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Anaesthesiology

KEY WORDS: ECT, Thiopentone Sodium, Propofol, Etomidate.

COMPARATIVE STUDY OF THIOPENTONE SODIUM, PROPOFOL AND ETOMIDATE FOR ANAESTHETIC EFFICACY & EFFECT ON SEIZURE DURATION IN ELECTRO-CONVULSIVE THERAPY

Dr. Pratima Singh*

MBBS, DA, DNB, Senior Resident, Department Of Anaesthesiology, Datia Medical College, Madhya Pradesh, India. *Corresponding Author

ABSTRACT

Introduction: Electroconvulsive treatment is a treatment where seizures are electrically induced in patients of psychiatric disorder for therapeutic impact. Electric current in ECT can cause severe haemodynamic disturbances. Administration of anaesthetic agents can cause attenuation of physiological disturbances. **Aims & Objectives:** To study impact of Thiopentone Sodium, Propofol and Etomidate on haemodynamics and seizure duration when used as anesthetic agents for ECT. **Materials &Methods:** After ethical clearance and written informed consent of patient and surrogates the study was conducted on 90 patients aged 18-65 yrs with no comorbidities other than the psychiatric disorder under treatment. **Conclusion:** In our study we concluded that Propofol was better than Thiopentone Sodium and Etomidate for anaesthesia during ECT. Etomidate provided the advantage of more haemodynamic stability and faster recovery. Propofol provided smoother induction and recovery with moderate seizure duration. Thiopentone on the other hand provided low seizure duration rendering it less effective therapeutically(probably due to its intrinsic antiepileptic property) and with more haemodynamic fluctuations.

INTRODUCTION:

Electroconvulsive treatment is a treatment where seizures are electrically induced in patients of psychiatric disorder for therapeutic impact. Electric current in ECT can cause severe haemodynamic disturbances. Administration of anaesthetic agents can cause attenuation of physiological disturbances. A seizure duration of 25 to 50 seconds is considered to be therapeutically beneficial. ECT is associated with decrease in self destructive behavior and suicidal tendencies in pharmacologically resistant psychiatric disorders. Historically ECT was done without administration of anaesthetia. In absence of anaesthesia and muscle relaxation ECT caused severe physiological derangements like increase in intra cranial tension, cerebral haemorrhage, myocardial infarction, arrythmias, haemodynamic fluctuations and even joint dislocations.

AIMS & OBJECTIVES:

To compare the effect of of Thiopentone Sodium, Propofol and Etomidate for anaesthesia in ECT with respect to - Induction time, Alteration of Hemodynamics, Seizure duration and Recovery time.

MATERIALS AND METHODS:

After ethical clearance and consent of patient and surrogates the study was conducted on 90 patients aged 18-65 yrs with no comorbidities other than psychiatric disorder under treatment. The study was conducted over 1 year (October 2023- October 2024).

The patients were divided in three groups comprising of thirty patients each. Group T was given Inj. Thiopentone (5 mg/Kg), Group P was given Inj Propofol 2% (2 mg/Kg) and Group E Etomidate (0.2 mg/kg). All the patients were nil per oral for 6 h before procedure and received the dose of their antipsychotic medication even on the day of procedure 6 hrs prior to ETC.

Inclusion Criteria:

1)Age 18-65 years
2) no comorbidity other than psychiatric disorder
3) Posted for ECT

Exclusion Criteria:

1) Full stomach
2) Hypertension
3) Neuromuscular problems
4) Epilepsy
5) Drug allergy
6) Pregnancy
7)Cochlear implant
8) Patient in shock

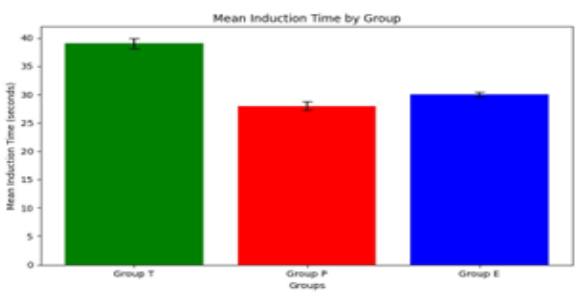
PROCEDURE:

1) Preanaesthesia Evaluation – a thorough pre anaesthesia assessment was done for all the patients
2) Routine Investigations – CBC, LFT, KFT, Serum Electrolytes, RBS, PTINR, APTT, ECG and CXR.
3) Written informed consent of patient and surrogate.
4) Patient was signed in and monitors were attached ECG, NIBP, SPO2 AND ETCO2. IV access was secured. Premedication that was given to the patients. Inj Glycopyrrolate 0.2 mg i.v. & Inj. Ondansetron 0.15mg/kg i.v. Preoxygenation with 100% oxygen for 3 min was done. Group T was given Inj Thiopentone (5 mg/Kg) and Group P was given Inj Propofol 2% (2 mg/Kg) and Group E Etomidate (0.2 mg/kg) till the loss of eyelid reflexes & the induction time was noted. For muscle relaxation iv Succinylcholine (2 mg/kg) was given to all the patients. A bite block was inserted to prevent tongue bite. 60 Hz 800mA DC was given over 2 seconds with bi-temporal electrodes to all patients to induce seizures. All the patients were ventilated with 100% of oxygen utilizing a Bain's circuit at rate of 14–16 breaths/min till spontaneous breathing returned with adequate tidal volume, respiratory rate and return of protective airway reflexes. Vital monitoring was meticulously done throughout procedure.

