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Thiopentone sodium versus propofol for anaesthesia in modified electro-convulsive therapy (ECT)

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***Abstract*---**Objectives: To compare the effects of thiopentone sodium and propofol as an intravenous anaesthetic agent in modified ECT. Methods: 100 patients of ASA I & II grade were randomly assigned in to two groups. Both groups were premedicated in ususal manner. Patients in Group A were induced with inj. thiopentone sodium 3-5mg/kg and in Group B inj. Propofol 1.5-2mg/kg. Then, Inj. Succinyl choline 0.5-1mg/kg was given. Patients were ventilated with 100% oxygen with bain circuit and mask. Shock was given after putting bite block. Patients were again ventilated till spontaneous respiration after seizures. Results: Propofol is better induction agent as compared to thiopentone sodium in terms of faster induction, better haemodynaemic stability, no significant effect on seizure duration, early recovery without any side effects. Conclusion: Propofol in the dosage of 1.5-2 mg/kg body weight intravenously can be safely used for modified ECT in ASA grade I and II pateints. Fast, smooth induction, better hemodynamics, early smooth recovery, antiemetic property and uncompromised therapeutic outcome makes propofol as an agent of choice for day care procedure. Though there is reduced

seizure duration with Propofol as compared to thiopentone, there is no effect on outcome of the therapy or effectiveness of ECT.

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

Introduction

Modified Electro convulsive Therapy (ECT) for major depressive disorders has established its efficacy and effectiveness as an evident based practice. Direct ECT was first introduced by Cerletti and Bini[1]. Since then, it has continued to occupy a central place amongst treatment modalities for large variety of psychiatric illness like severe acute depressions with suicidal tendencies, acute mania, schizophrenia, catatonic psychosis and delirium where pharmacotherapy failed[2]. The technique has proved to be simple and yet certain and replaced pharmacologically produced seizure therapy (Insulin coma therapy, Camphor and pentylenetetrozol induced seizure)[3].

In earlier days, for ECT electric shock was given directly without anaesthesia in conscious patients. Thus, the complications like- bone fractures, joint dislocation, biting of tongue and tearing off of muscle fibre were frequent[4]. Further, it was not a pleasant sight to look at convulsing and frothing patients who were being held by several persons to avoid injury. Typically, the acute phase of ECT is performed three times a week for 6 to 12 treatments. In successful cases, initial clinical improvement is usually evident after 3 to 5 treatments. Maintenance therapy can be performed at progressively increasing intervals from once a week to once a month to prevent relapses.

There is always a need of ideal anaesthetic agent which has rapid, smooth induction, short duration of action, minimal effects on seizure duration, compatible with antipsychotic drugs, minimal side effects and rapid recovery. Various anaesthetic drugs like methohexital, Thiopentone Sodium, Propofol and Etomidate were used [5-10]. Thiopentone is well accepted induction agent for ECT. It has rapid smooth induction, good anticonvulsant activity, less effects on seizure duration but associated with side effects like prolonged awakening time, arrhythmias, laryngeal spasm, porphyria, hypersensitivity to thiopentone sodium and post ECT nausea vomiting [6]. Propofol can be used where Thiopentone is contraindicated. Besides smooth induction, good anticonvulsant activity, attenuation of haemodynamic response, antiemetic and bronchodilator property[11]; propofol causes rapid recovery though slight decrease in seizure duration. Effect of drug can be predicted in patient with ASA grade 3 and above on the basis of effect in ASA 1 & 2. The purpose of the study is to compare effectiveness of Thiopentone and Propofol as an intravenous anaesthetic agent for Modified ECT.

Materials and Methods

Aim of the study was to compare the effects of thiopentone sodium and propofol as an intravenous anaesthetic agent in modified ECT in view of induction time

and quality, haemodynamic parameters, seizure duration, recovery characteristics and any side effects or complications T.

