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EFFECTIVENESS OF THIOPENTONE,PROPOFOL AND MIDAZOLAM AS AN IDEAL INTRAVENOUS ANAESTHETIC AGENT FOR ELECTRO CONVULSIVE THERAPY: A COMPARATIVE STUDY

Anaesthesiology

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ABSTRACT

An ideal anaesthetic agent for ECT should provide a smooth rapid induction, a rapid recovery and attenuation of the adverse physiological effects of seizure activity. In our study 90 patients were randomly allocated into three groups, group I-inj.Thiopentone 2.5% 5mg/kg, group II-inj.Propofol 1% 2mg/kg and group III-inj.Midazolam 0.2 mg/kg, 30 patients in each group. Patients were induced with above mentioned drugs for general anaesthesia for ECT. Observed parameters to compare the efficacy of the three drugs were : induction time, effect on seizure activity, serum potassium levels, haemodynamics, adverse effects and recovery pattern. Results were analysed using appropriate statistical tests. Propofol was better in many aspects compared to thiopentone and midazolam as per our study results.

KEYWORDS

ECT, propofol, thiopentone, midazolam, effect on seizures, recovery time

INTRODUCTION

Ever since "Modified electroconvulsive therapy" is introduced in 1963, by the use of intravenous anaesthetic agents, neuro muscular blockade and assisted or controlled ventilation with oxygen, the anaesthesiologist has a significant role to play in this modality of treatment in psychiatry.The anaesthetic requirements for ECT are amnesia, airway management, minimal effect on seizure threshold, prevention of bodily injuries, attaining haemodynamic stability, smooth and rapid emergence. Anaesthesiologist must be equipped with an in-depth understanding of the changes affecting cardio vascular system, respiratory system and central nervous system by the treatment process and the pharmacological measures to attenuate them. Selecting the anaesthetics with ideal properties for ECT is quite a challenging task. Here we have compared the efficacy of three induction agents.

AIM OF THE STUDY

To compare the effects of intravenous propofol, thiopentone and midazolam in patients undergoing electroconvulsive therapy.

OBJECTIVES

To compare the effects of propofol,thiopentone and midazolam on

1. induction time and seizure duration
2. adverse effects and serum potassium level
3. recovery pattern during ECT

MATERIALS AND METHODS

Study Design:

Prospective randomized control trial, double blinded technique.

Place And Period:

This study was done at ECT treatment room in the department of Psychiatry,Thanjavur medical college,Thanjavur-from 2018- 2020.

Sample Size: 90 Patients.

Inclusion Criteria:

Age18-60years,both sex, weight 45-80kgs,american society of anaesthesiologists (ASA) GRADE I and II,scheduled for ECT

Exclusion Criteria:

Major illness like tuberculosis, bronchial asthma, drug allergy, neuromuscular disorders, acute respiratory disorder, hypertension, epilepsy and cardiovascular disorder.

In this study,90 patients were randomly allocated by computerised randomization into 3 groups.Group I-Inj.Thiopentone 2.5% 5mg/kg (30patients),group II-Inj.Propofol 1% 2mg/kg (30 patients) and group III-Inj.Midazolam 0.2 mg/kg (30 patients)

Procedure:

After establishing IV line on left forearm,the calculated dose of thiopentone or propofol or midazolam was given over a period of 20 seconds.The induction dose was adequate till the loss of consciousness. Followed by Inj.Suxamethonium 0.5mg/kg was given after the cuffed forearm was isolated.When fasiculation subsided and adequate relaxation obtained, Guedel airway was inserted to prevent tongue bite and brief pulse stimulus(90- 120 volts MECT)for about two msec was given to produce seizure.All patients were ventilated with 100% O2 by bain's circuit till spontaneous breathing returned. Second blood sample was obtained 2 minutes after ETC.

All patients were monitored for changes in hemodynamic stability. HR,SBP,DBP,arterial O2 saturation ,ECG changes and respiratory rate were recorded throughout procedure.

Besides induction time,quality of induction,seizure duration,side effects and complication,changes in serum potassium level,duration of recovery were recorded.

OBSERVATION AND RESULTS

DEMOGRAPHIC PROFILE

AGE DISTRIBUTION

Among the study population, the median age in group I was 32.00 the median age in group II was 30.00 and the median age in group III was 30.00. There was no statistically significant difference in age distribution between the groups. (p value 0.1652).

Gender Distribution

Among the study population in group I, 17 (56.67%) were male and 13 (43.33%) were female. In group II, 18 (60.00%) were male and 12 (40.00%)were female. In group III, 18 (60.00%) were male and 12 (40.00%) were female. There is no statistically significant difference in gender distribution between the groups. (p value 0.9551) .

Weight Distribution

Among the study population, the median weight in group I was 54.00, the median weight in group II was 54.00 and the median weight in group III was 52.00. There was no statistically significant difference in weight between the groups (p value 0.1526).

