Original Research Article

Comparative study of propofol and thiopentone for modified electroconvulsive therapy at a tertiary hospital

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Abstract

Background: Electro Convulsive Therapy (ECT) is widely practiced as cheapest, safest and most effective therapeutic technique in medical sciences, despite of having medical and legal opposition. The anesthetic requirements are amnesia, airway management, prevention of bodily injuries, attaining hemodynamic stability, smooth and rapid emergence. Present study was aimed to compare sodium thiopentone and propofol as an ideal anesthetic agent for modified ECT at our tertiary hospital. **Material and Methods:** Present study was hospital based, prospective, comparative study, conducted patients 18-60 years age, either gender, with ASAI/II, normal cardio respiratory status posted for modified ECT. Sixty scheduled for ECT were randomly assigned to two groups of 30 patients each. as Group P (propofol 1.5mg/kg body weight) and Group T (Thiopentone sodium 2 mg/ kg body weight) received. **Results:** In this study, modified ECT was given to 60 patients who received alternately either propofol or thiopentone and the results evaluated. The mean weight of the patients was 57.79 kg and the mean age 32.35 years, difference was highly significant. Gender and body weight were comparable in both groups. In present study majority of patients were of Schizophrenia, mania depressive psychosis, paranoid schizophrenia and bipolar mood disorder. A statistically significant change ($p<0.05$) in heart rate post ECT at 1 min to 5min. between the two groups. A statistically significant change ($p<0.05$) in the systolic blood pressure post ECT at 3 minutes, 4 minutes and 5 minutes between the two groups. **Conclusion:** When propofol is used for anesthetic induction and also shorter duration of motor seizure, significantly faster psychomotor recovery and faster Emergence from anesthesia was noted with propofol as compared with thiopentone sodium for anesthetic induction for modified ECT.
Keywords: modified ECT, propofol, thiopentone sodium, anaesthetic induction, psychomotor recovery.

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INTRODUCTION

Electro Convulsive Therapy (ECT) has a central place in the treatment of psychiatric patients in spite of advances in psycho-pharmacotherapy. It is widely practiced as cheapest, safest and most effective therapeutic technique in medical sciences, despite of having medical and legal opposition.[1] Grand mal seizures are produced by ECT which are responsible for the therapeutic effect. Electro-convulsive therapy produces severe transient disturbances which can lead to dangerous sequel in patients who have cardiac and cerebrovascular diseases and undiagnosed illnesses in elderly.[2] Parasympathetic and sympathetic stimulation with adrenomedullary catecholamine release is responsible for hemodynamic changes. The Anesthetic requirements are Amnesia, Airway Management, Prevention of bodily injuries, attaining hemodynamic stability, Smooth and rapid emergence.[3,4] Detail understanding of the changes affecting cardio vascular system, respiratory system and central nervous system with violent muscular contractions and pharmacological measures to decrease them are major roles of anesthetics. Different strategies were studied for modification of cardiovascular changes with beta blockers, calcium channel blockers, Lignocaine, dexmedetomidine and

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fentanyl.[5] An ideal Anesthetic agent for ECT should provide a smooth, rapid induction, a rapid recovery and no physiological effects of seizure activity.[5,6] Present study was aimed to compare. Sod. Thiopentone and Propofol as an Ideal anesthetic agent for modified ECT at our tertiary hospital.

MATERIAL AND METHODS

Present study was hospital based, prospective, comparative study, conducted in Department of Anaesthesiology, Vilasrao Deshmukh Government Medical College, Latur, India. Study duration was of 2 years (July 2018 to June 2020). Study was approved by institutional ethical committee.

Inclusion criteria: Patient 18-60 years age, either gender, with ASAI/II, normal cardio respiratory status posted for modified ECT.

Exclusion criteria: Patients with history of recent myocardial infarction (<3months). Recent cerebrovascular accident, angina pectoris, congestive heart failure, major bone fractures, pregnancy, postnatal patients. Aneurysms of major vessels, porphyria. Patients with shock and hypovolemia.

Those who were able to give written consent for ECT and anesthesia, written consent was obtained, and for those patients who were deemed unfit to give consent by the treating psychiatrist, consent was got from their relatives.