This study was conducted in Dhiraj General Hospital, Smt. B. K. Shah Medical Institute and Research Centre in Department of Anaesthesiology. We studied 100 patients of Grade-I and Grade-II of American Society of Anaesthesiologist's (ASA) classification. The study is cross over in nature. All the patients participating in the study was explained clearly about the purpose and nature of the study in the language they can understand. They were included in the study only after obtaining written informed consent from patient and relatives. We used the protocol for gathering information regarding efficacy and tolerability of the procedure.

Inclusion Criteria
1) Patient in the age range of 25-60years.
2) ASA risk category I and II.
3) No known history of allergy, sensitivity or other form of reaction to anaesthetic drugs.
4) Patient and relatives willing to sign informed consent.

Exclusion Criteria
1) Refusal of patient or relatives or both.
2) Patients in ASA grade III and above.
3) Allergic to trial drugs.

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2) Patients in ASA grade III and above.
3) Allergic to trial drugs.
4) Patient with H/O full stomach, Major illness like- T.B., Asthma, neuromuscular disorders.
5) Patient with Respiratory Disorders, Hypertension, Epilepsy, Cardiovascular diseases, Diabetes, H/O MI in last six months will be excluded.
6) Patient on drugs which may alter the haemodynaemic parameters will be excluded.

Allocation of Groups

Each participant was undergoing for ECT for at least 2 treatment cycles. Each patient was given at least 2 cycles. The study is cross over in nature. Patients

were selected randomly. Group A received thiopentone (2.5%) 2.5-5mg/kg and patients in group B received Inj. propofol (1%) 1.5-2mg/kg.
Patient who received inj. Thiopentone in first treatment received Inj. Propofol in next treatment and patient who received propofol in first treatment received Inj. Thiopentone in next treatment. Both the drugs were used in same patient alternatively, so that the response of drugs can be assessed without patient's disease variants.

Preoperative examination

After taking detailed history, drug history, general physical examination along with examination of cardiovascular and respiratory system was done. Respiratory Rate, Pulse Rate and Blood pressure were recorded preoperatively. Assessment of airway was done as per Mallam-patti grading. Routine blood investigations (Complete blood counts, RBS, RFT) were carried out. Chest X-Ray and ECG were done. Patient were asked to keep nil by mouth at least for six hours before the procedure. The patients were reassured, the procedure was explained and a written informed consent from patient and relatives was obtained.

On the day of procedure, Intra-venous line was be secured with 18G intracath. Patient was shifted to OT table and kept in supine position. Multipara monitor was attached and base line respiratory rate, pulse rate, non-Invasive blood pressure (NIBP), SPO2 and ECG was recorded. Premedications (Inj. Ondansetron 4mg, Inj. Glycopyrrolate 0.2mg IV) were given 5 minutes prior to procedure.

Procedure

- ✓ Pre-Oxygenation with 100% O2 for 3-5 min.
- ✓ Induction with intravenous anaesthetic agent (Inj.Thiopentone 2.5-5mg/kg in group T and Inj. Propofol 1.5-2.0mg/kg in Group P) till the loss of eyelash reflex, followed by Inj. Succinylcholine
- ✓ 0.5-1.0mg/kg intravenously. Controlled Ventilation was given with a facemask and Bain circuit with 100% Oxygen.
- ✓ Bite block was put before application of the electrical stimulus to protect patient's teeth and minimize the risk of laceration of the tongue and patient was held tight for immobilization to prevent fracture and other complications. ECT was given.
- ✓ Haemodynamic changes, duration of seizure and recovery were noted.
- ✓ Patient was given 100% Oxygen after convulsions. And was ventilated by IPPV via bag and mask till spontaneous respiration.
- ✓ During procedure awareness was assessed by Ramsay sedation score [Table 1]. Recovery was observed inform of regain of reflexes, response to pain and follows the verbal commands.

