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Original Research Article

Thiopentone versus propofol-anaesthetic of choice in patients undergoing modified electroconvulsive therapy

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ABSTRACT

Background: The use of electroconvulsive therapy (ECT) as a treatment modality has increased over the recent years. This is largely due to the use of general anaesthetics, which reduces the physical and psychological trauma associated with the procedure. We attempted to compare the hemodynamic variations and recovery characteristics, along with their effect on seizure quality in patients induced with Thiopentone /Propofol, for Modified ECT.
Methods: This was a prospective, randomised controlled study, involving 80 patients. Patients in group 1 received Thiopentone 5 mg/kg, while patients in group 2 received Propofol 1 mg/kg. The hemodynamic status and recovery status were monitored in both the groups for the first thirty minutes. Seizural duration were also recorded. Data was analysed using Students t-test and Pearson Chi-square test.
Results: The induction time as well as recovery time was found to be significantly lesser ($p < 0.05$) in the propofol group. The hemodynamic response to was blunted and returned to baseline levels within 10-15 minutes after ECT in the propofol group, whereas it persisted even after 30 minutes in the thiopentone group. There was however, no significant difference in the duration of the seizural activity($p > 0.05$).
Conclusions: The quick and smooth induction, transient changes in hemodynamics, rapid recovery profile and minimal effects on the seizure quality altogether makes Propofol the preferred anaesthetic agent in Modified ECT.

Keywords: Anaesthetics, Electroconvulsive therapy, Intravenous, Propofol, Prospective studies, Thiopentone

INTRODUCTION

Electroconvulsive therapy (ECT) is considered as a first line treatment, as recommended by the American Psychiatric Association (APA), for patients with severe depression, acute mania, mood disorders with psychotic features and catatonia.[1]

Direct ECT was first introduced introduced by Cerletti and Bini.[2] In earlier days, for direct ECT electric shock was given directly without anaesthesia in conscious patients.

Thus, the complications like bone fracture, joint dislocation, biting of tongue and tearing off muscle fibres were frequent.[3] The introduction of ultra-short acting intravenous anaesthetic drugs and muscle relaxant particularly succinyl choline in clinical practice gave way for modified ECT with lesser complications.

Still, the duration of anaesthesia, hemodynamic changes, induction/ recovery time and characteristics, interaction with antipsychotic drugs, effect on seizure duration and post ECT confusion remains matter of concern during anaesthetic management of ECT.[4]

Present study aims to compare the effectiveness of thiopentone and propofol as an intravenous agent for modified ECT in view of hemodynamic parameters, seizure quality and recovery characteristics.

METHODS

After obtaining approval from the Institutional Ethics Committee and consent from patients and their relatives, 80 patients of ASA-PS I and II of either srx, aged 18 to 55 years, scheduled for modified electroconvulsive therapy were studied prospectively. Patients with history of uncontrolled hypertension, diabetes mellitus, thyroid dysfunction, valvular heart disease or bronchial asthma were excluded from the study.

Patients with known drug or food allergy were also excluded. All the patients were randomly allocated by computerised randomisation into two groups of 40 each. Group 1 received 2.5% thiopentone 4mg/kg while group 2 received 1% propofol 1 mg/kg. All the patients were kept nil orally for six hours before the procedure and allowed to continue respective antipsychotic treatment till the day of the procedure.

The baseline heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP) and oxygen saturation (SpO_2) were taken and recorded prior to induction. Intravenous access was secured using 18G canula. All the patients were premedicated with I/V Glycopyrolate 0.2 mg and pre-oxygenated for three minutes. General anaesthesia was induced till loss of eyelash reflex with intravenous anaesthetic drug as per the alloted group.

Relaxation was obtained using I/V Succinyl choline 0.5 mg/kg. Patients were ventilated with 100% oxygen via face mask, using Bain's circuit as soon as the fasciculations subsided. Guedel's airway was inserted to maintain the airway as well as to protect the tongue. Subsequently, the patients were shocked giving an electric stimulus of 180-540 mC.

Seizural activity was monitored using the isolated limb technique. A pneumatic tourniquet was applied to the patient's left arm and inflated to (systolic blood pressure+100) mmHg, just prior to administration of succinyl choline. The tourniquet was deflated only after the seizures disappeared completely. After the procedure, patients were again ventilated with 100 % oxygen. Upon resumption of spontaneous respiration, they were shifted to the recovery room in the left lateral position.

The heart rate (HR), SBP, DBP, MAP and SpO2 were recorded every five minutes till the procedure was over. The mean values for HR, SBP, DBP, MAP and SpO_2 at baseline (pre induction) and at the fifth, fifteenth and thirtieth minute (post induction) were calculated and analysed in the two groups.

The induction time (from time of injection of intravenous anaesthetic drug to loss of eyelash reflex), seizure duration (from onset of seizures to total disappearance of the seizure in the isolated limb) and recovery time (from time of injection of induction agent to the time taken to obey verbal commands and sit up unaided).

