IDEAL INTRAVENOUS ANAESTHETIC AGENT FOR MODIFIED ECT - THIOPENTONE OR PROPOFOL- A COMPARATIVE STUDY

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ABSTRACT

BACKGROUND

Modified electroconvulsive therapy (ECT) is a safe and effective treatment modality for major depressive disorders with suicidal tendencies. For this, one must have an ideal intravenous anaesthetic agent for induction which provides rapid onset, short duration of action, attenuates adverse physiological effect of ECT, rapid recovery. The studies in search of an ideal intravenous anaesthetic agent are limited.

Aim of this study is to compare the effect of IV thiopentone and propofol on induction time and quality, haemodynamics, seizure duration, recovery time.

MATERIALS AND METHODS

A study was conducted on 60 patients of ASA I and II of either sex having major depressive illness who were randomly allocated into two groups (n=30) based on IV induction agent used. Group I and Group II patients were induced with IV thiopentone 5 mg/kg and propofol 2 mg/kg respectively. The induction time, quality of induction, haemodynamic changes, seizure duration, recovery time were measured and analysed by Z test.

RESULTS

Induction was quicker in propofol group i.e., 41.03±6.11 seconds than in thiopentone (50.6±6.32 sec).[1,2] Seizure duration was not much significant compared to propofol and thiopentone groups. Though significant rise in HR, SBP, DBP was observed in both the groups following ECT, rise was significantly higher in thiopentone group compared to propofol group. Significantly, faster recovery was observed with propofol.

CONCLUSION

Propofol is a safe and suitable intravenous anaesthetic agent for induction of anaesthesia for modified ECT.

KEYWORDS

Modified Electroconvulsive Therapy, Propofol, Thiopentone.

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BACKGROUND

The use of electroconvulsive therapy (ECT) to provoke a generalised epileptic seizure was first described in 1938 and was performed without anaesthesia for almost 30 years.[3] A delicate balance needs to be maintained to achieve an adequate anaesthetic state along with an optimal duration of EEG seizure activity. Since then, it has continued to occupy a central place amongst treatment modalities for a large variety of psychiatric illnesses like severe acute depression with suicidal tendency, acute mania, schizophrenia, catatonic psychosis and delirium where pharmacotherapy failed.[4] The essential elements of anaesthesia for ECT include rapid loss of consciousness, effective attenuation of the haemodynamic response to the electrical stimulus, avoidance of gross movements, minimal interference with seizure activity, and prompt recovery of spontaneous ventilation, and consciousness. Use of general anaesthetic techniques with a rapid onset and recovery is essential to facilitate fast tracking. The purpose of this study was to compare the effectiveness of thiopentone and propofol as an intravenous agent for modified ECT in view of haemodynamic parameters, induction time and quality, seizure duration and recovery characteristic in a prospective, randomised, double-blind trial.

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MATERIALS AND METHODS

After approval from institutional ethical committee and consent from patient and relatives; 60 patients of ASA I and II of either sex, aged 18-60 years scheduled for MECT were studied prospectively over one-year period. Patients with a history of full stomach, major illnesses like TB, bronchial asthma, drug allergy, neuromuscular disorders, acute respiratory disorder, hypertension, epilepsy, cardiovascular disease were excluded from our study. All the patients were randomly allocated by computerised randomisation table into two groups of 30 each according to intravenous anaesthetic drugs administered for induction of anaesthesia in this double-blind trial. Group I and Group II received Thiopentone (2.5%) - 5 mg/kg, Propofol (1%) - 2 mg/kg, respectively.

All the patients were kept nil orally for six hours before procedure and allowed to continue respective antipsychotic treatment till the day of procedure.

Intravenous line was secured. Multipara (Philips MP30) was attached for monitoring heart rate, NIBP, RR, SpO_2 and the psychiatrist was allowed to place bitemporal ECT electrodes on forehead.

All the patients were premedicated with IV glycopyrrolate 0.2 mg and preoxygenated for three minutes. General anaesthesia was induced with intravenous anaesthetic agent as per the group allocated till loss of eyelid reflex. Then, intravenous succinylcholine 0.5 mg/kg was administered to all the patients for neuromuscular relaxation. When fasciculations subsided and adequate neuromuscular relaxation obtained, adequate size Guedel's airway was inserted to prevent tongue bite, and brief pulse stimulus (90-120 volts MECT) for about 2 msec was given to produce seizure. Subsequently, all the patients were ventilated with 100% oxygen at the rate of 12 breaths per minute until spontaneous breathing returned, and patients fully recovered clinically. All the patients were monitored for changes in haemodynamics HR, SBP, DBP, arterial oxygen saturation, ECG changes and respiratory rate throughout the procedure. Besides induction time (i.e., from time of injecting intravenous anaesthetic agent to loss of eyelash reflex) and quality of induction; seizure duration, side effects, recorded in both the groups. Duration of recovery (Cognitive, orientation and neuromuscular co-ordination) was recorded from injection of intravenous anaesthetic agent to time taken to obey verbal commands, opening of eye, ability to sit unaided and meet discharge criteria [Table 1].

The collected data was entered in the master chart. The results were analysed statistically by percentage, mean, standard deviation and Z tests.

RESULTS

The demographic characteristics as shown in Table 2 were comparable in both groups. Maximum number of patients were schizophrenic males in both groups.

Mean duration of induction was shortest with Group II as compared to Group I (P<0.001, highly significant) as shown in Table 2. Induction of anaesthesia was smooth with propofol compared to thiopentone.

