



## Original Research Article

# Comparison of Thiopentone sodium Vs Propofol as an Anaesthetic agent in Modified Electroconvulsive Therapy

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## Abstract

**Introduction:** ECT consists of programmed electrical stimulation of the CNS to initiate seizure activity. Modified ECT started with the use of IV induction agent and Muscle relaxant in 1963. This study was conducted to compare the effects of thiopentone sodium and propofol as an anaesthetic agent in modified ECT.

**Material and Method:** 30 patients of ASA grade II with only psychiatric illness were divided into two groups randomly and two sessions of ECT per patients were included. Group T received Inj. Thiopentone 2.5mg/kg IV over 20 sec while Group P received Inj. Propofol 1.5 mg/ kg IV over 20 sec. Inj. Succinyl choline 0.5mg/kg was given after isolating one forearm. Drugs were evaluated regarding their effects on ECT induced haemodynamic changes (Blood pressure, Heart rate), SpO<sub>2</sub>, seizure response, seizure duration, recovery characteristics and any side effects during the procedure and recovery.

**Results:** It was observed that Heart rate(HR) of the group T increase significantly after ECT compared to group P ( $P < 0.05$ ). The increase in Systolic Blood pressure (SBP), Diastolic blood pressure (DBP) and Mean arterial Pressure (MAP) after ECT were more with group T compared to group P ( $P < 0.05$ ). Group P had seizure duration of  $28 \pm 4$  secs. which was less than group T ( $40 \pm 6$  secs) ( $P < 0.05$ ). Eye opening was early in group P ( $424 \pm 64$ ) than group T ( $547 \pm 41$ ) ( $P < 0.05$ ). Pt in Group P sit unaided at  $623 \pm 86$  seconds compared to Group T ( $896 \pm 70$ ) ( $P < 0.05$ ).

**Conclusion:** Propofol in the dosage of 1.5mg/kg intravenously can be safely used for modified ECT.

**Keywords:** Modified ECT, Thiopentone Sodium, Propofol.

## Introduction

Electroconvulsive therapy (ECT) is highly successful, even life saving treatment for severe depression. It is often quicker to produce benefit, safer, more effective and has fewer side effects compared to drug therapy.

Modified ECT started with the use of IV induction agent and Muscle relaxant to prevent its complications such as discomfort, awareness, fractures, aspiration of gastric contents, bradycardia and hypoxia etc. Anaesthetic agents used for ECT should provide a rapid smooth

induction, quick recovery and attenuation of various physiological changes with minimum antagonistic effect on ECT induced seizure activity.

Thiopentone is well accepted induction agent for ECT. It has rapid smooth induction, good anticonvulsant activity, less effects on seizure duration but has effects like prolonged awakening time, arrhythmias and laryngeal spasm.

Propofol is an agent with smooth induction and rapid recovery. It also has good anticonvulsant activity, better haemodynamic stability, antiemetic and bronchodilator property. Propofol causes rapid recovery as its metabolism exceeds hepatic blood flow which leads to 10 times faster metabolism than Thiopentone.

### Material and Methods

The purpose of our study was to evaluate and compare the induction characteristics, hemodynamic changes, seizure response, seizure duration, the speed and quality of recovery for ECT using propofol or thiopentone for induction of anaesthesia. This randomized study was conducted after taking institutional permission and informed and written consent from the patient and relatives. Two sessions of ECT per patients were studied.

ASA grade II patients in the age group of 20-60years (either sex) without any medical systemic disease other than psychiatric illness were included in study. Exclusion Criteria were 1) Refusal of patient or relatives or both, 2) Patients in ASA grade III and above, 3) Patient without seizure in first session, 4) Allergic to trial drugs.

Pre operatively all patients were evaluated thoroughly by obtaining a complete medical history, physical examination and basic investigation as per institutional protocol. NBM status were checked. Respiratory Rate, Pulse Rate and Blood pressure were recorded preoperatively. Assessment of airway was done as per Mallam-patti grading. Written informed consent from patient and relatives were obtained.

