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Comparison of Thiopentone Sodium Versus Propofol As Induction Anaesthetic Agent for Electroconvulsive Therapy

KEYWORDS: Thiopentone Sodium, Propofol, Electroconvulsive Therapy

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ABSTRACT ***Background and goals of study:*** *An ideal Anaesthetic agent for ECT should provide a smooth rapid induction, a rapid recovery and attenuation of the physiological effects of seizure activity. The aim of the study is to compare the anaesthetic agents, propofol and thiopentone sodium with regard to hemodynamic changes, seizure duration and recovery from anesthesia in patients undergoing modified electroconvulsive therapy (MECT) for treatment of depression or mania.*

Methods: *Sixty patients (19-64 yrs) of ASA grade I and II patients diagnosed to have moderate to severe depression or mania in accordance with the international classification of disease 10th revision (ICD-10) who was prescribed ECT by the treating Psychiatrist were included in the study. The sixty patients in this study were randomly allocated into two groups, one of which received thiopentone sodium and the other propofol as the anesthetic agent for ECT. The hemodynamic parameters, duration of motor seizure, recovery profile and any complications were noted and compared.*

Results: *The results of this study indicate that propofol is a safe induction agent for modified ECT with significant advantages over thiopentone with regard to haemodynamic changes, speed of induction and recovery from anaesthesia with little untoward complications associated with its use. While overall outcome was similar in patients treated with propofol and thiopentone, use of the former was associated with longer courses of treatment, shorter seizures and greater stimulus dosing used to ensure adequate seizures.*

Conclusion: *Propofol appears to be a safe anaesthetic for ECT with minimal side effects.*

INTRODUCTION:

Electro convulsive therapy is a frequently used and life saving therapy for patients with major affective disorders in the field of Psychiatry[1]. Ever since "Modified electroconvulsive therapy" is introduced in 1963, by the use of intravenous anaesthetic agents, neuromuscular blockade and assisted or controlled ventilation with oxygen, the anaesthesiologist has a significant role to play in this modality of treatment in psychiatry[2].

As the treatment process of 'Modified electroconvulsive therapy' is associated with significant haemodynamic disturbances, the anaesthesiologist should reacquaint with relevant aspects of electro convulsive therapy, understand the effects of anaesthetic agents on the effectiveness of electroconvulsive therapy with an aim to acquire technical skill in this segment of anaesthetic practice.

An ideal Anaesthetic agent for ECT should provide a smooth rapid induction, a rapid recovery and attenuation of the physiological effects of seizure activity[3-7].

The aim of the study is to compare the anaesthetic agents, propofol and thiopentone sodium with regard to haemodynamic changes, seizure duration and recovery from anesthesia in patients undergoing modified electroconvulsive therapy (MECT) for treatment of depression or mania.

METHODOLOGY:

Sixty patients (19-64 yrs) of ASA grade I and II patients diagnosed to have moderate to severe depression or mania in accordance with the international classification of disease 10th revision (ICD-10) who was prescribed ECT by the treating Psychiatrist were included in the study. Patients with uncontrolled hypertension, valvular heart diseases, thyroid dysfunction, allergy to sulfa drugs or egg protein and those with history of porphyria or bronchial asthma, were excluded from the study.

The sixty patients in this study were randomly allocated into two groups, one of which received thiopentone sodium and the other propofol as the anesthetic agent for ECT. Randomisation was done using a stratified design. Patients were stratified according to whether they were diagnosed to have depression or mania. Randomisation was done by the Psychiatric PG who subsequently did not have anything to do with treatment allocation or outcome assessment. In all patients a detailed history, physical examination and relevant investigations were done and medication noted. Patients who were on benzodiazepines had the drug discontinued 12 hours prior to ECT. All patients were fasted overnight and received. I.M. atropine sulfate 0.6 mg 30 minutes prior to treatment.

Pre oxygenation was done. Pulse rate and oxygen saturation was monitored continuously using a pulse oximeter. Preoperative B.P, HR and SPO2 were monitored and recorded. After preoxygenation anesthesia was induced with either of the two drugs.

Group A - Received propofol 1.5 mg / kg body weight with 1 ml of 2% Lignocaine hydrochloride as the anesthetic agent. Propofol was used for each subsequent ECT in these patients

Group – B : Patients received Inj. Thiopentone sodium 2mg/kg body weight and continued to receive thiopentone sodium for each subsequent ECT.

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The induction dose was considered adequate if the eye-lash reflex was lost after 30 seconds, otherwise additional agents were injected (with increments of 0.2 mg / kg body weight of propofol or 0.5 mg / kg body weight of thiopentone sodium)

A blood pressure cuff was applied to the right upper arm and inflated to 40 mm of Hg above systolic B.P prior to the injection of succinylcholine to isolate the limb for monitoring motor seizure. In both the groups muscle relaxation was achieved with intravenous administration of 0.5 mg/kg body weight of succinycholine.