Table: 1 Ramsay Sedation Score

SCORE	RESPONSE
1	Anxious or restless or both
2	Cooperative, orientated and tranquil
3	Responding to commands

4	Brisk response to stimulus
5	Sluggish response to stimulus
6	No response to stimulus

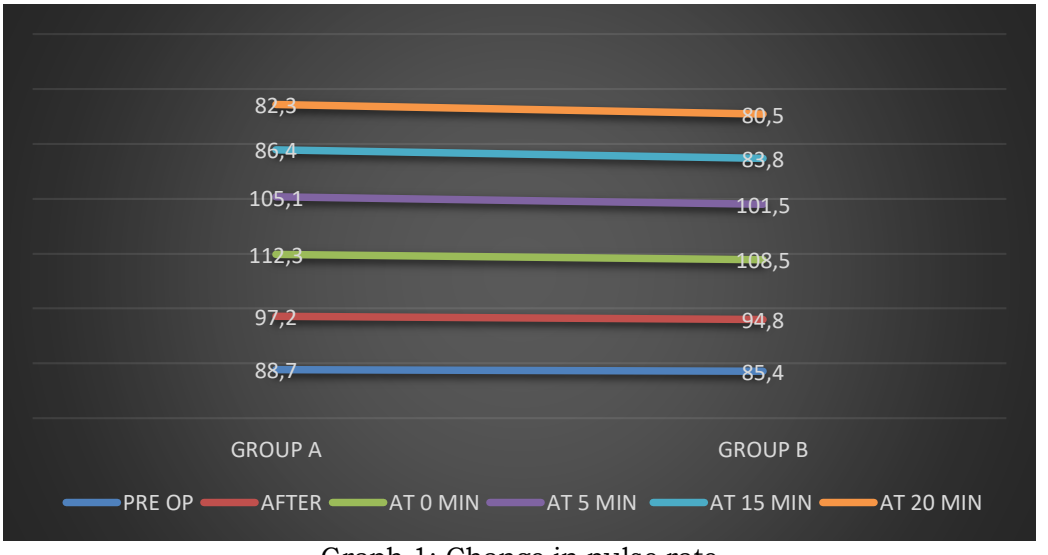
- ✓ Patient was shifted to the recovery room when follows verbal commands. Vitals were monitored.
- ✓ Patient was monitored and assessed for intra operative and post-operative complications like-
- ✓ nausea, vomiting, desaturation, laryngospasm, arrhythmias, hypersesitivity reaction etc.

Statistical Methods Microsoft word and Excel were used to generate graph and tables. The inference based on 'P' value was made as follows:

- ✓ P > 0.05 – Insignificant
- ✓ P < 0.05 – Significant
- ✓ P < 0.01 – Highly Significant
- ✓ P < 0.001 – Very Highly Significant

