Original Article

Propofol and Sevoflurane as Induction Agents for Modified Electroconvulsive Therapy – A Comparative Study

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ABSTRACT

Aim: The present study was conducted at Chalmeda Anand Rao Institute of Medical Sciences Hospital, Bommakal, Karimnagar to find out the effects of sevoflurane and propofol as induction agents in electroconvulsive therapy (ECT). Main focus of study was on hemodynamic variations and duration of motor seizures during ECT.

Materials and Methods: 40 sessions of modified ECT to 12 patients were selected (n = 40), were divided into two groups of 20 each. Group 'P'(n = 20) were induced with propofol intravenously (1.25mg/kg body wt). Group 'S' (n = 20) were induced with sevoflurane 8vol%. All patients were premedicated with glycopyrrolate (0.2mg i.v.), and muscle relaxant is suxamethonium (0.5mg/kg body wt). They were oxygenated well before electrical stimulus and observed for changes in hemodynamics-heart rate(HR) and mean arterial pressure(MAP) every 5th min. and duration of motor seizures afterwards.

Results: In the present study, there is no significant difference ('P' value >0.05) between the two groups in MAP at 1min(group S 103.70 + 14.35 and group P 100.71+ 14.67 mmHg), 5min(group S 109.20 + 17.78 and group P 110.45 + 20.68 mmHg) and 10 min(group S 103.00 + 18.43 and group P 95.29+ 10.404mmHg). Similarly HR at 1min (group S 111.40 + 9.70 and group P 107.29 + 12.28/min), 5min (group S 104.50 + 25.96 and group P 102.90 + 18.62/min) and 10min(group S 100.90 +19.62 and group P 97.43 +13.40/min). Duration of motor seizures (group S 28.50 + 12.70 and group P 26.43 + 12.15 sec) is also similar in both the groups.

Conclusion: There is no difference between sevoflurane and propofol as induction agents used in electroconvulsive therapy in terms of hemodynamic variables and duration of motor seizures

Keywords: Electroconvulsive therapy, propofol, sevoflurane, hemodynamics

INTRODUCTION

Modified electroconvulsive therapy (ECT) is most often a day care procedure and requires an induction agent with a rapid onset and emergence. At the same time it should not increase the seizure threshold, or decrease the duration of seizures because the clinical outcome of ECT depends on the duration of seizures. Methohexital seems to be the gold standard [1] for induction of general anaesthesia in electroconvulsive therapy. As it is not freely available for clinical use, propofol has now taken its place as the most commonly used induction agent for ECT. So, there are several studies put forth to find out if any other general anaesthesia inducing agent could be proven similar or better than propofol, and the present study compares sevoflurane and propofol.

ECT is most commonly given for severe depression or schizophrenia [2]. In olden days ECT was given without any anesthesia and would result in many complications like bone fractures and joint dislocations [3]. But with the advance in technique and administration of anaesthesia, it has become a relatively safe procedure [4]. ECT is associated with an initial parasympathetic stimulation for a transient period of 10 to 15 seconds during which bradycardia is seen [5]. This is followed by a sustained

sympathetic surge for about 5minutes. During the period of this stimulation, the systolic blood pressure increases transiently by about 30-40% and heart rate by about 20% resulting in increase of rate pressure product (RPP) by 2-4 fold, an indicator of myocardial O2 consumption [6] . An ideal anaesthetic agent should minimize these hemodynamic events without any untoward effect on the seizure profile or recovery from anaesthesia.

Propofol is an intravenous anaesthetic agent with rapid onset and faster recovery, suitable for ECT but it causes pain on injection [7]. Mean seizure duration is lesser than methohexital [8] and also side effects like hypotension and apnoea.

Sevoflurane is an inhalational anaesthetic agent with low blood gas solubility coefficient, so with a rapid onset and rapid recovery. Rapid induction and less irritation to the airway makes it suitable for inhalational induction. As ECT is usually given thrice a week [9], inhalational induction would be more suitable in obese patients [10]. When compared to methohexital, seizure duration is reduced with sevoflurane[11]. However it has disadvantages like hypotension tachycardia, nausea and vomiting during the recovery period.

