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Original Research Article

Comparative study to evaluate anesthetic effect of Thiopentone Sodium and Propofol in electroconvulsive therapy

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Abstract

Introduction: In therapeutic management of psychiatric illness the response to electroconvulsive therapy may be attenuated if anesthesia that is used abolishes or inhibits seizures. Anesthetic agents used for electroconvulsive therapy should provided smooth and rapid induction, a rapid recovery, minimal alteration of the physiological effects of electroconvulsive therapy as well as minimal antagonistic effects on seizure activity.

Material and methods: In study of 120 patients with ASA grade I or II, having indication for Electroconvulsive therapy, half were randomly anaesthetized by 2.5% Thiopental Sodium with dose 3 mg/kg (Group I) and 1% Propofol in 1.5 mg/kg dose (Group II). A current of 110 volts was administered for 0.5 seconds. The settings and position of the electrodes were kept constant by the psychiatrist. Pulse and Blood pressure monitoring and Seizure response were evaluated along with side effects if any.

Observation: After Induction, systolic BP in the 2 Groups did not show any significant ($p>0.05$) difference while the diastolic BP was significantly ($p<0.05$) lower in the propofol group. After suxamethonium systolic and diastolic BP were significantly ($p<0.05$) decreased in the propofol group. After completion of seizure systolic BP came down to basal level at 10 mins and diastolic BP came down to basal level at 15 mins. While in the thiopentone sodium group, the BP did not come down even the end of 15 mins. The duration of seizure activity in the propofol group was markedly

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reduced ($p<0.05$) as compared to the thiopentone sodium group. The time from induction to electrical stimulus were found to be similar ($p>0.05$) in both groups. Recovery timing from induction to eye opening and induction to walking unaided were significantly ($p<0.001$) lower in the propofol groups suggesting faster recovery. During induction, higher percentage of patients showed discomfort on injection in the propofol group while during recovery headache, nausea and vomiting were noted in more patients within thiopentone group.

Conclusion: Propofol group compared to thiopentone sodium had reduced increase in BP and pulse rate, reduced duration of seizure activity. Recovery was faster and side effects were reduced during recovery.

Key words

Electroconvulsive therapy, Anesthetic agent, Thiopental Sodium, Propofol.

Introduction

The therapeutic effect of Electro-convulsive therapy (ECT) depends upon the production of a generalized convulsion and with minimum duration of seizure necessary for management of psychotic patients. It is important to study the effects of anaesthetic techniques on ECT induced seizures because the response to ECT may be attenuated if anaesthesia abolishes or inhibits seizures.

Most of the currently available agents for the induction of general anaesthesia have been use at some time or another for induction of anesthesia for ECT. Thiopentone sodium is most commonly used of the induction agent; others are Methohexitone, Diazepam, Ketamin, Etomidate and Propofol.

For these reasons, the desirable characteristics of anaesthetics of anaesthetic agents used for ECT should provided smooth and rapid induction, a rapid recovery, minimal alteration of the physiological effects of ECT as well as minimal antagonistic effects on seizure activity. Further, they must be compatible with a wide range of drugs and most not interfere with efficacy of ECT. Present study was undertaken with aim to compare the anaesthetic effect of Thiopentone Sodium and Propofol in induction, hemodynamic alterations, seizure response, apnea time and side effects in Electroconvulsive therapy.

Material and methods

Preset study was conducted on 120 patients needing electroconvulsive therapy in Bayaramjee Jeejeboy Government Medical College and Sassoon hospital, Pune.

Patients included in study were ASA grade I or II with indication of Depressive Schizophrenic or Manic states to Electroconvulsive therapy. Ethical approval for the study was taken and informed consent was obtained from the patient and where ever necessary from relative or RMO.

Complete physical examination with routine investigations of the patients was done to rule out other systemic disease except indication for ECT. The ECT was carried out in the morning with the patients fasted overnight. Anyone who required additional sedation on the day of treatment was excluded from study. Intravenous atropine 0.6 mg was given just before the induction of anesthesia.

