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Etomidate and Ketofol as induction agents: A comparative study of haemodynamic parameters

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Abstract

Background: For treating a variety of psychiatric disorders, Electroconvulsive therapy is a widely used and safe evidence. Hemodynamic effects, seizure activity, cognitive functions determine the choice of anaesthetic agents.

Aim: The present study evaluates and compares the effects of protocol and Etomidate on recovery pattern, hemodynamic effects and activity of seizures in patients undergoing electroconvulsive therapy.

Materials and Methods: The present study is a single blinded randomised controlled study which was conducted in 100 patients undergoing ECT in the age group of 20 to 65 years of either sex were selected consecutively and randomly divided into two groups namely group A which consisted of 50 patients who received Ketofol (propofol 1mg/kg + ketamine 0.5mg/kg) and group B which consisted of 50 patients who received etomidate (0.2 mg/kg body weight).

Results: Comparison of the mean systolic blood pressure, mean diastolic blood pressure and mean arterial blood pressure in the study group was not statistically significant. Seizure duration in the study group showed statistically significant differences. Induction of high quality and longer seizures observed in etomidate group. Ketofol group had a shorter time to return of spontaneous respiration, time to eye opening on command and time to respond to verbal commands when compared to etomidate group.

Conclusion: Patients who received ketofol had a shorter time to return of spontaneous respiration, time to eye opening on command and time to respond to verbal commands when compared to patients who received etomidate.

Keywords: Electroconvulsive therapy, haemodynamic effects

Introduction

In treating variety of psychiatric disorders, electroconvulsive therapy (ECT) is widely used and safe evidence [1]. Duration of seizure, hemodynamic and recovery parameters are the dependent factors for selecting the correct anaesthetic agent for electroconvulsive therapy. Etomidate is known to increase seizure duration when compared to propofol [2]. But however etomidate was reported to have increased confusion after ECT and had longer recovery. Ketofol (a combination of ketamine and propofol) is reported to have better cognitive recovery and better antidepressant effects [3]. In ECT, the main objective of general anaesthesia is to produce an unconscious state with muscle paralysis [4]. Recovery pattern, hemodynamic effects, activity of seizure, cognitive functions and cost effectiveness of the procedure is the choice of anaesthetic agent [5]. The present study evaluates and compares the effects of propofol and etomidate on recovery pattern, hemodynamic effects and activity of seizures in patients undergoing electroconvulsive therapy (ECT).

Materials and Methods

The present study is a single blinded randomised controlled study which was conducted in the department of anaesthesiology. This study was conducted between November 2017 to December 2018 and after approval from Institutional ethics committee. 100 patients undergoing ECT in the age group of 20 to 65 years of either sex were selected consecutively and randomly divided into two groups namely group A which consisted of 50 patients who received ketofol (propofol 1mg/kg + ketamine 0.5mg/kg) and group B which consisted of 50 patients who received etomidate (0.2 mg/kg body weight). Exclusion criteria included patients who declined the consent, age less than 20 years and greater than 65 years, patients undergoing ECT for a subsequent time without seizure on previous ECT session, major medical disorders such as diabetes, hypertension, respiratory disorders, ischemic heart disease, cerebrovascular event, raised intracranial pressure due to any cause, ASA grade III

ASA grade III and IV, agitated patients requiring additional sedation. Complete history, clinical examination in anaesthesia OPD or bed side in psychiatry ward were collected from all the patients. Currently using medication was recorded and were given constantly throughout the study. Informed consent was obtained from all the patients and was explained clearly to the patient in a clear, simple and vernacular language. After fasting overnight for at least 6 hours, the procedure was carried out in the morning in all the patients. The demographic data which includes age, body weight and ASA physical status were noted. All investigations such as haemogram, urine examination, chest x ray, ECG, blood urea, serum creatinine and serum electrolytes were done. Intravenous line was set up using 18 G cannula on arrival in the operation theatre. All patients were connected to multipara monitor. Systolic blood pressure, diastolic blood pressure, heart rate, electrocardiogram, oxygen saturation were monitored prior to induction and throughout the procedure. Just before start of the procedure, all patients received pre-anaesthetic medications with injection glycopyrrolate 0.2 mg IV. Pre-oxygenation with 100% oxygen for 5 minutes was given to all patients. Anaesthesia was given with either etomidate at dose of 0.2 mg/kg, or ketofol (propofol 1mg/kg + ketamine 0.5mg/kg). The vital parameters were recorded. The systolic blood pressure, diastolic blood pressure, heart rate, oxygen saturation were recorded before induction of anaesthesia (T0), after administering the study drug (Ti), after succinylcholine (Ts), after ECT (Te), at one minute (T1), 3 minute (T3), five minute (T5), 10 minute (T10), 15 minute (T15) and 20 minute (T20). From the start of electrical impulse to end of clonic contraction using a stop watch, the duration of seizure activity was recorded in seconds by tourniquet method. The assessment of recovery was done on time to return of spontaneous breathing, time to return of eye opening and time to respond to verbal commands. Until the patient was discharged from post-anaesthetic care to psychiatry ward, side effects like nausea, vomiting, respiratory depression, and hypoxemia were noted. Statistical package for social sciences (SPSS) was used to calculate the data obtained.

