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Original Article

Comparative Study between Intravenous Thiopentone Sodium and Propofol on the Recovery Profile of the Patients after Electroconvulsive Therapy

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Abstract

Introduction: The use of electroconvulsive therapy (ECT) to induce a generalized epileptic seizure was first described in 1938 and was performed without anesthesia for almost 30 years. Modification of treatment process, improvement in the anesthetic management, and greater attention to the preparation for emergencies have resulted in a high level of safety for ECT and its acceptance as a treatment in psychiatry.

Objectives: Objectives of the study were to study the recovery profile after electroshock in patients undergoing ECT with intravenous thiopentone sodium versus propofol.

Materials and Methods: This study was conducted on psychiatric patients (18-45 years), who belonged to the American Society of Anesthesiologists Grade I or II, and were already on medication. Each patient underwent a series of prescribed ECT. In this study, two treatment groups were included: ECT with thiopentone sodium (Group A) and ECT with propofol (Group B), as induction agents. A total 60 cases were included in the study. Un-paired *t*-test was applied for the analysis.

Results: No significant difference in the baseline value of oxygen saturation between the two groups. Duration of apnea was more in the propofol group; statistically not significant ($P > 0.5$). In the recovery profile, time taken for spontaneous eye opening was less in the propofol group; statistically not significant ($P > 0.5$). Time taken for verbal communication and phonation; for orientation of patient to name, place, and time; for patients sitting with support and sitting without support was less in the propofol group; statistically significant ($P < 0.05$). Mean sedation score was 2.40 with the thiopentone sodium group as against only 1.07 with the propofol group, and this difference was statistically significant.

Conclusions: Propofol was superior to thiopentone sodium with respect to recovery and side effects after ECT.

Key words: Electroconvulsive therapy, Propofol, Recovery profile, Thiopentone sodium

INTRODUCTION

The use of electroconvulsive therapy (ECT) to provoke a generalized epileptic seizure was first described in 1938 and was performed without anesthesia for almost 30 years.[1] The efficacy of ECT in alleviating an acute depression is dependent on the duration of the induced seizure.[1,2] Electroencephalographic (EEG) seizure activity lasting from 25 to 75 s allegedly produces the optimal antidepressant response. The patients experiencing initial seizure duration of 15 s (very short) or 120 s (very long) achieve a less favorable response to ECT.[2,3]

Propofol is associated with less nausea and vomiting,[4] faster emergence, better early psychomotor recovery, and better early cognitive recovery.[5,6] Initial concerns that

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shorter seizures produced with propofol administration might compromise the efficacy, have not been empirically supported in the period immediately after ECT and have been offset by its demonstrated advantages.[7,8]

Thus, this study was undertaken to assess the recovery profile after electroshock in patients undergoing ECT with intravenous thiopentone sodium versus propofol.

MATERIALS AND METHODS

This was a prospective, randomized, single-blinded (patient), and noncrossover study. After obtaining clearance from the Institutional Ethics Committee, this study was carried out on psychiatric patients who attended the OPD and were hospitalized. This study was carried out on psychiatric patients, after clearance from the ethics committee. The patients belonged to the American Society of Anesthesiologists (ASA) Grade I or II and were already on medication for psychiatric disorder. A written valid informed consent was taken from the close relative of the patients, as the patients were mentally subnormal or having psychiatric disorder to understand nature and consequences of anesthesia and procedure. The study was conducted on adult patients in the age group of 18-45 years. Each patient underwent a series of prescribed ECT. In this study, two treatment groups were included: ECT with thiopentone sodium (Group A) and ECT with propofol (Group B), as induction agents. A total of 60 cases were included in the study. Inclusion criteria consisted of ASA Grade I and II (psychiatric patients without any major illness), age group of 18-45 years, no history of drug allergies or anaphylaxis while the exclusion criteria were: ASA Grade III or IV, age <18 years and >45 years, pregnancy, history of allergies and anaphylaxis. Anesthesia technique was standardized. The patient's current medications were recorded and kept constant throughout the study. The following parameters were observed:

1. Fall in oxygen saturation.
2. Duration of seizures: Time from application of electrical stimulus to loss of clonic movement.
3. Duration of apnea: Time from induction of apnea by thiopentone sodium/propofol to the onset of first spontaneous post-ictal breath.
4. Time taken for spontaneous eye opening.
5. Time taken for verbal commands.
6. Time taken for phonation.
7. Time taken orientation in name, place and time.
8. Ability to sit with support.
9. Ability to sit without support.
10. Sedation score at the end 30 min:
    - 4: Asleep.
    - 3: Drowsy.
    - 2: Awake but not alert.
    - 1: Awake and alert.