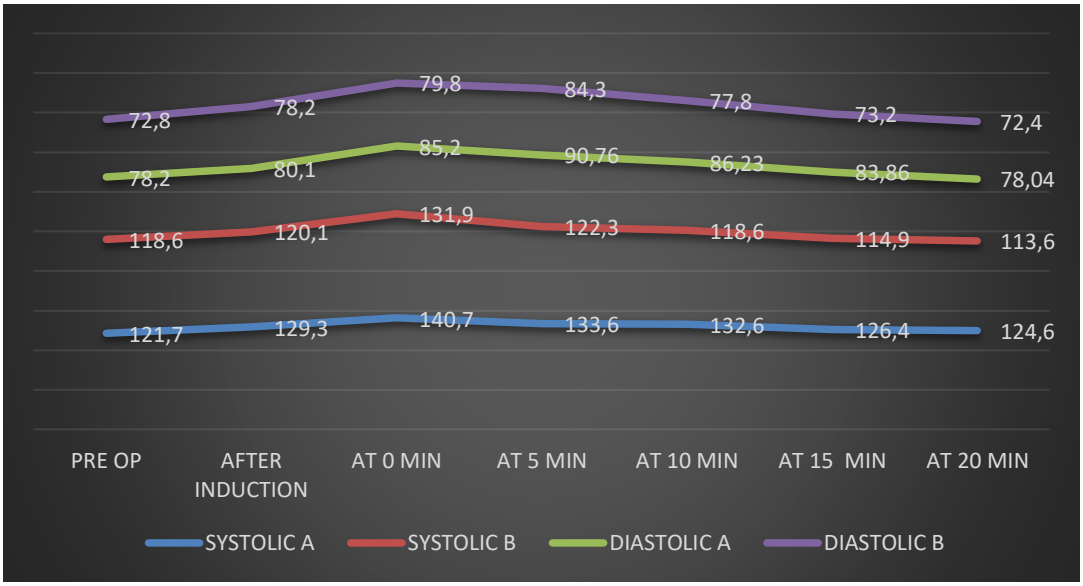
Results

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. Premedications and pre-oxygenation was similar in both the groups. In this study, induction was rapid with propofol as compared to Thiopentone sodium which was statistically significant. Time taken for induction (mean) was less with Propofol (41.9 ± 5.21 in seconds) as compared to Thiopentone (47.40 ± 5.68 in seconds) (P < 0.05).
In both group, a similar trend of increase in mean heart rate, however, the percentage of increase in each of the variables following the procedure was significantly greater in A group as compared to B group.[GRAPH 1]



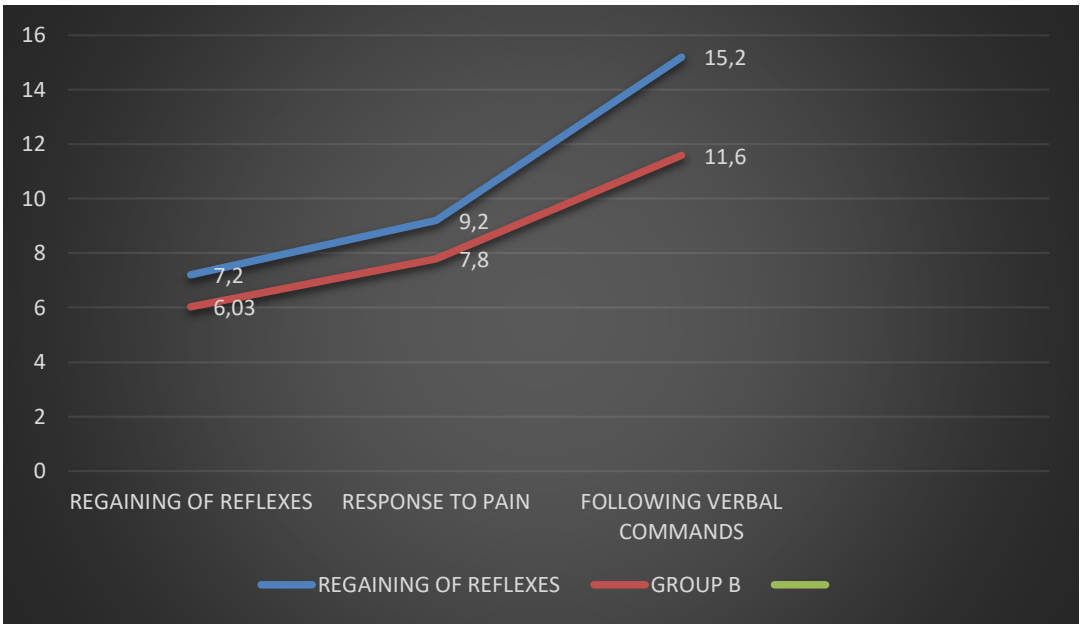
Graph 1: Change in pulse rate

There is no much rise in systolic BP after induction in B group (2.8% rise in SBP from baseline) as compared to A group (7.9% rise in SBP from baseline). Even post ECT rise in SBP was only 9.8% in B group as compared to 16% rise of SBP in A group. There is no much rise in diastolic BP post induction in B group (0.7% rise in DBP from baseline) as compared to A group (7.2% rise in DBP from baseline). Even post ECT rise in SBP was only 13.6% in B group as compared to 15.7%in A group [GRAPH 2].



Graph 2: change in systolic bp and diastolic bp in both groups

Following ECT there was reduced seizure duration time with B group (16.54 ± 2.87 in seconds) as compared to A group (20.19 ± 3.98 in seconds), which is not very significant (P value 0.032). A significance difference in recovery time was observed amongst the groups. Propofol had significantly earliest and smooth ($P<0.05$) followed by thiopentone with respect to time for regain of reflexes, responds to pain and following verbal commands.[GRAPH 3]



Graph 3: Recovery Characteristics

In present study, 96 out of 100 patients had sedation score of one (Ramsay sedation score) as compares to Thiopentone which have only 88 out of 100 patients have ramsay sedation score of one.