Results

In the tables, the data is presented as mean. The statistical significance level used was $p < 0.05$. Standard deviation is in brackets.

Table 1: Comparisons of mean systolic blood pressures among the groups

Time	Group A (n=50)	Group B (n=50)	P value
T0	113.85 (12.47)	114.22 (12.74)	0.074
Ti	106.25 (12.41)	106.64 (12.29)	0.091
Ts	108.67 (12.38)	107.11 (12.00)	0.062
Te	111.79 (12.14)	111.21 (12.92)	0.20
T1	114.55 (12.49)	115.30 (13.88)	0.080
T3	115.64 (12.13)	116.50 (12.82)	0.068
T5	114.28 (12.50)	114.99 (12.09)	0.092
T10	112.63 (12.07)	111.29 (12.95)	0.087
T15	111.35 (12.56)	110.81 (12.64)	0.086
T20	114.29 (13.09)	114.63 (13.59)	0.60

Table 1 shows that maximum increase in pulse rate was observed at the 3rd minute from the time of electrical stimulation. Comparison of the mean systolic blood pressure

in the study group was not statistically significant. Comparison of the mean diastolic blood pressure and mean arterial blood pressure in the study group was not statistically significant.

Table 2: Mean seizure duration and MMSE score (mini mental state examination score) in the study groups

	Group A (n=50)	Group B (n=50)	P value
Seizure duration (in Secs)	25.14 (3.98)	27.85 (4.67)	0.05
MMSE score	27.89 (1.66)	28.94 (1.58)	0.07

Table 2 shows that seizure duration in the study group showed statistically significant differences. Induction of high quality and longer seizures was reported in etomidate group. Groups do not differ significantly with regard to mean MMSE scores.

Table 3: Mean recovery time in the study groups.

	Group A (n=50)	Group B (n=50)	P value
Time to return of spontaneous respiration (mins.)	3.55 (0.21)	3.68 (0.60)	0.040
Time to eye opening on command (mins)	5.22 (1.28)	5.55 (1.69)	0.030
Time to respond to verbal commands (mins)	7.50 (1.78)	7.60 (2.00)	0.025

Table 3 shows that group A had a shorter time to return of spontaneous respiration, time to eye opening on command and time to respond to verbal commands when compared to group B. No side effects were observed in the two groups.

Discussion

In the present study, maximum increase in pulse rate was observed at the 3rd minute from the time of electrical stimulation. Comparison of the mean systolic blood pressure in the study group was not statistically significant. Comparison of the mean diastolic blood pressure and mean arterial blood pressure in the study group was not statistically significant where as in Sawai Singh Jaitwat *et al.* [6] study, similar results were observed. In the present study, seizure duration in the study group showed statistically significant differences. Induction of high quality and longer seizures was reported in etomidate group and similar results were observed in Sawai Singh Jaitwat *et al.* [6] study. Group A had a shorter time to return of spontaneous respiration, time to eye opening on command and time to respond to verbal commands when compared to group B. No side effects were observed in the two groups and similar results were observed in Sawai Singh Jaitwat *et al.* [6] study. Similar results were observed in other studies which are Mohammad Reza Habibi *et al.* [7]; reported that no significant differences between the two groups regarding the changes of hemodynamic variables including systolic and diastolic arterial blood pressure, mean arterial pressure and heart rate, were notice ($p > 0.05$). Muscle twitching was not observed in the two groups. Afsin Gholipour Baradari *et al.* [8]; conducted a study in which it was observed that decrease in all hemodynamic parameters (SBP, DBP, MAP and HR) from induction time to laryngoscopy was greater in the ketofol group (group B) than in the etomidate group (group A) ($p < 0.05$). The ephedrine prescription rate due to

hemodynamic changes was 24.4% (10 patients) and 5% (2 patients) in group B and group A, respectively ($p = 0.03$). Erkman Sanri *et al.* [9]; reported that respiratory AE rate and proportion of patient who required a respiratory intervention were significantly higher with ketofol ($p=0.0029$). Overall AE rate and rates of desaturation, emergence reaction were also significantly higher in ketofol group. Patel AS *et al.* [10]; reported that patients who received propofol had a significantly longer course of ECT, higher seizure thresholds, and increased amounts of electrical charge (mC) over their course. There were no significant differences in adverse events with either of the induction agents.

Conclusion

Etomidate and Ketofol do not significantly impact cognitive functioning and etomidate and ketofol provide adequate hemodynamic stability. Patients who received ketofol had a shorter time to return of spontaneous respiration, time to eye opening on command and time to respond to verbal commands when compared to patients who received etomidate.

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