Unpaired *t*-test was applied for the analysis of quantitative data and the following were considered: $P > 0.05$ - not significant, $P < 0.05$ - significant, $P < 0.01$ - very significant, $P < 0.001$ - highly significant.

RESULTS

Effect on Oxygen Saturation

The above data show that there was no significant difference in baseline value of oxygen saturation between the two groups. 2 min after ECT, fall in oxygen saturation was observed in both the groups but it was significant after 30 and 45 min ($P < 0.5$). However, the fall was not clinically relevant (Table 1).

Duration of Seizure

Seizure duration in the propofol group was less than the mean seizure duration in the thiopentone sodium group which was statistically extremely significant ($P < 0.005$) (Table 2).

Duration of Apnoea

Duration of apnea was more in the propofol group than the thiopentone sodium group. However, this was statistically not significant ($P > 0.5$) (Table 2).

Table 1: Comparison of SPO_2 at various time intervals between Groups A and B

SPO_2	Groups		Un-paired *t*-test applied		
	Group A	Group B			
	Mean±SD	Mean±SD	*t*-value	*P*-value	Significance
Preinduction	99.00±0.64	99.03±0.62	−0.205	0.838	Not significant
Induction	99.13±0.82	99.23±0.68	−0.515	0.609	Not significant
Pre-ECT	99.53±0.78	99.47±0.63	0.366	0.716	Not significant
Post ECT-1	98.80±0.81	98.67±0.61	0.724	0.472	Not significant
Post ECT-2	98.90±0.92	98.73±0.69	0.792	0.432	Not significant
Post ECT-3	99.43±0.82	99.13±0.82	1.420	0.161	Not significant
Post ECT-4	99.40±0.72	99.47±0.63	−0.381	0.705	Not significant
Post ECT-5	99.47±0.68	99.53±0.73	−0.366	0.716	Not significant
Post ECT-10	99.10±0.76	99.23±0.68	−0.717	0.476	Not significant
Post ECT-15	99.03±0.77	99.13±0.78	−0.503	0.617	Not significant
Post ECT-30	98.83±0.70	99.23±0.73	−2.171	0.034	Significant
Post ECT-45	98.63±0.62	99.27±0.74	−3.606	0.001	Significant

ECT: Electroconvulsive therapy, SD: Standard deviation

Table 2: Distribution of patients with respect to complications and recovery characteristics

Variables	Groups		Un-paired *t*-test applied		
	Group A	Group B			
	Mean±SD	Mean±SD	*t*-value	*P*-value	Significance
Seizures duration (s)	25.13±7.96	18.63±5.64	3.649	0.001	Significant
Apnea duration (min)	3.88±1.04	3.97±0.87	−0.362	0.718	Not significant
Time taken for spontaneous eye opening	9.06±3.06	7.92±2.94	1.473	0.146	Not significant
Time taken for verbal commands	12.58±3.71	10.07±3.23	2.804	0.007	Significant
Time taken for phonation	13.08±3.72	10.45±3.54	2.812	0.007	Significant
Time taken orientation in NPT	18.57±5.57	13.27±4.38	4.095	0.00013	Significant
Sit with support	25.17±6.89	19.03±5.37	3.847	0.0003	Significant
Sit without support	36.83±7.71	26.43±5.64	5.962	1.58E-07	Significant
Sedation score at end 30 min	2.40±0.68	1.07±0.58	−8.189	2.96E-11	Significant

SD: Standard deviation

Recovery Profile

- Time taken for spontaneous eye opening was less in the propofol group than the thiopentone sodium group; statistically not significant ($P > 0.5$).
- Time taken for verbal communication and phonation was less in the propofol group than the thiopentone sodium group; statistically significant ($P < 0.05$).
- Time taken for orientation of patient to name, place, and time was less with the propofol group than with the thiopentone sodium group; statistically significant ($P < 0.005$).
- Time duration for patients sitting with support and sitting without support was less with the propofol group than with the thiopentone sodium group; statistically significant.
- Mean sedation score was 2.40 with the thiopentone sodium group as against only 1.07 with the propofol group; statistically significant (Table 2).

