of Anaesthesia in the Assam Medical College, Dibrugarh for the period of June 2020 to May 2021. The study participants were recruited based on the inclusion and exclusion criteria. The sample size was calculated based on the Basker VU et al study and the final sample attained is 100 (50 in each group). Demographic details like age, sex, height, weight and ASA status were obtained. In both groups' intubation time, complications, maintenance and emergence were noted. The collected data was entered in MS excel and statistics were done with the help of SPSS 23. Categorical variables were expressed in the terms of number and percentages. Continuous variables were expressed in terms of mean and standard deviation. Association for categorical variables was found with Chi square test and Fischer exact test. For continuous variable student t test was used. p value <0.05 is considered to be significant. **Results:** Majority of our study participants were in 31-40 years of age. The mean age of Group sevoflurane was 36.04±7.37 and Group Propofol is 34.06±7.98. Male preponderance was seen in our study. Complication free induction was more in the propofol group 43(86%) whereas in sevoflurane 37(74%). Emergence time like extubation and orientation time were less in Sevoflurane group compared to Propofol group. **Conclusion:** Thus we conclude in our study that for smooth induction and less induction complications Propofol is the ideal an anesthetic agent for elective surgeries. For Emergence Sevoflurane was the preferred anesthetic agent.

INTRODUCTION:

Inhaled volatile anesthetics are used for the maintenance of the general anesthesia widely. It is due to the ease of administration and their known intraoperative and recovery characteristics. In late 1980's Propofol was found and it was the most commonly used intravenous anaesthesia today. It is a highly lipid soluble agent. The rapid induction, adequate maintenance and the rapid recovery to consciousness are the kinetics of Propofol. It is a preferred anaesthetic agent for surgeries with shorter duration. It has negligible postoperative complications which makes its superior when comparing to other inhaled anaesthetics.

On the other hand Sevoflurane is a new halogenated inhaled anesthetic drug with low blood gas partition coefficient (0.69)³. The drug's non-pungent odour makes it acceptable among the patients. They have a quick recovery following a surgery⁴. This drug is also used as an alternative agent to propofol for day care surgeries and procedures⁵. Both Propofol and Sevoflurane has a minimal effect on hemodynamic parameters^{6,7}. This study was done to compare the intraoperative hemodynamic characteristics and the recovery characteristics of the propofol and the sevoflurane.

Aim:

The aim of the study was to compare the induction, maintenance, emergence and safety characteristics of propofol with those of sevoflurane anaesthesia in patients undertaking elective surgical procedures lasting up to 60-90 minutes.

Methodology:

Study setting:

Hospital based clinical study conducted in Department of Anaesthesiology, Assam Medical College and Hospital, Dibrugarh which is a tertiary care centre. The study was done for a period of one year.

Sample Size:

Based on the Bhaskar VU et al study, considering the mean time of induction as critical variable with 99% confidence interval and 80% power the sample size was calculated. After adding the non-response rate of 10% the final sample size attained is 100(50 in each group).

Inclusion Criteria:

- Patients within the age group of 18-60 years of both genders
- Patients with American Society Anaesthesiologists(ASA) I and II

Exclusion Criteria:

- Patients not willing and cooperative
- Patients allergic to halogenated inhalational agents or propofol
- Patients with comorbidities like Hypertension and Diabetes Mellitus.
- Patients with history of malignant hyperthermia, pre-existing renal insufficiency, Hepatic disease, Endocrine disease, Neurological abnormality and electrolyte abnormalities.

- Patients undergoing any surgery under general anaesthesia within the last two weeks
- Pregnant and Lactating mothers
- Emergency Surgery cases

Institutional Ethical committee clearance was taken prior to conduction of the study. After explaining the procedure and obtaining the written informed consent from each patient the study was conducted. The patients were divided into two groups randomly through the computer generated number. Group S (sevoflurane) and Group P (Propofol) each consist of 50 participants. Group S received Sevoflurane for induction and maintenance and Group P received the Propofol for induction and maintenance.

Pre-operative check-up was done thoroughly which includes General and Systemic examinations an relevant essential laboratory investigations. The patients will be put in Nil per oral for minimum 6 hours for solid foods and 2 hours for the Liquids. Parameters like Electrocardiography (ECG), Baseline Heart rate (HR), Non-invasive blood pressure (NIBP) and pulse oximetry (SpO2) were recorded in the operation theatre.

After the completion of the surgery the anaesthetic agent administration was discontinued and neuromuscular blockade was assessed and patient was reversed with Injection Neostigmine 50 mcg/kg and Glycopyrrolate 10 mcg/kg. The patients were monitored for two hours during the postoperative period for Heart Rate, Systolic Blood pressure, Diastolic Blood pressure and Mean arterial pressure and also any complication, if any.

Statistical Analysis:

The collected data was entered in MS excel and Statistical analysis was done in SPSS 23. Continuous data was expressed in terms of Mean and Standard deviation .Categorical variable was expressed in terms of numbers (percentages). Student t test was used as test of significance for continuous variables. Chi square test was used as test of significance for continuous variables. P value of <0.05 was considered as significant.