The present study is aimed at comparing the effects of propofol and sevoflurane as induction agents in terms of hemodynamic variables and duration of motor seizures.

MATERIALS AND METHODS

After Institutional ethics committee approval, a total of 40 sessions of ECT of 12 patients were chosen and divided into two groups of twenty sessions each. All of them belong to American Society Anaesthesiologist's physical status grade 1 or 2. Written informed consent was taken from the patients. Preanesthetic checkup was done and overnight fasting was followed. All the patients were given glycopyrrolate 0.2mg intravenously as premedication 20 min before induction. Baseline NIBP, pulse oximetry and ECG were recorded before induction and again at every 5th minute throughout the procedure. Preoxygenation was done for 5 minutes. Each patient is induced with propofol or sevoflurane in alternate sessions of ECT as all patients in the study group came for more than one session of ECT. Group 'P' were given 1 ml of preservative free lignocaine intravenously with pressure on the vein just proximal to the i.v. catheter and released after 1 minute. Then they were induced with propofol 1.25 mg/kg intravenously over 15-20 second. Group 'S' were induced with 8 volume % of sevoflurane in 100% oxygen. The induction with sevoflurane was started with 2 volume % in 100% oxygen by a face mask connected to closed circuit and increased by 1 volume % every 2-3 breaths till 8 volume % is reached and then maintained constant till patient is induced. The isolation of one lower limb was achieved by applying a sphygmomanometer cuff inflated till 100 mm Hg above systolic blood pressure after induction but before administration of muscle relaxant. Suppression of muscle activity was achieved by using succinylcholine 0.5 mg/kg intravenously [12]. Oxygenation is continued till fasciculations have disappeared. A bite block is kept between the incisors to prevent tongue bite and patient is handed over to the Psychiatrist to apply brief pulsed current. The patient is now again given 100% oxygen through a face mask. Motor seizure duration was measured in an isolated right lower limb. The ventilation with 100% oxygen is continued till spontaneous respiration is satisfactory. The patient is then transferred to recovery unit and monitoring continued till 30 min after the seizures. All the data were transferred into SPSS 17.0 version software for statistical analysis.

RESULTS

Among the 40 sessions, there were 12 patients: 4 male and 8 female, mean age is 26.23 years, mean body weight is 45.88 kg (Table-1). The mean values of MAP at baseline, 1, 5 and 10 min after induction in both the groups and their 'P' values are shown in the Table-2. Similarly the mean values of heart rate at baseline, 1, 5 and 10 minute after induction and their mean values in both the groups is shown in the Table-3. Duration of motor seizures in both the groups is shown in the Table-4.

Table 1: Demographic data

Total number of patients	40
Male	4
Female	8
Mean age	26.23 yrs
Mean weight	45.88kg

Table 2: MAP variations in sevoflurane and propofol groups

MAP	Sevoflurane	Propofol	'P'value
Baseline	100.90±12.75	94.30±11.06	0.089
1min	103.70±13.97	100.65±14.27	0.499
5min	109.20±17.78	110.45±20.68	0.839
10min	103.00±17.94	95.3510.12	0.105

DISCUSSION

Hemodynamic parameters although increased initially and then came down gradually, do not show any statistically significant difference between the groups in the present study and correlates with the study of Matsubara T, Yamamoto H, Hikawa Y 2012 [13] .

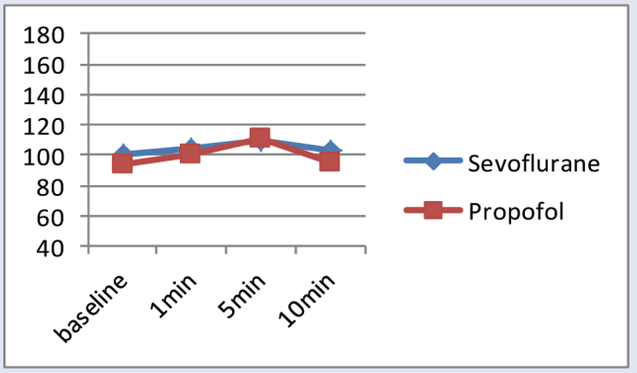

Figure 1: MAP in sevoflurane and propofol groups

There is no significant difference between propofol and sevoflurane groups in the mean values of MAP at 5min interval (P values are >0.05).