The patients were considered fit for transition to the ward when the Aldrete score was above 10.

RESULTS

The demographic characteristics as shown in Table 1 were comparable in both the groups. As shown in Table 2, the baseline parameters were comparable in both groups ($p > 0.05$).

Table 1: Demographic characteristics of all the patients in group 1 and 2.

Parameters	Group 1	Group 2
Number of patients	40	40
Mean Age (in yrs)	35.8±10.3	35.9±9.1
Sex (males/females)	22/18	20/20
Mean weight (in kg)	56.2±5.4	54.6±6.2

Table 2: Comparison of the baseline (preinduction) parameters in the two groups.

Baseline parameters	Group	Mean value	Standard deviation	p - value
Heart rate (HR)	1	78.45	7.65	0.31
	2	80.35	8.97	
Systolic BP (SBP)	1	118.75	9.66	0.39
	2	121.0	13.36	
Diastolic BP (DBP)	1	77.5	5.90	0.18
	2	79.6	7.7	
Mean arterial pressure (MAP)	1	90.13	5.66	0.06
	2	93.15	8.37	
Oxygen saturation (SpO_2)	1	98.45	0.64	0.26
	2	98.60	0.55	

Table 3: Comparison between Induction time, seizure duration and recovery time in the two groups.

Parameter (in seconds)	Group	Number of patients	Mean value (in seconds)	Standard deviation	p - value
Duration of induction	1	40	41.5	9.39	0.00
	2	40	31.05	5.40	
Duration of seizures	1	40	29.28	10.59	0.55
	2	40	27.23	9.47	
Time required for recovery	1	40	431.00	93.61	0.00
	2	40	311.00	77.32	

Table 3 compares the time required for induction of the patients, duration of the induced seizures and time required for the complete recovery in the two groups. The induction was smoother and faster in group 2 (p=0.000, highly significant). These patients also recovered faster and could be shifted to the ward earlier (p=0.000, highly significant).The incidence of side - effects like nausea, vomiting, coughing, delirium or pain on injection was nil in both groups. There was no significant difference in the duration of the seizures (p=0.55).

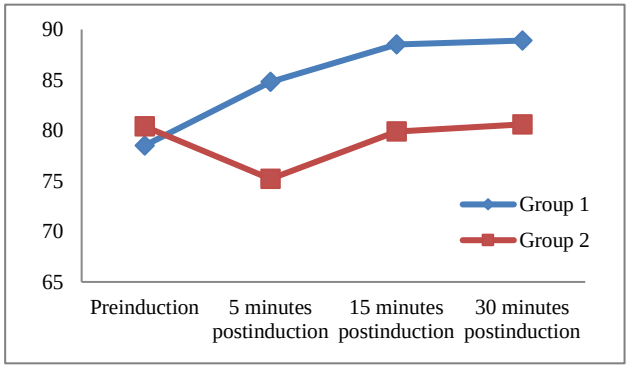

Figure 1: Trends in heart rate (HR) in the two groups

Significant changes were noted in both groups at all time points. Patients in group 1 showed increase in the heart rate, which persisted even after 30 minutes post - induction.The heart rate of patients in group 2 showed a significant dip following induction, which returned to baseline values as early as 15 minutes post - induction.

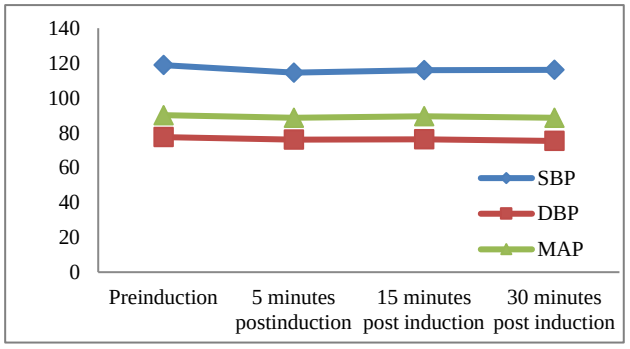

Figure 2: Trend of systolic BP, diastolic BP and mean arterial pressure (MAP) in group 1.

The baseline systolic BP, diastolic BP and mean arterial pressure were comparable in the two groups (p= 0.391, 0.184 and 0.062 respectively).

As shown in Figure 2, all three parameters (SBP, DBP and MAP) were unchanged throughout the entire observed period. However, in group 2, there was a temporary dip in the SBP, which returned to baseline values by 15 minutes. The DBP and MAP were unchanged.

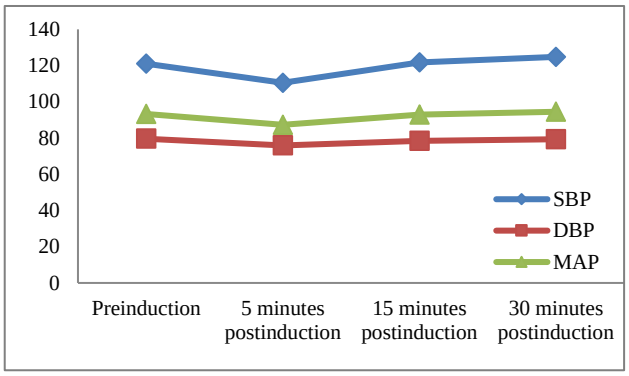

Figure 3: Trend of systolic BP, diastolic BP and mean arterial pressure (MAP) in group 2.