Category	Description of Status	PADSS
Vital signs	Within 20% range of pre-op value	2
	Within 20% to 40% range of pre-op value	1
	>40% range of pre-op value	0
Respiratory status	O_2 saturation >94% on room air	2
	O_2 saturation >94% on nasal prongs @ 4 LPM or less	1
	O_2 saturation >94% on FM @ 10 LPM or less	0
Nausea and vomiting	Minimal, treated with oral medications	2
	Moderate, treated with parenteral Medications	1
	Continues after repeated treatments	0
Pain	Acceptable to patient (with oral medications)	2
	Pain somewhat acceptable to patient	1
	Pain not acceptable to patient	0

Table 1. Post-anaesthetic Discharge Scoring System

*A minimum score of 7/8 (and/or return to same preoperative status) is achieved prior to transferring the patient to a Phase III recovery area or home (Earlier minimum score of 9/10 was there in Post-anaesthetic discharge scoring system (PADSS) but in the present study, category of surgical bleeding has been omitted as there was no need of this category).

Parameters	Group I	Group II
Age (yrs.)	30.4±10.55	27.33±8.06
Sex (M/F)	24/6	27/3
Weight (kg)	51.8±5.93	53±5.92
Duration of induction(sec.)	50.6±6.82	41.03±6.11
Seizure duration (sec.)	36.26±4.83	26.36±2.79

Table 2

After application of ECT, significant rise in HR, SBP, DBP was observed up to 3 minutes in both the groups, but these were highly significant in thiopentone group [Tables 3 and 4].

The decrease in duration of seizure was highly significant in propofol compared to thiopentone (P < 0.001) [Table 2].

Time interval	Group I	Group II
Basal	82.3±4.25	84.53±4.27
After induction	85.07±5.44	84.70
After ECT 1	120.23±9.88	109.36±7.83
2	124.76±8.26	107.2±6.99
3	119.3±7.45	103.1±7.1
5	99.33±6.77	90.23±6.69
10	88.36±6.21	88.99±5.43
20	87.66±6.66	85.4±6.69
30	87±6.63	84.57±6.23

Table 3. Mean Heart Rate at Various Time Interval

Systolic BP		
	I	II
Basal	124.3±6.83	123.9±7.33
After induction	121.03±8.42	120.9±7.13
1	158.23±11.81	134.22±9.28
2	146.24±11.61	130.66±8.36
3	138.2±11.66	124.33±8.11
5	128.21±8.30	122.67±6.67
10	126.67±8.28	122.36±7.68
20	122.22±7.88	121.22±6.98
30	121.22±7.82	121±6.25
Diastolic BP		
	I	II
Basal	76.7±4.43	78.5±4.63
After induction	79.23±6.21	81.2±5.53
1	99.23±10.26	90.66±7.53
2	93.36±7.82	85.66±7.76
3	87.23±7.36	81.12±4.95
5	83.2±5.67	78.7±4.62
10	79.2± 4.36	78.23±4.12
20	77.86±4.12	76.1±4.26
30	77.36±3.96	75.23±3.89

Table 4

DISCUSSION

In recent years, ECT has assumed an increasingly important role in the treatment of severe and medication-resistant depression and mania as well as in the treatment of schizophrenic patients with affective disorders, suicidal drive, delusional symptoms, vegetative dysregulation, inanition, and catatonic symptoms.[5]

In the present study, the dose used for induction was calculated according to the body weight which was adequate to reach the induction criteria i.e. loss of eyelid reflex and could not interfere with the ECT induced seizure.

In the present study, induction was rapid with propofol as compared to thiopentone, which was statistically significant ($P < 0.05$).[1,2]

Induction was smooth with propofol in comparison to thiopentone. Mean seizure duration was significantly short in propofol compared to thiopentone group. Though significant shortening of seizure duration was observed with propofol which was above 25 seconds, it does not affect modified ECT efficacy or therapeutic outcome. Duration of seizure activity lasting for >25 sec. in single session or a maximum of 210 sec. of cumulative duration leads to good therapeutic outcome.[6] Elevation of seizure threshold after Propofol administration may explain the lower duration of seizure.

Increase in heart rate, SBP and DBP after ECT was observed in both groups, but it was statistically highly significant in thiopentone group. Propofol blunts the sympathetic response, so there was less increase in HR, SBP and DBP. The significant rise in HR after ECT with thiopentone as compared to propofol was also noted by Boey WK et al,[7] Arya A et al[8] and Singhal SK et al.[9] In this study, propofol seems superior to thiopentone in attenuating the physiological response to ECT with minimal haemodynamic changes. Arrhythmias occurred only in 6.67% patients in thiopentone group, which were transient and resolved spontaneously.

A significant difference in recovery time was observed among the groups. Propofol group had significantly earliest and smooth recovery ($P < 0.05$), followed by thiopentone with respect to time for the ability to obey verbal command, ability to sit unaided. The mean time taken to meet discharge criteria was also significantly ($P < 0.05$) least in propofol group (11.59 min) similar to other studies. An early recovery helps in early discharge to home.[7,8,10]

CONCLUSION

To conclude, propofol in the dosage of 2 mg/kg body weight intravenously can be safely used for modified ECT in ASA Grade I and II patients. Fast, smooth induction, early smooth recovery, better haemodynamics, make propofol as an agent of choice for day care procedure.

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