Discussion

This study is to compare effectiveness of thiopentone and propofol as an intravenous anaesthetic agent for Modified ECT in ASA I and II patients. ECT is one of the most widely recognized, accepted and most effective treatment modality for various psychiatric disorders and illnesses. With the use of IV induction agents and succinylcholine, modified ECT came in to existence. It reduces incidence of psychological trauma.

Thiopentone is well-accepted induction agent for ECT. It has rapid smooth induction, good anticonvulsant activity, less effects on seizure duration but associated with side effects like prolonged awakening time, arrhythmias, laryngeal spasm, porphyria, hypersensitivity to thiopentone sodium and post ECT nausea vomiting. Besides smooth induction, good anticonvulsant activity, attenuation of haemodynamic response; propofol causes rapid recovery though slight decrease in seizure duration. In this study, induction dose was calculated according to body weight, which was adequate to reach the induction criteria i.e. loss of eyelash reflex and could not interfere with ECT induced seizure. In present study, all patients underwent for study in both the groups. So, age, sex, weight, height and ASA status of the patient is not significant as both the groups have same patients. Premedications and pre-oxygenation was similar in both the groups.

Induction was rapid with propofol as compared to Thiopentone sodium, which was statistically significant ($P<0.05$). Time taken for induction (mean) was less

with Propofol (40.82 ± 5.98 in seconds) as compared to Thiopentone (48.58 ± 6.12 in seconds). This suggests that propofol has faster induction than thiopentone. Jain et al[7] (In her study mean induction time with Propofol was 41.03 ± 6.11seconds as compared to Thiopentone had 50.6 ± 6.82seconds. Rapid induction with Propofol.), Daria et al[13] (mean induction significantly less in propofol 40.4 seconds, while in thiopentone 49.4 seconds).

After giving inj. succinylcholine, haemodynaemics were stable during IPPV with 100% oxygen. There were no tachyarrhythmia's or bradyarrhythmias. In B group, an increase in all hemodynamic parameter seen after the procedure, mean heart rate (95.24± 9.68 vs 108.23 ± 10.77), SBP (122.32 ± 9.88 vs 131.65 ± 10.88), DBP (74.42 ± 5.89 vs 84.98 ± 6.58). In A group too, a similar trend of increase in all hemodynaemic parameters was seen after the procedure, mean heart rate (99.72 ± 15.24 vs 116.53 ± 13.04), SBP (132.02 ± 9.12 vs 142.46 ± 7.65), DBP (84.32 ± 8.21 vs 92.32 ± 8.21). However, the percentage increase in each of the variables following the procedure was significantly greater in A group as compared to B group. So, there is good hemodynamic stability of vitals with propofol compared to thiopentone. Increased in heart rate, SBP and DBP after ECT were observed in both groups, but propofol blunts the sympathetic response, so there was less increase in HR, SBP and DBP with propofol. Various authors, the significant rise in HR after ECT with thiopentone as compared to propofol was also noted by Omprakash et al[6] (In both groups, there were transient increase in PR after induction from 85.46 to 115.87 in P group and from 85.46 to 115.57 in T group.). Alok Kumar et al[15] (In group B, an increase in all haemodynaemic parameters was seen after the procedure, mean heart rate (82 ± 12 bpm vs. 75 ± 16 bpm), In group A too, a similar trend of increase in all hemodynaemic parameters was seen after the procedure, mean HR (82 ± 14bpm vs. 72 ± 14bpm). However, percentage increase in each of the variables following procedure was significantly greater in group A as compared to group B ($P<0.05$), Jain et al[7] (mean HR in A group after ECT vs basal was 120.23 ± 9.88 bpm vs 82.3 ± 4.25 as compared to B group 109.36 ± 7.83 vs 84.53 ± 4.27 bpm) which correlates well with our study. In the study by Jain et al[7] SBP after ECT in A group was 156.32 ± 12.02 vs 124.3 ± 6.83, while in P group 134.22 ± 9.28 vs 123.9 ± 7.33mmhg and DBP after ECT in T group was 99.23 ± 10.26 vs 76.7 ± 4.43mmhg while in P group 90.66 ± 7.53 vs 78.5 ± 4.63mmhg. Study suggested that rise in DBP after ECT was less with propofol as compared to Thiopentone sodium. This result correlates well with our study.