All patients were premedicated with Inj Atropin 0.5 mg IM 1/2 hr. before procedure.

The patients were randomly allocated in two groups. Group T -- received Inj. Thiopentone 2.5mg/kg V over 20 sec and Group P -- received Inj. Propofol 1.5 mg/ kg V over 20 sec. Induction dose was considered adequate if eyelash reflex was lost after 30 sec. Additional dose was given as per need. This was noted as induction time. Patient who received inj. Thiopentone in first treatment received Inj. Propofol in next treatment and Vice versa. Both the drugs were used in same patient alternatively, so that the response of drugs can be assessed without patient's disease variants. For visual confirmation of seizure, one forearm was isolated by inflating the tourniquet to a pressure 20% > SBP before giving Inj. Succinyl choline 0.5mg/kg IV. Patients were ventilated with 40% oxygen with ambu bag and mask with 6l/min of oxygen till fasciculation subsided. When adequate relaxation was ensured a mouth prop was inserted and bitemporal ECT was performed. After seizure mouth prop changed to airway and ventilation was assisted with facemask and ambubag till return of spontaneous satisfactory respiration.

Heart rate, BP and SpO<sub>2</sub> were recorded every minute for 6 min after induction and at recovery. Induction characteristics like spontaneous movement, Pain on injection, Hiccups, Desaturation episodes and laryngospasm were noted.

Seizure response was noted as, Mild -- Movement of facial muscle, Moderate --Large joint, facial and minimal back movement and Severe-- above and marked back movement. Seizure duration was noted from the seizure in isolated forearm.

As patients' mental status were not normal, we could not use complex psychometric test to assess recovery so simple tests were done. Recovery assessed by--Time of return of spontaneous respiration, Time of opening eye on verbal command, Time to sit unaided. After 20 min, patient was asked to walk unaided for 10 meters and were graded according to impairment as under: a- No impairment, b--Slight impairment, c-

-Moderate impairment--1-2 staggers, d--Severs impairment--Constant staggers, e--Unable to stand.

Side effects like nausea, vomiting, bronchospasm and restlessness were recorded.

### Observations and Results

All parameters and variable studied were statistically analyzed. They were analyzed by using paired 't' test. Results were expressed as mean  $\pm$  SD. P value  $\leq 0.05$  was considered statistically significant and value  $\leq 0.001$  was highly significant.

In present study, age, sex, weight, height and ASA status of the patient is not significant as both the groups have same patients. All patients underwent for study in both the groups. Premedication and pre-oxygenation was similar in both the groups.

The induction time was  $57 \pm 6$  sec in group T and  $64 \pm 10$  sec in group P. The difference in the induction time was not statistically significant. 25% (7) of patient in group P and 3%(1) of in group T complained of pain on injection. 7% (2) of patient of group T develop hiccups. There was no incidence of laryngospasm in any group.

Preprocedure hemodynamic parameters were comparable. As shown in Graph 1 HR of the group T increase significantly after ECT and remain elevated upto recovery. (Graph 1) Compared to baseline value, the SBP and DBP

decreased at induction. The increase in BP after ECT was more with group T compared to group P which is statistically significant. MAP showed similar changes. (Graph 2) The pattern of changes in RPP was similar as BP.

There was fall in SpO<sub>2</sub> but remains at 90% after ECT in both the group. It returns to normal after cessation of seizure because ventilation was assisted with ambubag with O<sub>2</sub> (6L/Min) till return of satisfactory spontaneous respiration.