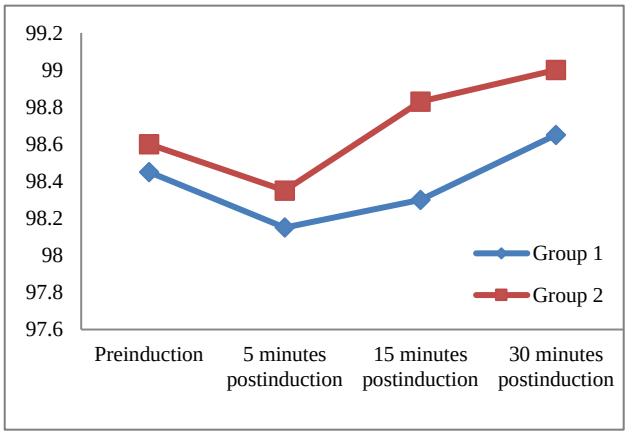

Figure 4: Oxygen saturation trends in the two groups.

Both groups showed minimal dip in the oxygen saturation status in the immediate 5 minutes following induction, which returned to baseline by 15 minutes.

DISCUSSION

Electroconvulsive therapy employs the electrically induced generalised seizures to ameliorate the symptoms of psychiatric disorders like severe depression, mania and schizophrenia. It is also used as a secondary treatment when the patient shows insufficient response to pharmacotherapy.[5] Although the use of anaesthetic drugs reduces the physical and psychological trauma, it may cause adverse effects like nausea, vomiting, dizziness, headache and drowsiness often lasting for several hours after the procedure. Barbiturate anaesthesia may increase the ECT induced amnestic deficits for nonverbal material. Anaesthesia has also been associated with falls and the risk of fractures, no doubt because of dizziness, sedation and psychomotor impairment.[6,7] All these accentuate the ñeed for an ideal anaesthetic agent for induction which provides rapid onset, short duration of action, attenuates adverse physiological effects of ECT, and rapid recovery without adverse shortening of seizure duration.[4] The studies in search of an ideal agent are ongoing.

In our study, faster induction was noted with propofol (mean=31.05 sec), when compared with thiopentone (mean=41.5 sec). This correlated with previous studies.[4,8,9] A study by Shah et al shows a high incidence of gag reflex, coughing and vomiting in those induced with thiopentone[4] No such effect was seen in our study. Propofol injection caused pain on injection in 20% and thrombophlebitis in 3.3% of the patients.[4] However the incidence of such side effects was nil in our study. This was attributed to the administration of propofol through a large bore (18 guage), free flowing intravenous canula.

Various studies have demonstrated poorer quality of seizures and subsequently, shorter duration of seizures with propofol, when compared to thiopentone.[4,10] In contrast to this, our study showed no significant difference between the seizure duration in the two groups ($p = 0.55$). The mean seizural duration was 27.2 sec in the propofol group, versus 29.28 sec in the thiopentone group. This could be due to the lower propofol dosages (1mg/kg) used in our study, rather than the higher dosages (2 mg/kg) used in a previous study.[4]

Studies by Shah et al and Bolaji et al both showed significant rise in the heart rate, SBP and DBP in the thiopentone group, compared to the propofol group.[4,11] Significant increase in the heart rate which persisted above 30 minutes was noted in the patients induced with thiopentone. There were, however, no significant changes in the systolic as well as diastolic blood pressure. The patients in the propofol group had transient fall in the heart rate as well as systolic blood pressure, which returned to baseline as early as 10-15 minutes' post ictal. This can be attributed to the blunting of the sympathetic response to ECT by propofol. The transient hypotension which may occur with propofol injection can be minimised by adequately hydrating the patients prior to the procedure. The persistent tachycardia associated with thiopentone may be deleterious in patients with poor cardiac reserve.

The recovery times were significantly lower in the patients induced with propofol ($p = 0.00$). The average time taken for the patients to obey verbal commands, sit up unaided and meet the discharge criteria was 311 seconds in the propofol group, versus 431 seconds in the thiopentone group. Those patients who received propofol had a subsequently, shorter stay in the recovery bay and could be shifted to the ward earlier. This correlated with the findings of the previous studies.[4]

Fast and smooth induction with a good recovery profile makes propofol the preferred anaesthetic agent for anaesthesia - requiring procedures performed in remote locations. A dosage of 1 mg/kg produces minimal hemodynamic changes and has no effect on the seizural activity. Thus, propofol can be considered as a better alternative to thiopentone sodium, for inducing patients posted for modified electroconvulsive therapy.

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