Anesthesia and ECT

All patients were to complete 6 to 8 ECT treatments consecutively on Monday,

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Wednesday and Saturdays of each week and the anaesthetic agents were to be alternated thought out the treatments. The patients were randomly allocated so that 60 patients were anaesthetized with 2.5% thiopentone sodium (Group I) and the other 60 patients with 1% propofol (group II). The thiopentone (3mg/kg) and propofol (1.5mg/kg) were given over 20 seconds thought an indwelling needle in a vein on the dorsum of the hand. The induction dose was considered adequate if the eyelash reflex was lost after 30 seconds, otherwise additional agent was titrated as necessary. The sleep dose was recorded for subsequent treatment. Suxamethonium 0.6 mg./kg was given when the patient was asleep. The patient's lungs were inflated with 100% oxygen via a facemask and & bag. When fasciculation's subsides a mouth prop was inserted and a bitemporal ECT performed. A current 110 volts was administered for 0.5 seconds. The settings and position of the electrodes were kept constant by the psychiatrist. The mouth prop was changed to a guedel air way after the seizure and ventilation assisted with a facemask with 100% oxygen at the rate of one breath every 5 seconds, until return of spontaneous respiration.

Monitoring of pulse and blood pressure was done at baseline, after atropine, after induction and after Scoline then at 0 minute and at every 5 minute up to 15 minute after the completion of seizure.

Seizure response to ECT was graded as follows: tonus (contracture) - good-facial muscle contraction only, moderate-facial muscles, shoulders, and other parts, and poor-severe contraction of all muscles, including back. Clonus - good, movement of facial muscles and platysma, with slight movement at joints between the long bones, moderate, the above plus slight muscle movement, and poor, server movement of all muscles.

The time from induction, the time from ECT to the end of the seizure (seizure time) and the duration of apnoea were recorded. Duration of recovery being able to walk unaided was noted. Specific side effects during induction and recovery were recorded.

Statistical analysis

Quantitative data was presented in mean (Standard deviation) while qualitative data as frequency (percentage) distribution in tabular form. Comparison of mean of parameters in between the groups was done using unpaired t test and Chi square test was used to compare the difference of proportions. Significance level was considered at 5% so that difference of $p<0.05$ was significant.

Results

The patients needing ECT were within 24 to 46 years age group, with statistically no significant ($p>0.05$) difference of mean age, mean weight, gender and age group distribution in between the two groups. (**Table - 1**) The patients included in study had illness as per indication for ECT as shown in **Table - 2**.

The difference of mean duration of induction in between the groups was not significant ($p>0.05$). Pre-induction values and immediate post induction values of pulse rate, systolic and diastolic B.P. were recorded. We found no significant difference in the 2 Groups. 0.6 mg atropine was given intravenously and BP and pulse rate were recorded again in the 2 Groups. And no significant difference was found except for the diastolic BP which showed a significant ($p<0.0$) difference.

Blood pressure difference in between the groups was statistically not significant ($p>0.05$) at baseline and pre induction and after suxamethonium, systolic BP in group I had raised higher to 131.7 mm Hg and in Group II it was

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116.3 mm Hg while the diastolic BP in group I was 93.0 mm Hg and 80.0 mm Hg in Group II with statistically highly significant difference ($p<0.001$). Increased systolic and diastolic blood pressure in both the groups but significantly ($p<0.05$) higher in thiopentone sodium group. In our study, post ECT systolic and diastolic BP was recorded at 0, 2, 5,10 up to 15 minutes past ECT and there was a significant ($p<0.05$) difference in the 2 Groups. Blood pressure variation was less in Group II. In Group II at 10 minutes systolic blood pressure came down to the basal level and diastolic BP came down to the basal level at 15 minutes after seizure. (**Table - 3, Table - 4**)

Pulse rate at induction in Group I (thiopentone sodium) was 119.3 /min and in Group II (propofol) was 115.3 /min and the difference was not significant ($p>0.05$). After suxamethonium pulse rate in Group I was higher and the difference was significant ($p<0.05$). There was a rise of pulse immediate after ECT in both the groups, but in Group I the rise was significantly ($p<0.05$) higher. Later there was no difference in pulse rate in between the groups ($p>0.05$). (**Table - 5**)

Duration of seizure in Group I was 21.2 seconds and in Group II it was 15.7 seconds with statistically highly significant ($p<0.001$) difference.

Also, in between the two groups no significant ($p>0.05$) difference of apnea time was noted, but recovery time of induction to eye opening and walking time was significantly ($p<0.05$) lower in Group II. (**Table - 6**)

Out of 60 patients, 46 had no side effect in group I and 50 patients in Group II had no side effect at induction and at recovery. It was noted that discomfort on injection found in 6.7% of Group I and 16.7% in Group II while cough in 16.7% in Group I and 3.3% in group II. The difference of side effects was statistically not significant ($p>0.05$) during induction but statistically significant ($p<0.05$) difference was noted of side effects at recovery in between the groups. (**Graph - 1**)

Discussion

Electroconvulsive therapy still retains a place in modern psychiatric practice. The anesthetic agent for electro convulsive therapy should provide a smooth, rapid induction, a rapid recovery, attenuation of physiological effects of electroconvulsive therapy as well as minimal antagonistic effects on seizure activity.