Results:

Table 1: Demographic characteristics of the study participants

Demographic variables	Group S (Sevoflurane) (N=50)	Group P (Propofol) (N=50)	P Value
Age			0.48
<40 years	36(72%)	39(78%)	
>40 years	14(28%)	11(22%)	
Gender			0.84
Male	27(50%)	26(52%)	
Female	23(46%)	24(48%)	
Height(in Cm)			0.46
<150 cm	3(6%)	5(10%)	
>150 cm	47(94%)	45(90%)	
Weight (in Kg)			0.40
<50 Kg	6(12%)	9(18%)	
>50 Kg	44(88%)	41(82%)	
ASA Status			0.49
ASA I	38(76%)	35(70%)	
ASA II	12(24%)	15(30%)	

In our study majority of the study participants were of less than 40 years of age (S-36(72%), P-39(78%)). Male preponderance was observed in the study participants(S-27(50%), P-26(52%)). Most of the study participants were more than 150cm (S-47(94%),P-45(90%)). Few study participants were found to be <50 Kg (S-6(12%), P-9(18%)). Majority of the study participants were observed to have ASA I (S-38(76%) and 35(70%)).

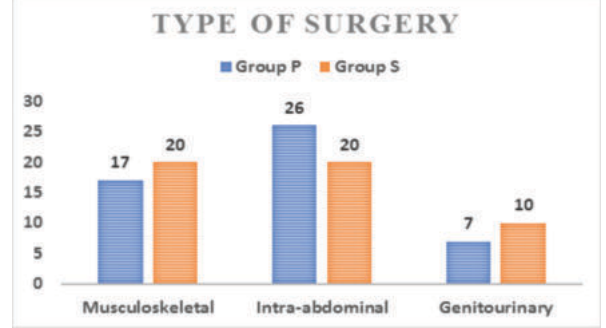


Figure 1: Type of Surgery among both the groups:

The most common type of surgery underwent by the study participants was intra-abdominal surgery (Group S-26(52%) and Group P-20(40%)). The second common most surgery performed was musculoskeletal surgery Group S-17(34%) and Group P-20(40%) followed by Genitourinary surgery.

Table 2: Anesthetic induction times and side effects among the study groups

Variables	Group S (Sevoflurane) (N=50)	Group P (Propofol) (N=50)	P Value
Induction time	3.01±0.18	2.22±0.20	<0.001
Tracheal intubation time	7.02±0.21	5.07±0.24	<0.001
Complication free induction	37/50	43/50	0.13

The mean time required to induce in Group S was 3.01±0.18 and Group P was 2.22±0.20 .The mean time taken for the tracheal intubation in Group S was 7.02±0.21 and Group P was 5.07±0.24. There was a difference between the two groups and it was found to be statistically significant. The complication free induction for Group S was 37(74%) and Group P was 43(86%). There was a difference between the two groups and it was found to be not statistically significant.

Table 3: Side effects during Induction:

Variables	Group S (Sevoflurane) (N=50)	Group P (Propofol) (N=50)	P Value
Breath holding	2(4%)	0(0%)	0.15
Cough	2(4%)	0(0%)	0.15
Excitement	4(8%)	0(0%)	0.04
Laryngospasm	0(0%)	0(0%)	
Others(if any)	1(2%)	2(4%)	0.55

Fisher exact test

The most common side effect noted in Group S was Excitement 4(8%) followed by Breath holding time 2(4%). Group P had no side effects.

Table 4: Emergence Time of the two groups

Emergence Time	Group S (Sevoflurane) (N=50)	Group P (Propofol) (N=50)	P Value
Extubation(min)	9.42±1.03	12.78±1.39	<0.001
Command Response(min)	10.96±1.12	14.06±1.20	<0.001
Orientation (min)	15.28±1.70	19.56±1.56	<0.001

The mean time for extubation was 9.42±1.03 for Group S and 12.78±1.39 for Group P. The Command Response and the Orientation was lesser in Sevoflurane group compared to Propofol.