Sixty scheduled for ECT were randomly assigned to two groups of 30 patients each. Randomization was done using a stratified design, according to whether they were diagnosed to have depression or mania. Outcome assessment was done by trained raters who were blind to the drug used. Each patient's pre-treatment and post-treatment psychiatric ratings were done by the same rater. ECT was given thrice weekly thrice, Monday, Wednesday, Friday.

Group P: Received propofol 1.5mg/kg body weight as the anesthetic agent.

Group T: Patients received Inj. Thiopentone sodium 2 mg/ kg body weight.

In all patients a detailed history, physical examination and relevant investigations were done and medication noted. Patients who were on benzodiazepines had the drug discontinued 12 hours prior to ECT. All patients were fasted overnight and received. Resuscitative equipment's and emergency drugs were kept ready before administering ECT to treat the complications if any that might occur. Intravenous access secured pre oxygenation was done. Pulse rate and oxygen saturation was monitored continuously using a pulse oximeter. Preoperative B.P, HR and SPO2 were monitored and recorded. Intravenous Glycopyrrolate 0.2 mg was given. In both the groups muscle relaxation was achieved with intravenous administration of 0.5 mg/kg/bd wt. of succinyl-choline. After establishing an I.V. line on the left forearm the calculated dose of propofol or thiopentone was given over a period of 20 seconds. The induction dose was considered adequate if the eyelash reflex was lost after 30 seconds; otherwise additional agents were injected (with increments of 0.2 mg / kg body weight of propofol or 0.5 mg/kg body weight of thiopentone sodium) Suxamethonium 0.5 mg/kg was given after the cuffed forearm was isolated. Patients were ventilated normally at the rate of 8-10 breaths/min with 100% O2. Once the fasciculation due to suxamethonium subsided a soft mouth prop was inserted, bitemporal electrodes were placed for ECT and bilateral ECT was administered using brief pulse bidirectional constant current stimuli above seizure threshold (sine wave type) was used to administer electric shock. The duration of motor seizure was recorded by a stopwatch as well as stimulus intensity and the number of re-stimulation required to achieve a motor seizure of at least 15 seconds. Any patient who did not develop a bilateral tonic clonic motor seizure of at least 15 seconds were re-stimulated with higher stimulus doses by increasing the duration of pulses until on adequate seizure was achieved and maximum of 3 rest imulations were permitted at each session. Oxygenation was performed between re-stimulations. Once the motor seizure subsided patient's ventilation was assisted with a facemask with 100% oxygen until the patient resumed spontaneous respiration. Any side effects like pain on injection, abnormal movement, and prolonged seizure defined as seizure duration >120sec, vomiting, bronchospasm or laryngospasm was noted. During recovery, patient was called by his/her name without other sensory stimuli and eye opening was noted. The presence of prolonged post-ictal restlessness or confusion was also noted in some patients. Data was collected by using a structure proforma. Data entered in MS excel sheet and analysed by using SPSS 24.0 version IBM USA. Qualitative data was expressed in terms of proportions. Quantitative data was expressed in terms of Mean and Standard deviation. Comparison of mean and SD between two groups was done by using unpaired t test to assess whether the mean difference between groups is significant or not. A 'p' value of <0.05 was considered as statistically significant where as a p value <0.001 was considered as highly significant.

RESULTS

In this study, modified ECT was given to 60 patients who received alternately either propofol or thiopentone and the results evaluated. The dose of the drugs was titrated according to requirements. The mean dose of thiopentone (Group–t) used was 2.2mg/kg and that for propofol (Group–p) was 1.44 mg/kg. The mean dose of

succinylcholine given 0.52 mg/kg ECT was given to patients with different age groups, weight and different psychiatric illness. The mean weight of the patients was 57.79 kg and the mean age 32.35 years, difference was highly significant. Gender and body weight were comparable in both groups.

Table 1: Distribution according to age

Characteristic	Propofol		Thiopentone		p value
	Frequency	Percent	Frequency	Percent	
Age group (years)					
18-30	11	36.7	23	33.3	
31-40	11	36.7	2	23.3	
41-50	6	20	4	23.3	
51-60	2	6.7	1	13.3	
Mean age	37.37 ± 13.00		28.33 ± 9.97		0.004 (Highly significant)
Gender					
Male	13	43.3	14	46.7	
Female	17	56.7	16	53.3	
Weight (kgs)	56.53 ± 10.35		59.07 ± 9.43		0.326 (Not significant)

In present study majority of patients were of Schizophrenia, mania depressive psychosis, paranoid schizophrenia and bipolar mood disorder. Less common patients were catatonia, mania and severe depression.