Table 3: HR variations in sevoflurane and propofol groups

HR	Sevoflurane	Propofol	'P'value
Baseline	94.80±14.78	89.95±9.81	0.216
1min	111.40±9.45	106.95±11.85	0.197
5min	104.50±25.96	102.90±18.62	0.824
10min	100.90±19.10	97.25±13.01	0.484

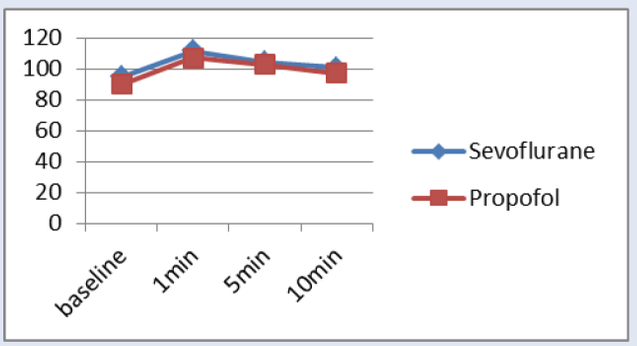

Figure 2: Heart Rate variations in sevoflurane and propofol groups

There is no significant difference between propofol and sevoflurane groups in the mean values of HR at 5min interval (P values are >0.05)

Table 4: Mean duration of motor seizures in sevoflurane and propofol groups

	Sevoflurane	Propofol	'P' value
Motor Seizure duration in sec	28.50±12.36	26.43±11.79	0.559

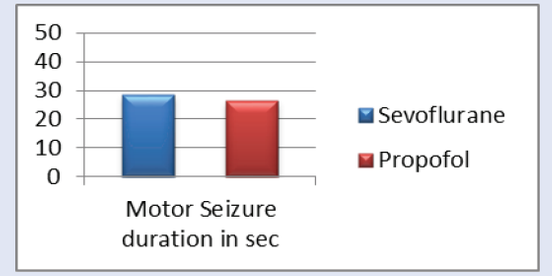

Figure 3: Mean duration of motor seizures in sevoflurane and propofol groups

There is no significant difference between propofol and sevoflurane groups in the mean values of motor seizure duration (P values are >0.05).

The motor seizure duration in the present study has a mean value of 26.43±12.15 second with propofol and this correlates with that mentioned in Nadeem A. Zaidi, Fauzia A. Khan (23.7 ± 3.38 sec) in 2000, [14] Toprak 2005 (28.91 ±7.9 sec) [15], D.C.Turkkal.et.al 2009, (24.2±4.0 sec) [16] Shah et al 2010 (26.36±2.79 sec) [17] and Dogan et.al 2011. (27.45±3.31 sec) [18] in their respective articles. The mean value of motor seizure in sevoflurane group in the present study is 28.50±12.70 which correlates with the value given by Palmer J, Khalil M & Meagher D (24-72 sec) in 2004 [19] and J Segal, RJ Davidow 2006 (30.54 ± 15.06 sec) [20] but varies widely with that mentioned by Toprak's (2005) (43.09±16.6 sec), probably because the method of administration of sevoflurane was different . There is no statistically significant difference between propofol and sevoflurane regarding the hemodynamic values as evidenced by students T test. The timings of sample collection for haemodynamics was started immedialtely after administration of induction agent so as to know the effect of induction agent on variations in haemodynamics. Previous workers like Toprak (2005) have collected the data timing with respective to the time of passage of electricity.

LIMITATIONS

The present study has certain limitations like small sample size which may not represent general population. Old age patients were not included in the study in whom ECT is given to treat severe depression. Absence of EEG monitoring to know the actual seizure duration, BIS monitoring to compare the depth of anaesthesia in both the groups. Peak values of hemodynamic variables are related in time with application of electrical stimulus but not with respect to induction as monitored in this study.

CONCLUSION

There is no difference between propofol and sevoflurane as induction agents for modified electoconvulsive therapy

in terms of hemodynamics and motor seizure duration.

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Conflict of interest: None declared.

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