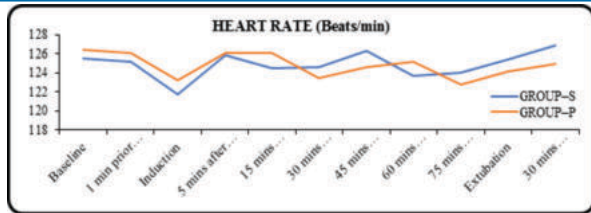


Figure 2: Heart rate of both the groups

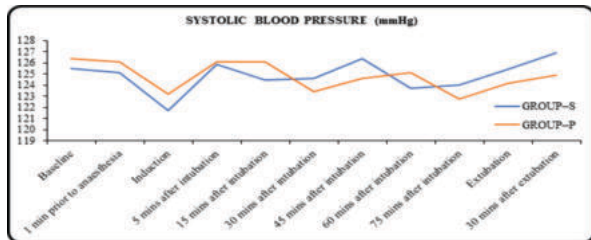


Figure 3: Systolic Blood pressure of both the groups

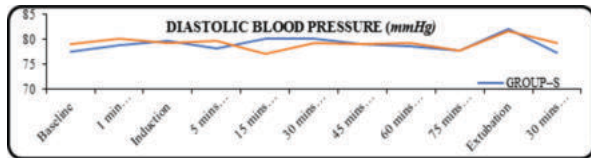


Figure 4: Diastolic Blood pressure of both the groups

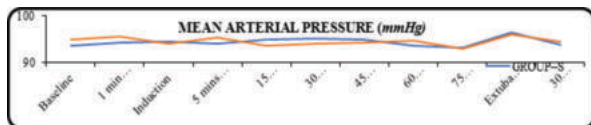


Figure 5: Mean arterial pressure of both the groups

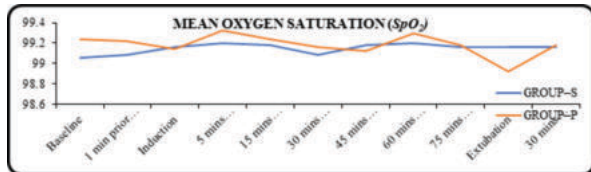


Figure 6: Mean Oxygen saturation among both the groups

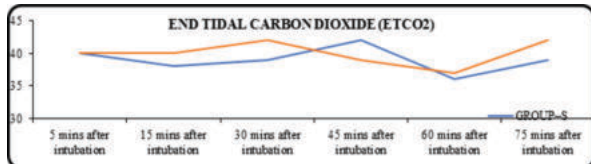


Figure 7: End Tidal Carbon Dioxide (ETCO2)

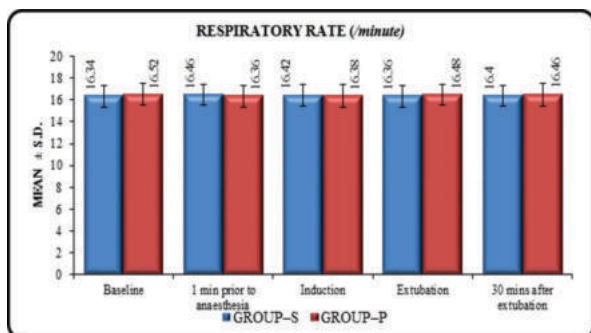


Figure 8: Respiratory rate of both the groups during intubation and extubation

The mean heart rate, Mean Systolic blood pressure, Mean Diastolic Blood pressure are more or less equal in both the groups. Similarly the Mean Arterial Pressure, Mean oxygen saturation, Mean tidal carbon dioxide and the mean respiratory rate are more or less equal in both groups and the difference is found to be not statistically significant (Figure 2-

Figure 8).

DISCUSSION:

Majority of our study participants belongs to 31-40 years of age .The mean age in Group S was 36.04 ± 7.37 and Group P was 34.06 ± 7.37 . W.Scoot et al showed the mean age of study participants to be little higher compared to our study. Male prepondence observed in our study which is vice versa in W.Scoot were female prepondence is seen. Hypotension was noted more in Sevoflurane group 10 compared to Propofol group 6. There results were similar to the studies of Snyed et al 9 and Jellish et al 10.

The induction time of anaesthesia was shorter for propofol compared to sevoflurane in our study (Group P- 2.22 ± 0.20 and in Group S- 3.01 ± 0.18). The difference is also found to be statistically significant. Similar results were found in Scoot et al study. Lient CA et al 11 in his study done to compare the efficacy of Sevoflurane-Nitrous oxide and Propofol -Nitrous oxide stated that induction time of anaesthesia was slower in Sevoflurane group compared to the propofol group.

In our study the complication free induction was more in Propofol group compared to the Sevoflurane group. But the difference is not found to be statistically significant. Emergence time was shorter in sevoflurane group 9.42 ± 1.03 compared to the propofol group 12.78 ± 1.03 . Vitanen et al 12 in his study also stated that emergence time was shorter in Sevoflurane group compared to the propofol group.

Many studies were done for propofol and sevoflurane induction and maintenance of general anaesthesia . But none reflected the superiority of any anaesthetic agent over the other 13 14.

These limited studies stated that propofol was better for induction compared to sevoflurane and for emergence sevoflurane was considered better than propofol.

CONCLUSION:

It was concluded after comparing the induction and maintenance characteristics of propofol and sevoflurane in elective surgeries that induction and emergence time was slower with sevoflurane. Smooth induction and less induction complications can be attained by using propofol and we can make it as an ideal anesthetic agent for induction in adult surgeries. Hemodynamic changes were not noted in both the groups.

Limitation:

The first limitation was our sample size was small. Bispectral values were not monitored .So anaesthetic depth of the patients. The recovery phase was not followed to find out which anaesthetic agent is better than the other.

Funding:

None of the authors received funding for this study.

Competing interest:

No Competing interest

Author's contribution:

All authors in our study contributed to the data collection of the patients.

Acknowledgements:

The authors like to thank the Dean of the Medical College and hospital and the Head of the Department and the Professor of the Anaesthesia department.

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