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Original Research Article

Comparison of Intraoperative Hemodynamic Parameter and Recovery Characteristics between Propofol Infusion and Sevoflurane Inhalation in Subjects undergoing General Anaesthesia

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Abstract

Background and Objectives: Current research was planned to compare intraoperative hemodynamic changes and recovery characteristics among propofol infusion and sevoflurane inhalation in subjects undergoing General Anaesthesia.

Material and Method: It was hospital based single blinded comparative research among 40 subjects undergoing surgeries lasting less than 2 hours under General Anaesthesia. One group of 20 subjects were given Propofol Infusion 0.1 -0.3mg/kg/min while other group were given Sevoflurane Inhalation 1-2%, Vital Datas like Pulse, BP, and Recovery in the form of Eye Opening, Response to verbal command, Muscle tone and Extubation time after discontinuation of Anaesthetic Agent were compared.

Results: Changes in heart rate were analogous. Mean arterial pressure was also lesser in the propofol compared to sevoflurane group. More subjects in propofol group had episodes of hypotension and hypertension than sevoflurane group. Recovery profile was comparable in both groups which was not statistically significant.

Conclusion: Sevoflurane demonstrated advantage over propofol in respect of intraoperative cardiovascular stability without increasing recovery time. The time taken for extubation and recovery was parallel in both groups.

Keywords: Propofol Infusion, Sevoflurane Inhalation, General Anesthesia**,** Hemodynamic Change, Recovery Profile

Introduction

Inhaled anaesthetics permit quick emergence from anaesthesia since of easy titrability with inherent neuromuscular blocking effects [1]. The low solubility in blood of the newest anesthetics facilitate fast induction of

anaesthesia, allow accurate control of anesthetic concentrations during preservation of anaesthesia, and favor timely recovery at the end of anaesthesia independent of the duration of administration. General anaesthesia is needed for many ENT, Abdominal and Upper Limb surgeries which produces cardiovascular stimulation, unstable hemodynamics during induction as well as maintenance. The require for reduction of cardiovascular responses and quick emergence as well represent a active clinical challenge for anesthesiologists [2,3]. The challenge to the anesthesiologist is to develop the pharmacokinetic advantages of these drugs while diminish the risks and augmented expense linked with the manufacture and augmented rate of administration of these new drugs [4].

Different anaesthetic agents in anaesthesia methods have been tried with anecdotal results [5-7].The utilization of intravenous anesthesia with propofol during microlaryngeal surgery is in prevalent clinical practice owing to its quickness and quality of development [8-10].

Propofol is IV hypnotic drug utilized for induction and maintenance of sedation and general anaesthesia when given intravenously it acts very fast within 1 minute by slowing brain wave activities with result last for about 10 minutes with minimum residual CNS effect. It is insoluble drug accessible as a lipid emulsion. It has a very little half life.

MOA: It interacts with GABAa receptors which is inhibitory neurotransmitter. Propofol combines with GABA receptors and decrease the rate of dissociation of GABA and thus prolongs GABA activated opening of the chloride channels with ensuing hyperpolarisation of cell membrane.

Sevoflurane is a fresh inhaled anesthetic that too permits quick emergence owing to its low blood solubility. It has been effectively utilized as an option to propofol for different day care procedures [11,12] Although, the utilization of sevoflurane in microlaryngeal surgery is not much assessed. Mixture of sevoflurane, nitrous oxide, and opioid for preservation of anesthesia has been found to be efficient in maintaining cardiovascular stability during microlaryngeal surgery [13].

Propofol and sevoflurane are recognized to offer good haemodynamic stability, In the present prospective randomized observational research, comparison done between propofol and sevoflurane for maintaining anaesthesia during intra-operative period and its recovery profile.

Material and Methods

The current hospital-based comparative research was performed at the Anaesthesia Department of Nootan Medical College and Research Centre, Visnagar of Gujarat, from January 2021 to August 2021 for a period of 8 months. All the ethical clearance was obtained from the institutional review board (NMC/2019/987).

Study Participants, Sample Size and Sampling Technique

40 adult subjects were randomly owed into two groups by utilization a computer generated random scale.

Group S: 20 subjects of ASA grade I and II received maintenance with Sevoflurane Inhalation

Group P: 20 subjects of ASA grade I and II received maintenance with Propofol Infusion.