Table 2: Distribution according to diagnosis

Diagnosis	Propofol		Thiopentone	
	Frequency	Percent	Frequency	Percent
Schizophrenia	7	23.3	8	26.7
Mania Depressive Psychosis	6	20.0	7	23.3
Paranoid Schizophrenia	5	16.7	4	13.3
Bipolar Mood Disorder	4	13.3	4	13.3
Catatonia	3	10.0	3	10.0
Mania	2	6.7	2	6.7
Severe depression	3	10.0	2	6.7

The changes in systolic blood pressure, diastolic blood pressure, mean blood pressure and Heart rate from the baseline (preinduction) were calculated at various time intervals following ECT. A statistically significant change ($p<0.05$) in heart rate post ECT at 1 min to 5min. between the two groups.

Table 3: Comparison of HR between Propofol and Thiopentone

Characteristic	Mean ± Std. Deviation		P	Inference
	Propofol	Thiopentone		
HR pre ECT	87.67 ± 12.60	87.67 ± 12.60	1.000	Not significant
HR after induction	97.33 ± 10.97	97.60 ± 12.07	0.929	Not significant
HR at 1 min	117.53 ± 14.13	128.07 ± 12.46	0.003	Highly significant
HR at 2 min	119.07 ± 12.99	132.40 ± 13.51	0.0001	Highly significant
HR at 3 min	106.67 ± 11.21	120.60 ± 12.94	0.0001	Highly significant
HR at 4 min	98.13 ± 10.21	112.87 ± 10.63	0.0001	Highly significant
HR at 5 min	90.87 ± 10.11	102.73 ± 8.51	0.0001	Highly significant

A statistically significant change ($p<0.05$) in the systolic blood pressure post ECT at 3 minutes, 4 minutes and 5 minutes between the two groups.

Table 4: Comparison of Systolic Blood Pressure between Propofol and Thiopentone

Characteristic	Mean ± Std. Deviation		P	Inference
	Propofol	Thiopentone		
SBP pre ECT	120.93 ± 9.41	121.27 ± 9.90	0.894	Not significant
SBP after induction	111.80 ± 7.36	114.47 ± 10.33	0.254	Not significant
SBP at 1 min	151.52 ± 11.84	155.40 ± 17.67	0.327	Not significant
SBP at 2 min	141.13 ± 9.23	140.00 ± 15.82	0.736	Not significant
SBP at 3 min	132.07 ± 8.25	126.27 ± 11.78	0.031	Significant
SBP at 4 min	124.47 ± 8.75	115.07 ± 9.89	0.0001	Highly significant
SBP at 5 min	117.20 ± 9.66	108.80 ± 8.56	0.0001	Highly significant

A statistically significant change ($p<0.05$) in diastolic blood pressure was noted at post ECT 3 and 4 minutes, between the two groups.

Table 5: Comparison of Diastolic Blood Pressure between Propofol and Thiopentone

Characteristic	Mean ± Std. Deviation		P	Inference
	Propofol	Thiopentone		
DBP pre ECT	74.33 ± 8.79	74.53 ± 9.08	0.931	Not significant
DBP after induction	69.27 ± 6.49	68.47 ± 7.35	0.656	Not significant
DBP at 1 min	151.52 ± 11.84	155.40 ± 17.67	0.327	Not significant
DBP at 2 min	91.73 ± 9.51	89.87 ± 9.32	0.446	Not significant
DBP at 3 min	84.33 ± 8.19	79.07 ± 6.74	0.009	Highly significant
DBP at 4 min	78.53 ± 9.41	73.13 ± 6.25	0.011	Significant
DBP at 5 min	73.33 ± 8.95	69.40 ± 6.04	0.051	Not significant

A statistically significant change ($p<0.05$) in mean blood pressure was noted at post ECT 3, 4 and 5 minutes, between the two groups.