Compared to Thiopentone sodium and propofol as induction agents for electro convulsive therapy in 60 patients in each group we noted that pre-induction values and immediate post induction values of pulse rate, systolic and diastolic B.P. had no significant ($p>0.05$) difference in the between the groups. After administration of IV atropine difference of pulse rate and systolic blood pressure in between groups was not statistically significant ($p>0.05$) except for the diastolic BP showed a significant ($p<0.05$) difference.

Boe and Lai [1] in their study found that after one minute of induction, the systolic blood pressure of the propofol group decreased by an average of 3.3 mm Hg. In study by Bone and colleagues [2] found a significantly greater decrease ($p < 0.05$) in diastolic arterial pressure following induction with propofol compared to methohexitone.

In the study by Boe and Lai [1], there was significantly greater increase (p less than 0.05) in the systolic arterial pressure following the fit with methohexitone compared to propofol. Post ECT systolic there was a significant difference in the 2 Groups of systolic and diastolic BP. It was significantly less in Group II. In Group II, at 10

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minutes systolic blood pressure came down to the basal level and diastolic BP came down to the basal level at 15 minutes after seizure. In group I, even at the end of minutes it had not reached basal l level.

Boe and Lai [1] had also noted increase in systolic and diastolic blood pressure and heart rate after electro convulsive therapy was significantly greater with thiopentone sodium as the anaesthetic agent. The heart rate of the propofol group was significantly lower than the control at the fifth minutes by a mean of 3 beats/min.

In our study we did not observe any dysrrhythmias. Dysrrhythmias are commonly seen during electro convulsive therapy and result from the predominance of either parasympathetic or sympathetic activity. In study conducted by Rampton, at al. [3] transient dysrrhythmias were observed during 19% of the treatment episodes with no significant difference in their incidence following the two different induction agents.

The duration of seizure activity in the propofol group was markedly reduced ($p<0.001$) as compared to the thiopentone sodium group. The time from induction to electrical stimulus were found to be similar in the 2 groups. So also the tonus and clonus responses to electrical stimulus were found to be similar in the 2 groups.

The time from induction to electrical stimulus was significantly longer with propofol ($p<0.001$) with no drug time interaction in the study conducted by Bone [2]. Seizure time was shorter with propofol as compared to thiopentone sodium as also reported Dwyer, et al. [4] and 18.0 sec by Rouse, et al. [5]. Also Fear, et al. [6] studied the mean seizure duration ($p<0.01$) and mean total seizure duration ($P<0.01$) had also found that they were shorter in propofol group. Malsch Gratz and Mani [7] in their study had also found that seizure duration was significantly shorter with propofol than with methohexital anesthesia.

Bone and colleagues [2] in their study showed that the propofol group had significantly better tonus for the second treatment ($P<0.05$) and the first and second treatments combine ($p<0.05$) and better clonus for the first and second treatments combined ($p<0.05$). There was no statistically significant ($p>0.05$) difference of Apnea time in between the groups.

Side effects

Side effects during induction and recovery were also noted and found that during induction, higher percentage of patients showed discomfort on injection in the propofol group. The no of patients who coughed on induction was more in the thiopentone sodium group.

Side effects during recovery were mainly nausea, vomiting and confusion in thiopentone sodium group. Fewer cases of nausea and vomiting were seen with propofol.

Boe and Lai [1] in their study, showed that there was significantly more discomfort on injection with propofol ($P<0.001$). No induction side effects were noted. The instances of recovery side effects (propofol: thiopentone) were headache (6:1) restlessness (3:5) and withdrawal (0:1) there was no venous thrombosis with either drug. The differences were statistically not significant.

In their study Fredaman, et al. [8] found that although awakening times were similar, both hemodynamic stability and cognitive recovery were more favorable after propofol compared with insignificant decrease in seizure duration.

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The findings in our study were also similar to that noted by Omprakash TM and colleagues [9].