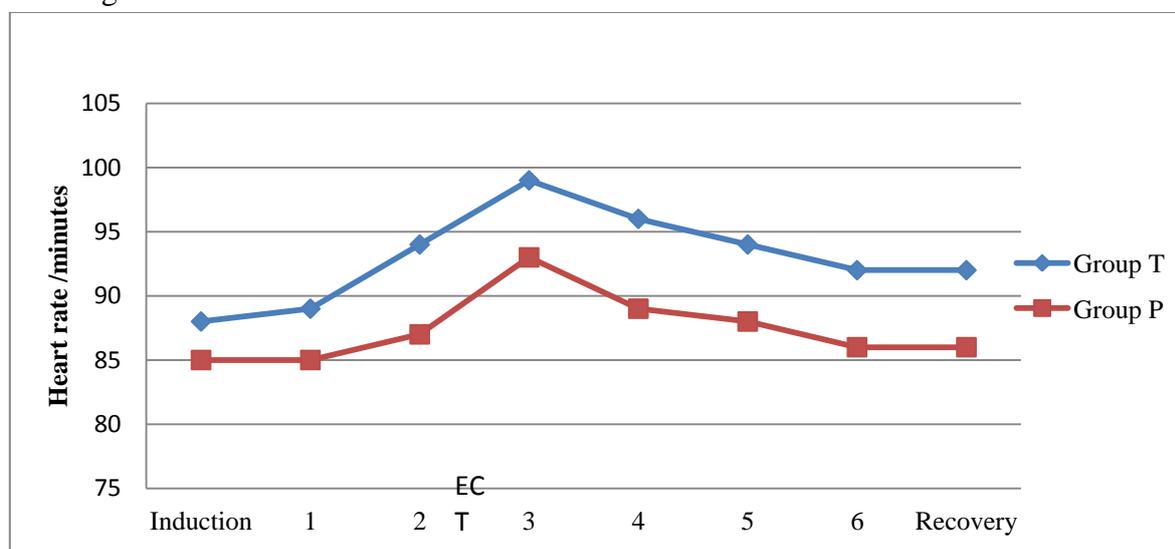
72% (21) of patient showed mild seizure response and only 8% (2) showed severe response with propofol (P<0.05). Pentothal had more chances of severe seizure response (32% (9)). (P<0.05) (Table 1)

Group P had seizure duration of  $28 \pm 4$  secs. which was less than group T ( $40 \pm 6$  secs) but remained above 25 sec in all patients which is considered as minimum requirement for therapeutic efficacy. (P<0.05) (Table2)

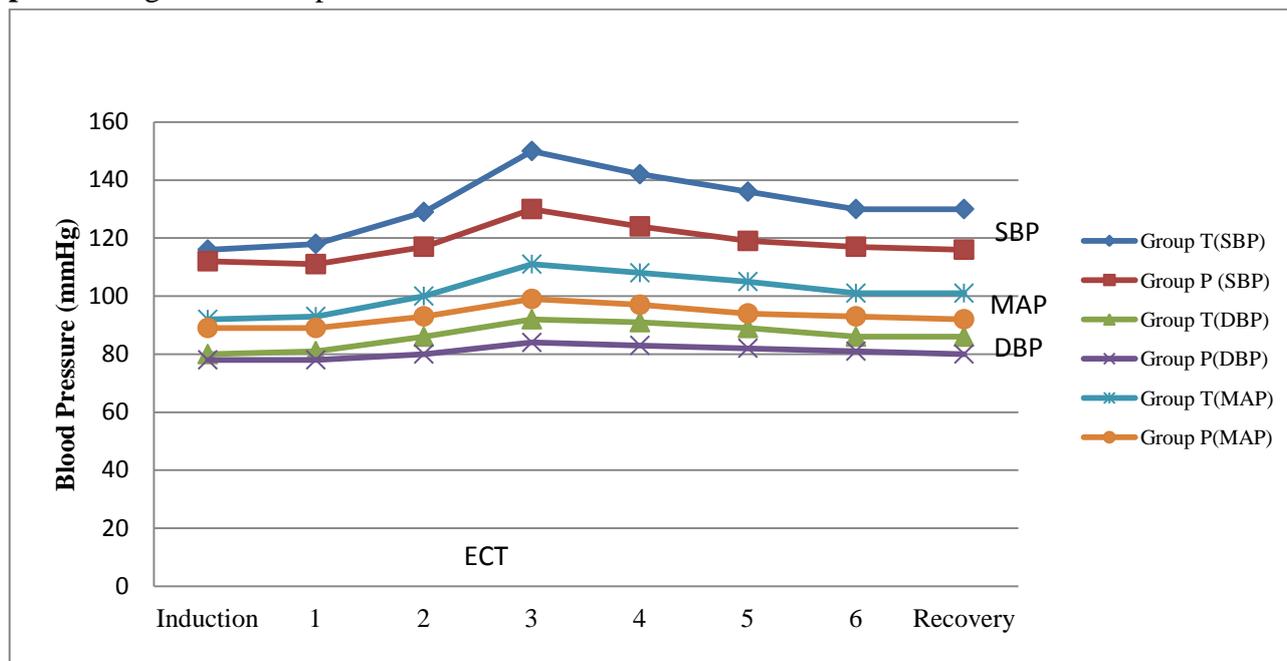
A significance difference in recovery time was observed amongst the groups. Eye opening was early in group P ( $424 \pm 64$ ) than group T ( $547 \pm 41$ ) (P<0.05). Pt in Group P sit unaided at  $623 \pm 86$  secs compared to Group T ( $896 \pm 70$ ) (P<0.05). (Table 3) Walking after 20 min and Orientation was early and better in group P .