Induction Time

The mean induction time(in seconds) was 49.47 ± 2.67 in group I, in group II the mean induction time was 40.10 ± 3.03 and in group III the mean induction time was 79.27 ±2.75.

The mean induction time was more with midazolam group when compared to thiopentone and propofol group. There was statistically significant difference in induction time between the study groups ($p<0.001$).

Seizure Duration

The mean seizure duration(in seconds) was 36.67 ± 1.77 in group I, in group II the mean seizure duration was 24.80±1.24 and in group III the mean seizure duration was 19.77±1.96 .

The mean seizure duration was more with thiopentone group when compared to propofol and midazolam group. There was statistically

significant difference in seizure duration between the between the study groups (p value<0.001).

Adverse Effects

Among the study population, 20 patients (66.67%) in group I (tachycardia in 8 patients (26.66%), headache in 4 patients (13.33%), nausea in 6 patients (20.00%), vomiting in 2 patients (6.66%)),7 patients (23.33%) in group II(had tachycardia),16 patients (53.33%) in group III (7 patients (23.33%) had apnea, 7 patients (23.33%) had headache, 2 patients (6.66%) had nausea.) There was statistically significant difference in side effects after anaesthesia between three study groups (p <0.05).

Serum Potassium Level

In pre ECT, group I had mean serum potassium level of 4.21 ± 0.48, group II had mean serum potassium level of 4.33 ± 0.45 and group III had mean serum potassium level of 4.42 ± 0.48. There was no statistically significant difference in Pre ECT serum potassium between the groups (p value 0.2273).

In Post ECT, group I had mean serum potassium level of 4.49 ± 0.49, group II had mean serum potassium level of 4.53 ± 0.45 and group III had mean serum potassium level of 4.63 ± 0.47. There was no statistically significant difference in post ECT serum potassium between the groups (p value 0.5012).

Recovery Pattern

Among the study population, the meantime for the response to obey vocal commands (eye opening) in minutes was 6.64 ± 0.10 in group I, in group II it was 4.56 ± 0.01 and in group III it was 8.23 ± 0.01. There was statistically significant difference in time to obey vocal commands(eye opening) between the three study groups (p value <0.001).

DISCUSSION

In this study we compared the effects thiopentone,propofol and midazolam when used as induction agents.30 patients in each group were allocated randomly.Demographic profiles age ,gender and weight were comparable(p >0.05) between the three groups. The induction time was more with midazolam group followed by thiopentone and propofol group, that is propofol gives quickest induction among the three(p<0.001). The seizure duration was more with thiopentone group compared to propofol group and midazolam group(p<0.001). Though seizure duration was more with thiopentone group(36seconds) when compared with propofol group (24seconds) and midazolam group (19 seconds), it doesnot affect modified ECT efficacy or therapeutic outcome. The side effects during induction was more in thiopentone group(26.67%),and in midazolam group(23.3%) compared to propofol group(20.00%) p value was <0.05. There was increase in serum potassium level in all three groups after ECT which was not statistically significant between the groups.Pre and post ECT p values between the groups were 0.2273 and 0.5012 respectively .This may be due to synchronous contraction of all voluntary muscles of body which are rich in potassium secondary to succinylcholine induced fasciculation which pumps out potassium into general circulation causing greater increase in plasma potassium concentration. Regarding the hemodynamics, there was an increase in mean heart rate from 1st minute onwards in all 3 groups.The mean heart rate in thiopentone group and propofol group almost touched pre-treatment values by 30th min while midazolam group touched by 20th min and this is statistically significant (p<0.001). There was an increase in mean systolic blood pressure(SBP) and mean diastolic blood pressure(DBP) following ECT in all 3 groups from 1st min onwards. There was increase in mean SBP and mean DBP in 2nd ,3rd min in all 3 groups which was more in thiopentone group compared to propofol and midazolam group.The propofol group had the earliest and smooth recovery followed by thiopentone followed by midazolam groups. The mean time taken for ability to obey oral commands , ability to sit up unaided and time taken to meet discharge criteria(PADSS score) were also significant (p<0.001).

CONCLUSION

Among the study groups ,the induction time and seizure duration were shorter in propofol group. Propofol resulted in fewer side effects and early recovery from the effects of anaesthesia than thiopentone and midazolam. Propofol used as an induction agent was associated with lower increase in HR,BP which would be advantage in patients whom tachycardia and hypertension would be detrimental. Propofol in the dosage of 2mg/kg body weight IV can be safely used for ECT in ASA I and ASA II patients when compared to thiopentone 5mg/kg and midazolam 0.2 mg/kg.Fast, smooth induction, early recovery, better hemodynamic parameters, antiemetic property without much changes in serum potassium level makes Propofol as an agent of choice for day care procedure