Conclusion

As induction agents for electroconvulsive therapy propofol had a smooth rapid induction compared to thiopental sodium had comparable hemodynamic stability, reduced duration of seizure activity without affecting the efficacy of electroconvulsive therapy, faster recovery and minimal side effect during recovery. Propofol compared to Thiopentone Sodium can be used safely as an anaesthetic agent for induction in electroconvulsive therapy.

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Table - 1: Demographic characteristics of patients in both groups.

Characteristics		Group – I (n=60)	Group- II (n=60)	p value
Age in years , mean (SD)		36.7 (8.8)	34.6 (9.7)	0.216
Wt in kgs mean (SD)		57.5 (7.9)	55.9 (8.2)	0.278
Gender	Male, No's (%)	36 (60%)	33 (55%)	0.579
	Female No's (%)	24 (40%)	27 (45%)	

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Table - 2: Illness of patients in the study needing ECT.

Illness- indications	Group I	Group II	Total
Schizophrenia	28	34	62
Chronic schizophrenia	6	2	8
Schizophrenic with M.R.	2	0	2
Paranoid Schizophrenia	4	2	6
Delusional disorder	12	2	14
Paranoid depression	2	0	2
Post-psychotic depression	2	0	2
Brief psychotic episode	4	4	8
Alcohol induced psychosis	0	2	2
Acute psychotic illness	0	10	10
Mania	0	2	2
Substance induced psychosis	0	2	2
Total	60	60	120

Table - 3: Comparison of Systolic Blood pressure (SBP) in between the groups.

SBP (mm of Hg)	Group I	Group II	't'	p value
Baseline	118.1 (23.7)	119 (16.9)	.176	.861
Pre-induction Value	123.7 (14.5)	115.7 (16.5)	1.992	.051
Immediate post induction	132.7 (15.1)	116.3 (14.7)	3.980	.000
Post ECT 1 min.	195.3 (31.5)	158.0 (33.1)	4.472	.000
Post ECT 3min	175.3 (30.5)	148.3 (25.3)	3.731	.000
Post ECT 5 min	158.7 (28.4)	137.7 (20.1)	3.307	.002
Post ECT 10 min	133.3 (19.4)	120.3 (14.3)	2.962	.004
Post ECT 15 min	119.7 (12.7)	112.7 (9.8)	2.387	.020

Table - 4: Comparison of Diastolic Blood pressure (DBP) in between the groups.

DBP (mm of Hg)	Group I	Group II	't'	p value
Baseline	83.1 (9.0)	79.7 (7.6)	1.617	.111
Pre-induction Value	86.7 (9.2)	80.0 (7.9)	3.010	.004
Immediate post Induction	93.0 (11.2)	80.0 (7.9)	5.204	.000
Post ECT 1 min.	132.1 (14.6)	111.7 (19.2)	4.623	.000
Post ECT 3min	120.5 (13.3)	104.6 (16.3)	4.140	.000
Post ECT 5 min	109.7 (12.5)	97.5 (14.3)	3.532	.001
Post ECT 10 min	96.9 (11.8)	86.3 (10.9)	3.610	.001
Post ECT 15 min	85.3 (7.8)	80.3 (7.6)	2.513	.015

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Table - 5: Comparison of pulse rate in between the groups.

Pulse rate/ min	Group I	Group II	't'	p value
Baseline	105.3 (19.2)	109.8 (24.2)	0.792	0.43
Pre-induction Value	119.3 (17.7)	115.3 (19.8)	.825	.412
Immediate post Induction	120.3 (18.8)	123.2 (24.5)	.520	.605
Post ECT 1 min.	123.7 (14.9)	112.5 (20.7)	2.409	.019
Post ECT 3min	120.9 (14.5)	111.6 (18.0)	2.214	.031
Post ECT 5 min	116.7 (13.6)	108.5 (15.7)	2.164	.035
Post ECT 10 min	114.4 (15.7)	108.1 (14.9)	1.578	.120
Post ECT 15 min	109.1 (14.2)	102.7 (15.7)	1.660	.102

Table - 6: Seizure duration and recovery duration in the groups.

Duration	Group I	Group II	't'	p value
Seizure (seconds)	21.2 (5.7)	15.7 (4.5)	4.225	0.000
Apnoea Time (min)	3.13 (1.3)	3.1 (1.4)	0.095	0.925
Induction to Eye Opening Time (min)	10.2 (3.4)	7.1 (2.2)	4.161	0.000
Induction to Walking Time (min)	35.4 (8.04)	17.7 (5.4)	10.004	0.000

Graph - 1: Side effects at recovery in both the groups.