Patients in Group T (4) develop more nausea and vomiting compared to group P(None).Headache was present in 3 patient of Group T.

**Graph 1:** Changes in Heart Rate



**Graph 2** Changes in Blood pressure



**Table 1:** Seizure response

	Mild	Moderate	Severe
Group T	4%	64%	32%
Group P	72%	20%	8%
P value	<0.05*	>0.05	<0.05*

\*-- significant

**Table 2:** Seizure Duration

	Group T	Group P	P value
S. duration	40±6	28±4	<0.05*

\*-- significant

**Table 3:** Recovery

	Group T	Group P	P value
Eye opening on verbal command	547±41	424±64	<0.05*
Sitting unaided	896±70	623±86	<0.05*

\*-- significant

**Discussion**

ECT is one of the most widely recognized, accepted and most effective treatment modality for various psychiatric disorders and illnesses. ECT induces cardio respiratory hazardous changes through parasympathetic and sympathetic imbalance. Thus many different strategies have been advocated for modification of these responses. Use of different anaesthetic induction agent is one such strategy. With the use of IV induction agents and succinylcholine, modified ECT came in to existence.<sup>(1)</sup>

This study was conducted to compare thiopentone and propofol as an anaesthetic agent for MEECT. In our study patients belonged to age group of 20-60 yrs and two session of ECT per patient were included in study. This study design was similar to that of Nadeem et al<sup>(2)</sup> and Villalonga A et al<sup>(3)</sup>. As recomended by Grounds et al.<sup>(4)</sup> intravenous cannula was placed in the peripheral vein. Inj Atropine 0.5mg intramuscular given half an hour before procedure. Same was done in our study. Thiopentone in the dosage of 2.5mg/kg and propofol 1.5mg/kg was given for induction as per