Inclusion Criteria:

1. Subjects with ASA grade I and II
2. Subjects with age 18-60 years
3. Body weight between 50-80 kgs
4. Elective Surgeries including ENT, Abdominal and Upper Limb Surgeries
5. Subjects who give consent

Exclusion Criteria:

1. Subjects with ASA grade III, IV, V
2. Age <18 or > 60 years
3. Weight < 50 or >80 kgs
4. Any major Cardiorespiratory disease
5. Subjects who did not give consent

Data collection

The subject was enrolled in the research who had given informed consent to contribute in the research.

Preoperative Preparation

After through pre operative assessment and examination, all routine investigations were carried out and written informed consent was taken. All subjects were kept for Nil by Mouth for 6 hours before surgery. Venous access was secured and Injection Ringer Lactate was started. All subjects were premedicated with Inj Glycopyrrolate 4 mcg/kg, Inj. Ondnsetron 0.15 mg/kg in preoperative room.

Procedure

All standard monitoring like SpO_2, BP, ECG were applied. Inj. Fentanyl 2 mcg/kg was given 5 min before induction. Both the group were induced with inj. Propofol 2 mg/kg, inj. Succinyl choline 2 mg/kg followed by Endotracheal intubation with portex, cuffed endotracheal tube. Muscle relaxant inj. Atracurium 0.5 mg/kg as loading dose followed by 0.1 mg/kg as maintenance dose as and when required. For maintenance of anaesthesia, Group S was given inhalation Sevoflurane, oxygen and Nitrous oxide while group P were given Propofol infusion 0.1 – 0.3 mg/kg/min, oxygen and Nitrous Oxide. All subjects were given Inj. Paracetamol 15 mg/kg for analgesia.

Vital data's were recorded before induction, immediate after intubation, and then every 15 min till extubation. Hypotension was managed with ephedrine 5 mg boluses while hypertension and tachycardia were managed with esmolol. The administration of sevoflurane and propofol was discontinued at the conclusion of surgery. The endotracheal tube was removed when subjects were aware and breathing sufficiently. The duration of surgery, emergence time, and the time to extubation were recorded. Subjects were observed in the recovery area, the vital data and SpO_2 were recorded after extubation at 5, 10, 15 and 30 min. Any unfavorable events like, sore throat, pain, dizziness, postoperative nausea, and vomiting were evaluated and treated accordingly till shifting of the subject to ward.

Results

The demographic variables were equally distributed among the groups. The duration of surgery was also comparable [Table 1]. There was decrease in heart rate following induction in both groups compared to baseline. However, there was no increase in heart rate above baseline in both groups after intubation and throughout intraoperative period. There was no clinically or statistically significant difference in the heart rate between the two groups. ($p>0.05$) The systolic blood pressure, the diastolic blood pressures and mean arterial blood pressures were well maintained in the two groups and there was no significant difference both statistically and clinically. Time to eye opening, time to extubation and response to verbal commands were shorter in the Desflurane group which was statistically and clinically significant. Time to eye opening was 6.50±2.22 min in group S versus 4.86±1.34 min in group D ($P< 0.001$). Time to Extubation was 8.10±2.24 min in group S and 5.98±1.47 min in group D ($P < 0.001$). Response to verbal commands was 8.82±3.14 min in group S and 6.74±1.50 min in group D ($P < 0.001$).

Recovery characteristics as evaluated by modified Aldrete score were better in group P and clinically and statistically significant at 1,2 and 3 mins. At 1 min total modified Aldrete score was 12.50+1.03 min in group P and 11.92+1.02 min in group S ($P= 0.03$). At

2 min, it was 13.08+0.84 min in group P and 12.39+0.85 min in group S (P = 0.002). At 3 min, it was 13.69+0.29 min in group P and 13.28+0.64 min (P = 0.001)

Table 1: Demographic data and duration

Variables	Group S (Mean±SD)	Group P (Mean±SD)	P value
Age (Years)	39.45+8.80	39.18+7.47	0.54
Weight (KG)	54.5+5.4	52.8+6.31	0.25
Duration of surgery (min)	63.43+12.34	64.09+13.77	0.39
Duration of anaesthesia (min)	73.33+23.43	73.17+26.05	0.09