Table 6: Comparison of Mean Blood Pressure between Propofol and Thiopentone

Characteristic	Mean ± Std. Deviation		P	Inference
	Propofol	Thiopentone		
Mean BP pre ECT	89.87 ± 8.56	90.11 ± 8.94	0.914	Not significant
Mean BP after induction	83.44 ± 6.55	83.80 ± 7.51	0.846	Not significant
Mean BP at 1 min	117.40 ± 10.18	118.60 ± 10.25	0.650	Not significant
Mean BP at 2 min	108.20 ± 8.94	106.58 ± 10.48	0.521	Not significant
Mean BP at 3 min	100.24 ± 7.61	94.80 ± 6.71	0.005	Highly significant
Mean BP at 4 min	93.84 ± 8.45	87.11 ± 6.08	0.001	Highly significant
Mean BP at 5 min	87.96 ± 8.51	82.53 ± 5.87	0.006	Highly significant

The mean seizure duration in the thiopentone–succinylcholine group was 50.83 ± 8.45 seconds while in the propofol–succinylcholine group it was 34.70 ± 8.68 seconds, difference was statistically highly significant. The time to eye opening in the thiopentone – succinylcholine group was 358.87 ± 51.11 seconds while in the propofol–succinylcholine group it was 326.57 ± 44.78 seconds, difference was statistically significant.

Table 7: Duration of motor seizure, time for eye opening were analysed.

Characteristic	Mean ± Std. Deviation		P	Inference
	Propofol	Thiopentone		
Seizure duration (seconds)	34.70 ± 8.68	50.83 ± 8.45	0.0001	Highly significant
Eye opening (seconds)	326.57 ± 44.78	358.87 ± 51.11	0.012	Highly significant

DISCUSSION

Electroconvulsive therapy (ECT) has developed into a widely recognised, but frequently controversial treatment modality in psychiatric practice. Since the introduction of ECT, this treatment modality has undergone many changes to enhance its efficacy and safety, have also complicated evaluation. The treatment was modified by the use of intravenous anesthetic agents, neuromuscular blockade and assisted ventilation with 100% oxygen. Death during ECT has been due to cardiac problems involving both vagal and ectopic mechanisms. The ECT seizure causes widespread physiological changes due to autonomic stimulation.[7] Bradycardia followed by tachycardia usually occurs along with hypotension followed by hypertension. During ECT, the cardiac index can reach very high levels with ECG changes of myocardial ischaemia.[8] The mechanism of the cardiovascular disturbances during ECT have been reviewed recently and are the result of intense stimulation of the autonomic nervous system with sequential increases in parasympathetic followed by sympathetic outflow and a large increase in circulating catecholamines.[9] In clinical practice, many different strategies have been advocated for modifying the cardiovascular response of ECT, including the administration of beta blocking agents and vasodilating drugs.[7,8,9] However, some of these necessitate invasive monitoring and all suffer from the risks of either adequate protection or deleterious side effects. The cardiovascular response to ECT noticed in this study following the administration of propofol correlates with the study of Hoyer *et al.*,[10] and Jarineshin H *et al.*,[11] who compared propofol and thiopentone for ECT. Manjula B *et al.*,[12] studied propofol, thiopentone, etomidate as induction agent found a similar cardiovascular response with the administration of propofol. Amey A S al.,[13] compared the haemodynamic responses between propofol and thiopentone during ECT and the cardiovascular response correlated with the change seen in this study with propofol usage. Seizure duration changes following ECT following Inj. Propofol and Inj. Thiopentone was noted. After propofol induction mean seizure duration was 34.70 ± 8.68 sec as compared to after thiopentone induction was 50.83 ± 8.45, difference was highly significant. These results are similar with previous studies done by Jarineshin *et al.*,[14]

Recovery characteristics were assessed by eye opening to verbal stimuli in absence of other stimuli. After propofol induction mean duration for eye opening was 326.57 ± 44.78 sec as compared to after thiopentone induction was 358.87 ± 51.11 sec, difference was highly significant. These results are similar with previous studies done by Lekprasert V *et al.* and Mir A H *et al.* Each drug has its own advantages and disadvantages for ECT induction. Various adjuvants were used previously to deal with cardiovascular and endocrine changes induced with intravenous induction and ECT. Though there is no Ideal anesthetic agent or combination of anesthetic agents, propofol can be considered as sole agent for induction with comparatively stable hemodynamic parameters.

CONCLUSION

The heart rate was stable immediate post induction and for the first five minutes following delivery of shock when propofol is used for anesthetic induction and also shorter duration of motor seizure, significantly faster psychomotor recovery and faster Emergence from anesthesia was noted with propofol as compared with thiopentone sodium for anesthetic induction for modified ECT.

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