Heart rate was monitored by manually palpating the radial artery pulsation and blood pressure was measured using blood pressure monitor at regular time intervals as indicated. A screen was put to separate the anaesthetist giving the drug and the anaesthetist who is performing the procedure and taking the reading. Patients were ventilated normally at the rate of 8-10 breaths / min with 100% O2. Once the fasciculation due to suxamethonium subsided a soft mouth prop was inserted, bitemporal electrodes were placed for ECT and bilateral ECT was administered using brief pulse bidirectional constant current stimuli above seizure threshold (sine wave type) was used to administer electric shock.

The duration of motor seizure was recorded as well as stimulus intensity and the number of re-stimulation required to achieve a motor seizure of atleast 15 seconds. Any patient who did not develop a bilateral tonic clonic motor seizure of atleast 15 seconds were restimulated with higher stimulus doses by increasing the duration of pulses until on adequate seizure was achieved and maximum of 3 restimulation were permitted at each session. Oxygenation was performed between re-stimulations. Once the motor seizure subsided patient's ventilation was assisted with a facemask with 100% oxygen until the patient resumed spontaneous respiration.

Any side effects like pain on injection, abnormal movement, prolonged seizure defined as seizure duration > 120 sec, vomiting, bronchospasm or laryngospasm was noted. During recovery, after 20 minutes the patient was asked some simple questions which they were able to understand and comprehend to assess the patients orientation and ability to talk. Also the patient's ability to walk to 10 meters unaided was assessed after 20 minutes and graded by the recovery room nurse who remained blinded to the anesthetic agent given. The presence of prolonged postictal restlessness or confusion was also noted.

RESULTS:

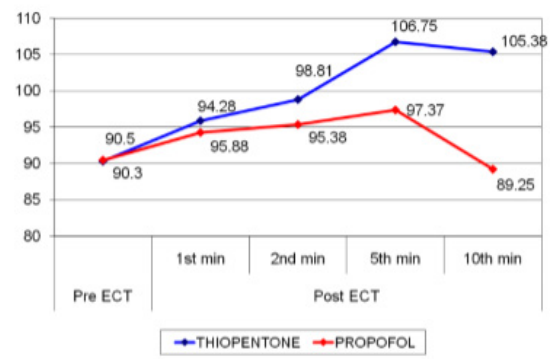
Total 24(40%) patient were diagnosed to be depressives and 36 (60%) were maniacs. Patients in the two group did not differ with respect to proportions of patients who were previous drug non-responders (Propofol 8/30, Thiopentone – 10/30). Equal number of patients in each group were on concurrent medication, antidepressants or antipsychotics or both. The group did not significantly differ in proportion of patients with pre ECT physical risk factors such as hypertension (Propofol 4/30, Thiopentone 3/30)

Mean dose of Propofol given was 76.20 mg (SD ± 14.76 mg) Range (60-100 mg). The mean dose of thiopentone given was 120 mg (SD ± 28.30 range 100-200mg). The mean dose of succinylcholine given was 32.3 mg (SD ± 6.57 mg) (range 20-50mg).

There was an increase in heart rate from second minute on wards in the both groups. There was a maximum increase in heart rate by the 5th minute in both groups, with the thiopentone group registering a higher heart rate than the propofol group. The maximum difference in heart rate between the two groups were observed the 10th minute. The mean heart rate in the propofol treated patients almost touched the pretreatment values, while the mean heart rate with the thiopentone group was still elevated.

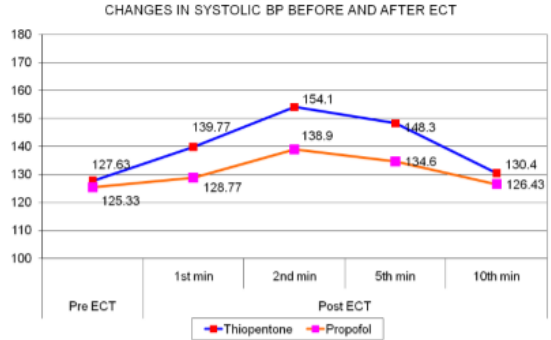
The difference in mean heart rate between the pre ECT and Peak heart rate following ECT was 16.08 beats / min for thiopentone whereas it is 6.87 beats / min for propofol.

CHART -1
CHANGES IN HEART RATE BEFORE AND AFTER ECT



There was an increase in systolic BP following the administration of ECT in both groups, but the increase in systolic blood pressure is much higher with the thiopentone group compared to the propofol group. There was maximum increase in BP at 2nd min in both the thiopentone and propofol group which is more with thiopentone compared to propofol and it is statistically significant. There was a gradual increase in BP from the 2nd minute to 5th minute with a statistically significant increase in BP in the thiopentone group compared to the propofol group. The systolic BP touched the baseline pressure at around the 10th min in both groups.