Mean duration of seizure was less in B group (17.07sec) than in A group (19.21sec). $P >0.05$. There is no effect of reduced seizure duration with propofol on outcome of the therapy or effectiveness of ECT[7]. This result also similar to Zaidi et al[16] (The mean duration of seizure was 31.08 ± 4.13 seconds with thiopentone and 23.76 ± 3.38 seconds with propofol ($p<0.001$).). Jain et al[7] (Mean seizure duration 94 ± 21 with P group vs. 83 ± 34 seconds with A group, B value <0.01 is significant.), Omprakash et al[6] (Propofol had shorter seizure duration as compared to Thiopentone group, B value less than 0.05 is significant, elevation of seizure threshold after propofol administration may explain the lower duration of seizure[17,18], Daria et al[13,18] (Mean seizure duration was found less in propofol as 25.6seconds while in thiopentone it was found 28.1 seconds and on comparison this difference was found non significant), Zaidi et al[16] (The

mean duration of seizure was 31.08seconds ± 4.13 with thiopentone and 23.76 ± 3.38seconds with propofol (p<0.001)). There is no effect on therapeutic outcome or ECT therapy as observed in previous studies[7]. Lee et al[14] conducted study on rat and demonstrated that propofol increases the seizure threshold resulting in reduced seizure activity. Regaining of reflexes was earlier in B group (6.93minutes) than in A group (6.07minutes). P value is 0.002 statistically significant. Responds to pain in B group is significantly early (7.33min) than A group (8.70 min). P=0.000 highly significant. Following verbal commands in B group is significantly early (10.5 min) than A group (14.07 min). P=0.000 highly significant. Post procedure sedation was less in B group as compared to A group. At 20min, 96 patients had Ramsay sedation score of 1 in propofol as compared to thiopentone group in which only 88 patients had sedation score of 1. P value was 0.011, 0.006, 0.000 and 0.010 at 5min, at 10min, at 15min and at 20min respectively. P value is highly significant. This suggests that Propofol has faster recovery than thiopentone. A significant difference in recovery time, clear headed recovery was observed among the groups. Propofol group had significantly earliest and smooth recovery compared to thiopentone with respect to time for the ability to obey verbal command, ability to sit unaided. These results also match with previous study. Recovery from anaesthesia is faster and smoother with propofol with less sedation as compared to thiopentone.

This results also similar to previous studies by Zaidi et al[16] (Recovery features showed that the ability to obey vocal commands like opening of eyes took a mean of 5.04 ± 1.36minutes with thiopentone and 3.28 ± 0.89minutes with propofol (p<0.001). Patients who were treated with thiopentone were able to sit up unaided after mean period of 8.84 ± 1.51minutes, while with propofol patients took 6.68 ± 1.06minutes (p<0.001). Patients given thiopentone took 13.68 ± 1.72minutes compared to those in the propofol group who took 10.28 ± 1.02minutes). No significant side effects of any drugs in this study were noted. There were no side effects in this study like- arrhythmias, nausea, vomiting, laryngo-spasm, prolonged awakening, asystole, hypersensitivity etc.

Conclusion

To conclude propofol in the dosage of 1.5-2mg/kg body weight intravenously can be safely used for modified ECT in ASA grade I and II pateints. Fast, smooth induction, better hemodynamics, early smooth recovery, antiemetic property and uncompromised therapeutic outcome makes propofol as an agent of choice for day care procedure. Though there is reduced seizure duration with propofol as compared to thiopentone, there is no effect on outcome of the therapy or effectiveness of ECT.

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