DISCUSSION

Seizure may not be visualized in many patients, and yet ECT produces effective seizure as evident by EEG. Although the motor seizure was not recorded, it was quantified by EEG monitoring. Propofol has been found to have more potent anticonvulsant effects during ECT than other IV anesthetics.[2,8-10] However, the use of a minimally hypnotic dose of propofol (0.75 mg/kg) has been associated with a seizure duration that is comparable to standard hypnotic doses of methohexital.[8] The use of propofol can significantly shorten the duration of seizure activity and its effect on the antidepressant action of ECT has been a concern. However, the ECT seizure duration in this study, after larger dose of propofol (1.5 mg/kg), was significantly longer than after thiopentone sodium, possibly because higher shock energy was delivered to patients in the propofol group.

In this study, it was found that duration of seizure in the propofol group was less than the mean seizure duration in the thiopentone sodium group, which was statistically extremely significant ($P < 0.005$).

Duration of apnea was more in the propofol group than the thiopentone sodium group. However, this was statistically not significant ($P > 0.5$).

Recovery profile: Time taken for spontaneous eye opening was less in the propofol group than in the thiopentone sodium group. However, this was statistically not significant ($P > 0.5$).

Time taken for verbal communication and phonation was less in propofol group than thiopentone sodium. This time for verbal communication and phonation was statistically significant ($P < 0.05$).

Time taken for orientation of patient to name, place, and time was less with propofol group than with thiopentone sodium group. This was statistically significant ($P < 0.005$).

The time duration for patients sitting with support and sitting without support was less with propofol and the time duration recording was statistically significant. Mean sedation score was 2.40 with thiopentone sodium group as against only 1.07 with propofol group, and this difference was statistically significant.

In thiopentone sodium group (Group A): Fall in oxygen saturation from 99.00 ± 0.64 to 98.80 ± 0.81 was observed. It returned to base value after that.

In propofol group (Group B): Fall in oxygen saturation from 99.03 ± 0.62 to 98.67 ± 0.63 was observed in first 2 min after electroshock. The oxygen saturation returned to the base value by 3rd min. However, it was not clinically important.

On comparison of both the groups, it was found that the fall in saturation was not statistically significant up to 15 min. In

this study, the patient was ventilated with oxygen-enriched air via facemask and bag after induction. The ventilation was discontinued during shock and convulsion. Then, manual ventilation was restarted until the return of spontaneous respiration. This method is also recommended by royal college of psychiatrist.[11] Oxygen flow of 6L/min was added to a self-inflating bag, thus delivering 0.40-0.50 FiO_2.

Lew *et al.*[12] studied the oxygenation during ECT and found the saturation was decreasing in 60% patients in whom ventilation was continued throughout the convulsion and in 82.5% of patients in whom ventilation was discontinued. There was no significant change.

Seizure duration: In this study, the duration of seizure in the propofol group (Group B) was 18.63 ± 5.64 s and in the thiopentone sodium group (Group A) was 25.13 ± 7.96 s. The reduction in the duration of seizure following propofol was found to be statistically significant. Therefore, in this study, it was found that propofol reduced the seizure duration as compared to thiopentone sodium.

Boey and Lai[13] found mean seizure duration of 37.5 s Dwyer *et al.* reported 23.5 s, whereas rouse and colleagues Simpson *et al.*[14] reported it as 18 s. Comparison of the present study with these studies was difficult because of differences in doses of propofol and the methods of ventilation.

It has generally been considered that the duration of seizure is an important variable for the therapeutic efficacy of ECT.

Simpson *et al.* 1987[14] warned against the use of propofol on the group that reduction in ECT induced seizure duration would affect the efficacy of therapy and would increase the chance of failure to convulse and inadequate seizures may leading to inefficient therapy.

But work done by Dwyer *et al.* in 1988, Mitchell *et al.* in 1991, and Martonsson *et al.* 1994 showed that propofol significantly reduced the seizure duration without reducing the therapeutic outcome. They found the weaker trends of prolonged course of ECT, but these differences in the length and course were not statistically significant.

Seizure duration depends on many factors including concurrent drug therapy, the type and doses of anaesthetic induction agents, age of the patients and electric stimulation.