study design of Nadeem et al<sup>(2)</sup>. Aad singhal et al<sup>(5)</sup>. These figures correlate well with the relative potency ratio of 1.6:1 (P:T) found by Grounds et al.<sup>(4)</sup>. Pain on injection was noted (25%) with propofol in our study. Nadeem et al.<sup>(2)</sup> observed 80% incidence and singhal et al.<sup>(5)</sup> observed 34% incidence when propofol was given. Inj suxamethonium was given in dose of 0.5 mg/kg which was comparable with other studies of Nadeem et al.<sup>(2)</sup> And Boey wk et al<sup>(6)</sup>. The dose which was taken in our study was also appropriate according to ronarzewski et al.<sup>(7)</sup> which suggested that dose of 25 mg had practical advantage over 50mg and theoretical advantage over 15 mg, After induction there was a decrease in HR in propofol group in contrast to thiopentone group. With both the groups, heart rate increased as a response to ECT but significantly higher with thiopentone and remain elevated upto recovery. These findings were consistent with studies of Singhal et al.<sup>(5)</sup> And Boey WK et al.<sup>(6)</sup> SBP and DBP showed similar results which was comparable with Singhal et al<sup>(5)</sup>. And Boey WK et al<sup>(6)</sup>. SpO<sub>2</sub> showed fall after ECT in both groups. Lew et al.<sup>(8)</sup> found that hypoxemia occurred frequently during ECT despite O<sub>2</sub> supplementation if ventilation discontinued for duration of seizure. They found that continuous supplementation of O<sub>2</sub> prolong the modified convulsion. In our study we kept the rate of ventilation constant so the effect of hyperventilation and oxygenation on seizure duration was minimised. We have used Ambubag with O<sub>2</sub> flow of 6L/min(FiO<sub>2</sub> 0.4%) as recomended by Lew et al.<sup>(8)</sup>

The intensity of convulsion was assessed according to the classification modified from Ferguson et al.<sup>(9)</sup>. We found the mild seizure response with the propofol group. Study of Boey WK et al.<sup>(6)</sup> also showed the similar finding. Efficacy of the ECT depend on the seizure duration. Three monitoring methods were available 1) EEG 2) BP Cuff 3) EMG. In our study we measured seizure duration by the cuff method as recomended by most of the studies.

According to Fink and Johnson et al.<sup>(10)</sup>, duration of seizure by cuff method was 10% shorter than the EEG. Because of its simplicity the cuff method was used in our study. The minimum seizure duration for effective ECT is 25 sec as recomended by simpson et al.<sup>(11)</sup> And fink et al.<sup>(10)</sup>. In our study propofol reduced seizure duration by 25% which was similar with the Nadeem et al.<sup>(2)</sup>, Boey we et al.<sup>(6)</sup> and dwyer et al.<sup>(12)</sup>. But it was more than the recomended effective seizure duration of 25 secs. Freedman et al.<sup>(13)</sup> concluded that propofol in dose of <1.5 mg/kg associated with clinically acceptable seizure during ECT. Other thought that the cumulative seizure time of 210 secs was important. If effect depend upon total duration of seizure than extra treatment might be required to achieve the same therapeutic effect. The risk of extra treatment should be balanced against the advantage of cardiovascular stability and rapid recovery with propofol.

Time for opening eye on verbal command was shorter with propofol. Sitting unaided was earlier after propofol. The ability to walk after 20 min after induction was significantly better after propofol. Our results were comparable with the Nadeem et al.<sup>(2)</sup> and singhal et al.<sup>(5)</sup> But Boey wk et al.<sup>(6)</sup> showed that there was no significant difference between the drugs in the time to opening eyes and sitting unaided. The quality of recovery assessed by orientation of patient regarding time, place and person as well as complications occurred during recovery. Thiopentone metabolized slowly and is associated with a hangover effect, which is disadvantageous for day care anaesthesia. While Patient in propofol group were less drowsy and less disoriented. Propofol showed marked antiemetic effect in recovery period. (Borgeat et al.<sup>(14)</sup>). According to BailineSH et al.<sup>(15)</sup> propofol mainly indicated in patient who have excessively long seizures and / or severe nausea and vomiting after ECT.

As we used two induction agent in same patient we could not assess therapeutic efficacy of individual drug but with the reference of study done by Singhal et al<sup>(5)</sup>, Boey WK et al.<sup>(6)</sup> And

Bilge et al. <sup>(16)</sup> we can say that propofol does not affect therapeutic efficacy.

### Conclusion

We concluded from this study that propofol appears to be safe anaesthetic agent for ECT with greater hemodynamic stability, less vigorous seizure response and minimal side effect without affecting therapeutic outcome.

**Conflicts of interest** --none

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