Statistical Analysis

Statistical analysis was done using the SPSS SOFTWARE. To calculate the sample size, a power analysis of α=0.05 and α=0.90, showed that 30 patients per study group were needed. Data are expressed as either mean or standard deviation or numbers and percentages. Continuous covariates were compared using ANOVA. Chi square test performed for the data evaluation with the p- value reported at the 95% confidence interval. $p<0.05$ was considered statistically significant. Unpaired student t test was used to analyze duration of seizure.

OBSERVATION&RESULTS



1) Demographic data like age and sex ratio was comparable in the three groups.

2) Induction time The mean induction time in group T was 39+0.91 sec , Group. P was 28+0.78sec and Group E was 30+0.42 sec.

3) HeartRate(HR)

After the administration of ECT, a significant ($P < 0.05$) change in Heart Rate from the baseline was observed in all the three groups.

There was an increase in Heart Rate for up to 5 min after ECT, which was followed by a descending trend & reaching back to baseline values at 15 min.

However, there was less rise in Heart Rate with Group E group in comparison to Group T and Group P.

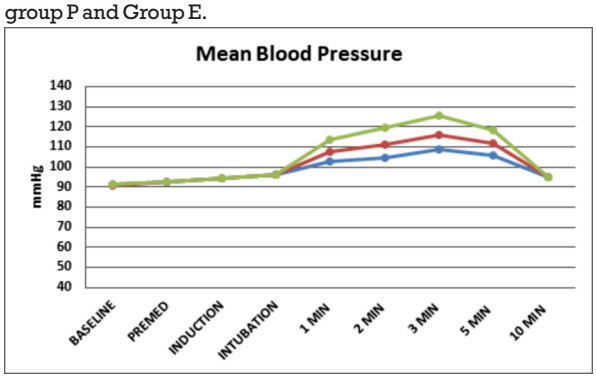
3) Systolic blood pressure(SBP)

Initially, rise in SBP from baseline value for upto 5 mins &then it decline back to baseline in 30mins.

This variability was statistically significant ($p<0.05$), and was more pronounced in group T than in group P followed by Group E.

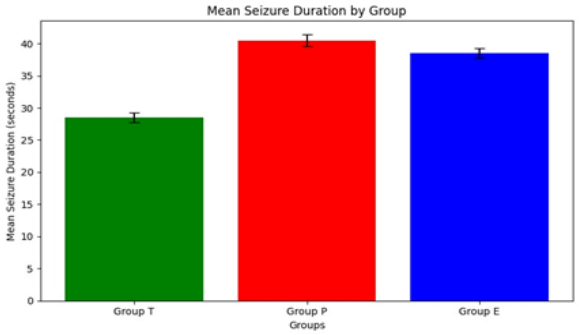
4) Diastolic blood pressure(DBP)

Similar to SBP, DBP also showed statistically significant variability for upto 5min from the baseline value following ECT& it was highly significant in group T as compared to group P and Group E.



5) Seizure duration

Mean of seizure duration was found to be 28.5+0.76 sec in case of Group T, 40.5 + 0.96 sec in Group P and 38.5+0.76 sec in case of Group E.



6) Recovery

The recovery of cognition, orientation, & neuromuscular coordination was significantly fast in Group E and Group P compared to group T.

DISCUSSION:

In our study, faster and more smooth induction was seen with Etomidate and Propofol than with Thiopentone. This observation was in consensus with observations in a similar study done by Paqueta et al and in a study by Carlos et al.

In a study led by led by Ancelotti, 2017, comparative outcomes were found for the induction time for Propofol 41.6sec & Thiopentone 48.2sec, proposing rapid and smoother induction with more stable haemodynamics with Propofol than Thiopentone.

The cardiovascular unsettling influences during ECT are the consequence of activation of the autonomic sensory system & surge in catecholamines.

Extreme variations in BP and/or Heart Rate are unsafe in patients with cardiac illness. Ventricular arhythmias & myocardial ischaemia are the most common reasons for mortality following ETC.

In our study, Heart Rate changes were lower in Etomidate (change of 8-10 beats/min from baseline) Propofol (change of 15-20 beats /min from baseline) as compared to Thiopentone group where increase was 40 to 45 beats/min above baseline value. This was followed by a decline in heart rate throughout the following fifteen mins. Critical variation in Heart Rate after ECT with Thiopentone Sodium contrasted with Propofol was observed in a similar study by Dacosta and Kroos et al., 1988.[4,5]

Blood pressure variation following ECT was relatively less with Propofol than with Thiopentone. In Propofol, change in the mean SBP was 25–30 mmHg over the baseline in first 5 min & came to down to baseline after 30 min. With Thiopentone, the increase in the mean SBP an incentive in the initial 5min was 45–50 mm Hg.

Minimal increase in DBP was seen in Propofol with the mean change being 9–13mm Hg as compared to thiopentone with mean increase in DBP 24–26 mmHg.

No arrythmias were observed during ECT in our study.
In our study, we found that the seizure length was more limited in Propofol (27.6±3.2 sec) in contrast with Thiopentone (40.2±4.8 sec).

Comparable outcomes were found by E. Fernandez and G. montinel et al & by N.Williams and L.Yamal et al.[1,4,5]

In our study,we found recovery time was more in thiopentone sodium (10.43 min) in contrast with Propofol (7.4 min) ($p<0.001$) Comparative outcomes were found by M. Klose et al in 1992.

CONCLUSION:

In our study we concluded that Propofol was better than Etomidate and Thiopentone Sodium for anaesthesia during ECT due to quicker and smother induction, more haemodynamic stability, acceptable seizure duration and faster recovery. This haemodynamic advantage of Etomidate was achieved at the cost of seizure duration rendering the Therapeutic effect of ECT less beneficial.[4,5] Thiopentone on the other hand provided shorter seizure duration rendering it less effective therapeutically and with more haemodynamic fluctuations.

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