Recovery: After ECT, recovery was evaluated using sedation score, which was carried out at the end of 30 min

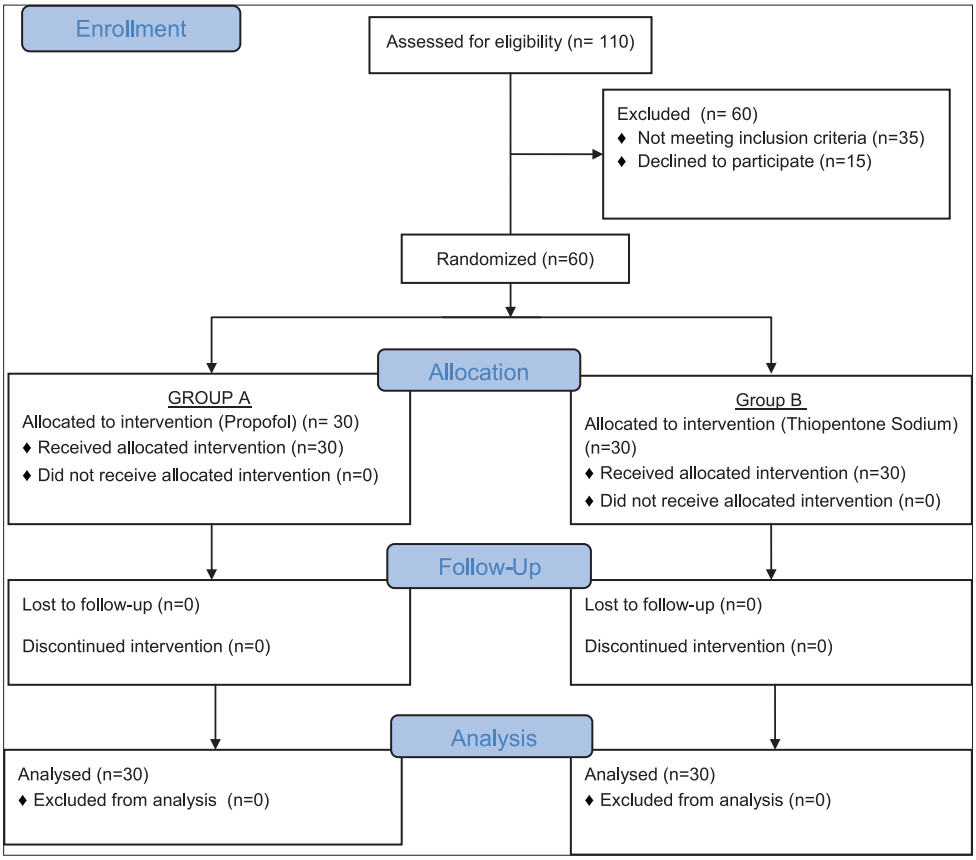

Figure 1: Consort 2010 flow diagram

after induction. In addition, time taken for spontaneous eye opening verbal communication, phonation, orientation of patient to name, place and time (in comparison to pre ECT questionnaire) and ability to sit with support and sit without support were noted.

Spontaneous eye opening: Spontaneous eye opening in 7.92 ± 2.94 min after induction with propofol and in 9.06 ± 3.06 min after inducing with thiopentone sodium recovery times of all measured variable were found to be more rapid with propofol. There were no statistically significant differences between two groups ($P > 0.05$).

Verbal communication and phonation: Time taken for verbal communication and phonation in patients induced with propofol were 10.07 ± 3.23 and 10.45 ± 3.54. In comparison, in the patients induced with thiopentone sodium time taken to achieve the same were 12.58 ± 3.71 and 13.08 ± 3.72 min, respectively. The difference in this time duration for verbal communication and phonation was considered to be significant ($P < 0.05$) between the two groups.

Orientation: Time taken for orientation of patient to name, place and time (in comparison to pre-ECT questionnaire) was 13.27 ± 4.38 min in patient induced with propofol and 18.57 ± 5.57 min in patients induced with thiopentone sodium. This time duration for patients to get oriented to name, place and time was found to be statistically significant ($P < 0.005$) (Figure 1).

CONCLUSION

It can be concluded from this study that propofol was superior to thiopentone sodium with respect to recovery after ECT, as there was a significant decrease in the time taken for spontaneous eye opening, verbal communication, phonation, orientation to name, place and time, sitting with support and without support. Sedation scoring, which was carried out at the end of 30 min after induction, showed the patients induced with propofol were awake in comparison to those induced with thiopentone sodium who was drowsy at the end of 30 min after induction. There was no difference with respect to oxygen saturation values.

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