Statistically significance at p≤0.05

Table 2: Comparison of score on eye opening, time to extubation and response to verbal commands

Recovery parameters in min	Group S (Mean±SD)	Group P (Mean±SD)	P value
Eye Opening	6.50±2.22	4.86±1.34	0.02
Time to Extubation	8.10±2.24	5.98±1.47	0.001
Response to verbal commands	8.82±3.14	6.74±1.50	0.05

*Indicates statistically significance at p≤0.05

Table 3: Comparison of Modified Aldrete score in both group

Total Score	Group S (Mean±SD)	Group P (Mean±SD)	P value
1 min	11.92+1.02	12.50+1.03	0.03
2 min	12.39+0.85	13.08+0.84	0.002
3 min	13.28+0.64	13.69+0.29	0.001
5 min	13.65+0.35	13.69+0.47	0.16
10 min	13.98+0.05	13.78+0.22	0.2
15 min	13.95+0.12	13.78+0.54	0.32
30 min	13.92+0.24	13.72+0.10	0.47
60 min	13.88+0.12	13.74+0.31	0.51

Discussion

Inhalational anaesthesia remains by far the most frequently utilized technique for general anaesthesia. Whether they are utilized for induction or maintenance of anaesthesia, inhalational agents are persistent as they are efficient, dependable, safe, and easy to deliver, stable and with no major end-organ squeal. The current research was performed to compare intraoperative hemodynamic changes and recovery characteristics between propofol infusion and sevoflurane inhalation in subjects undergoing General Anaesthesia. Findings recommend that quick recovery can be achieved with both the techniques while maintaining intra-operatively a alike degree of hypnosis in both groups. On the other hand, sevoflurane offers improved intraoperative hemodynamic stability than propofol during General surgery. Induction with both sevoflurane and propofol was well tolerated by the subjects. Although the inhalational induction with sevoflurane was slower than intravenous induction with propofol, this is clinically satisfactory. Our

induction time with propofol was alike as reported in earlier researches [14,15].

Duration of surgery and anaesthesia, EtCO2 concentrations was comparable between the two groups. In our study, intraoperative haemodynamic parameters including Heart rate, SBP, DBP and MAP, did not change in the 2 groups during the course of anaesthesia and were maintained within 20% of baseline values with both anaesthetics. Comparable results were noted in studies conducted by Kaur A *et al* [16] and Wilhelm W *et al* [17]. In another research Nathason MH *et al* [18] concluded that Heart rate values were lesser in the sevoflurane group during the induction-to-incision period.

Propofol has a straight arterial vasodilator effect, accountable at least in part for the decrease in arterial pressure when it is administered during anesthetic induction. Sevoflurane keeps cardiovascular stability better then propofol even when utilized in elevated concentrations. Husedzinovic *et al* [19] found that stroke volume was significantly elevated in the sevoflurane than in the propofol group.

Our emergence times were evenly quick in both the groups and comparable with earlier studies utilizing remifentanil and alfentanil based anesthesia for ear-nose-throat surgery [9-12].Our occurrence of postoperative nausea and vomiting were fewer in both the groups. This is perhaps owing to the administration of antiemetic premedication to the subjects. No additional significant adverse effect was reported.

Modified aldrete score [20] was comparatively higher in the desflurane group at 1,2 and 3 minutes which was clinically and statistically significant in our study. These results were consistent with studies conducted by Strum EM i [21] on admission to PACU. Kaur A *et al* [16] noted that though the intermediate recovery, as evaluated by the modified Aldrete score was similar among the desflurane and sevoflurane groups on arrival at the PACU and at 10 minutes, the score at 5 minutes was significantly elevated in the desflurane group ($p < 0.05$). Welborn *et al* [22] concluded that mean times to awakening and premature revival were more quick with desflurane than with sevoflurane, correspondingly. Nevertheless, they also found that later recovery times did not fluctuate among the 2 groups. Drawback of present research was a lack of researcher blinding to the use of study drugs.

Conclusion

Sevoflurane demonstrated advantage over propofol in respect of improved intraoperative hemodynamic stability. Sevoflurane offers a appropriate substitute to propofol for anaesthesia in subjects undergoing microlaryngeal surgery.

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