CHART - 2
CHANGES IN SYSTOLIC BP BEFORE AND AFTER ECT



There was an increase in diastolic BP following the administration of ECT in both the groups with the increase in diastolic BP higher with the thiopentone group compared to the propofol group. Diastolic BP touched the maximum level around 1-2 minutes.There was statistically significant increase in diastolic BP in the thiopentone group compared to the propofol group. The diastolic BP started to decrease and reached the base line value by 8-10 minutes.

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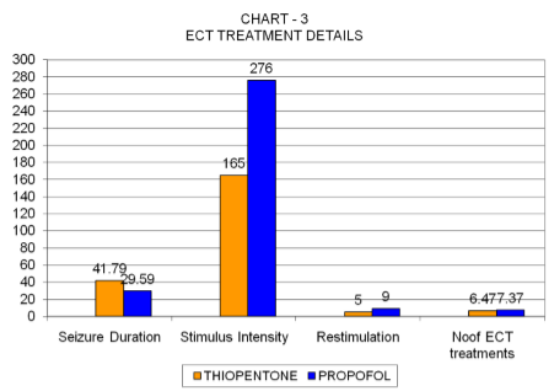
The mean seizure duration was more with thiopentone group compared to propofol group and it was statistically significant. Though propofol resulted in lesser mean seizure duration compared to the thiopentone group. Number of patients who required restimulation were more with the propofol group compared with the thiopentone group. 9/30 in propofol group and 5/30 in thiopentone group, but it was not found to be statistically significant. The total number of ECT treatments required to produce the desired effect is more with propofol group compared with the thiopentone group, but it was not statistically significant. Thus, propofol use resulted in higher stimulus intensities being used to elicit adequate seizure, shorter seizure duration and greater number of treatments and more number of restimulations were required compared to the thiopentone group.

The propofol group had early recovery and was able to talk and walk better at 20 minutes compared to the thiopentone group patients. In the propofol group 6/30 patient had the impaired ability to talk after 20 minutes compared to 16/30 patients in thiopentone group. The ability to walk unaided at 20 minutes was impaired is 4/30 in propofol group compared to 13/30 in thiopentone group.

Post ECT complications were more in thiopentone group compared to propofol group.



DISCUSSION:

The study compares Propofol with Thiopentone on haemodynamic parameters, seizure duration, recovery, complication and outcome in a mixed group of 60 depressed and maniac patients using a prospective study. Both the groups were matched by demographic and clinical variables. Out of these 24 patients (40%) were diagnosed to be depressive and 36 patients (60%) were maniac patients.

Electroconvulsive therapy and the resultant seizures evokes an autonomic reaction generating a parasympathetic and then sympathetic activation sequence. The phase of sympathetic activation and a 15 fold increase in circulating catecholamines result in severe tachycardia. Accordingly the maximum pulse rate registered in our study in a single patient was 159/minute from his basal pulse rate of 72 beats / minute. There was an increase in mean heart rate from the second minute onwards for both thiopentone and propofol group with a maximum heart rate around the 5th minute. Though initial tachycardia is due to the direct adrenergic outflow through sympathetic ganglia, the sustained response is due to the further release of epinephrine from adrenal medulla. The difference in mean heart rate between pre ECT heart rate and peak heart rate was 16.08 beats / min for thiopentone group, whereas it is 6.87 beats/min for propofol. These findings correlate well with the previous studies who reported a very significant attenuation in propofol group[3]. In our series, in the 2% of patients who were hypertensive, there was a very significant attenuation of pulse rate. This has a very significant protective effect on the cardiovascular system as a whole.

Both systolic and diastolic blood pressure is observed to increase from 1-2 minutes post ECT. At 2 minutes post ECT the increase in systolic blood pressure was 40% in the thiopentone group compared to 9% in the propofol group. In the 2nd, 5th & 10th min readings there was increase of BP more in the thiopentone group compared to the propofol group. All these findings correlate well with the previous studies which showed a statistically significant difference in Blood pressure rise in thiopentone group compared to the Propofol group. In 2% of patients who were hypertensives, systolic blood pressure reached basal levels at 2 minutes post ECT in the propofol group whereas they registered a 26% rise in the thiopentone group.

There was statistically significant difference in mean seizure duration with the thiopentone group compared to the propofol group. It is observed that propofol group needed more Stimulus Intensity compared to the thiopentone group which was statistically significant. Though the total number of ECT treatments required to produce the desired effect is more with the propofol group compared with the thiopentone group, it was not statistically significant. The propofol group had early recovery and was able to talk and walk better at 20 minutes compared to the thiopentone group.

Post ECT complications were more with the thiopentone group compared to the propofol group.

CONCLUSION:

Propofol appears to be a safe anaesthetic for ECT with minimal side effects.

Routine use of propofol for ECT would not be cost effective or clinically warranted, but propofol may be the drug of choice for induction for patients in whom sudden haemodynamic changes following ECT are detrimental.

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