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A Comparative Study of Sevoflurane Vs Thiopentone Sodium for Patients Undergoing Electroconvulsive Therapy

KEYWORDS: Electro Convulsive Therapy, Major depression, Sevoflurane, Thiopentone, Recovery

DR.BHAVINI SHAH
DR. D. Y. PATIL MEDICAL COLLEGE, DEPARTMENT OF ANAESTHESIA, SANT TUKARAM NAGAR, PIMPRI 411018.

DR. CHHAYA SURYAWANSHI
DR. D. Y. PATIL MEDICAL COLLEGE, DEPARTMENT OF ANAESTHESIA, SANT TUKARAM NAGAR, PIMPRI

DR.SANTHI NARAMANENI
DR. D. Y. PATIL MEDICAL COLLEGE, DEPARTMENT OF ANAESTHESIA, SANT TUKARAM NAGAR, PIMPRI

DR.MRIDUL DUA
DR. D. Y. PATIL MEDICAL COLLEGE, DEPARTMENT OF ANAESTHESIA, SANT TUKARAM NAGAR, PIMPRI 411018.

ABSTRACT *BACKGROUND: The aim was to compare use of sevoflurane and thiopentone sodium as anesthetic agent for patients undergoing ECT, with respect to efficacy, hemodynamic stability and recovery. MATERIAL AND METHODS: Randomized study of 30 patients with depression treated with bitempo - parietal electroconvulsive therapy. In group S patients induced with 8% Sevoflurane with oxygen. In Group T patients induced with 3-5 mg/kg inj. Thiopentone sodium I.V. Succinylcholine 0.75 mg/kg I.V was given in both groups as for neuromuscular blockade. We compare hemodynamic parameters including pulse rate, systolic blood pressure, diastolic blood pressure and pulse oximeter and recovery score. RESULTS: At induction there was no statistically significant increase in heart rate and blood pressure in S and T group. After injection of muscle relaxant there was increase in systolic blood pressure and diastolic blood pressure in group S, which is statistically significant. At return of spontaneous respiration there was significant fall in systolic blood pressure and diastolic blood pressure in group T as compared to group S. Modified aldrete score was taken for recovery purpose upto 30 min at interval of 10 min. Even after 30 min post electroconvulsive therapy score in group T was not achieved as compared to group S (10.00±0.00, 9.85±0.36).CONCLUSION: Sevoflurane induction gives faster recovery when compared to thiopentone and it can be another better alternative for ECT.*

INTRODUCTION

ECT is an established modality of treatment for severe psychiatric illness such as depression, drug resistant bipolar disorder and schizophrenia (1, 2). Generalized grand mall seizures lasting for 25 to 150 sec through passage of brief electrical current is given an alternate day to achieve a therapeutic change in abnormal psychotic mental state(2,3,4).

Initially in olden days, ECT was given without anesthesia but with high incidence of side effects like fracture, dislocation and tongue bite (5, 6). Therefore, to avoid this side-effects short general anesthesia with induction agent and small dose of depolarizing muscle relaxant was used. Muscle relaxant given for control of convulsion (7, 8). However, it is associated with various side effects like tachycardia, hypotension, sometimes bradycardia and oxygen desaturation especially in compromised coronary circulation.

At present time number of medications has been used for ECT including pre-treatment sedation, I/V or inhalational induction agents, muscle relaxants, anti-cholinergic drugs and drugs to attenuate Para sympathetic and sympathetic response(9). As procedure is short, the duration of generalized convulsion seizure and general anesthesia should be minimum so that patient can be shifted to the ward early.

Thiopental Sodium is ultra-short acting barbiturate, used for ECT since many years, but it has its own side effects like delayed recovery, post-operative restlessness, tachycardia, hypotension etc. (10,11).

Sevoflurane (fluorinated ether) is a newer inhalational anesthetic agent. It provides smooth induction and rapid recovery with minimum side effects (11,12).

Therefore, aim of our study was to evaluate the efficacy of sevoflurane as induction agent in patients undergoing ECT, and to compare induction, recovery profile and hemodynamic changes of sevoflurane with thiopentone sodium and any adverse effect of the two induction agents in patients undergoing ECT.

MATERIALS AND METHOD:

After institutional ethical committee approval and written informed consent was taken from the next kin of patient. Study was conducted at Dr. D. Y Patil medical college, pimpri, pune, during the period from November 2014 to November 2015 on 30 patients of age above 15 years of either sex with ASA 1/II posted for modified ECT: psychiatric patient with depression, drug resistance bipolar disorders and schizophrenia were included in the study. Exclusion criteria include patients with recent history of MI, pregnancy, raised ICP, hypersensitive to drug and patient with history of previous anesthesia complication. Thirty patients were randomly distributed into two groups of 15 patients each by lottery method.

Group S – patients given sevoflurane gradually up to 8% along with 6L oxygen for induction of anesthesia.

Group T- patients were given inj. Thiopentone sodium 3 - 5 mg/kg IV for the induction of anesthesia along with 6L of oxygen.

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ECT THERAPY PROTOCOL AND ANAESTHESIA MANAGEMENT

Patients undergoing ECT were fasted for 6 to 8 hours. They were evaluated prior to ECT by attending anesthesiologist and psychiatrist. A standard monitoring of ECG, NIBP and pulse oximeter were attached. In all patients I.V access was taken with 22gauge intracath, dextrose normal saline was started. These patients pre-medicated with Inj Glycopyrolate 0.2mg three min prior to the induction. Patients were preoxygenated with 100% oxygen for 3 min before induction in both groups.

In Group S – patients were induced with sevoflurane gradually till 8% with oxygen 6L till loss of eyelash reflex and convergence of eyeballs.

In Group T – patients were induced with Inj. thiopentone sodium 5 mg/kg titrated until loss of eyelash reflex.

Time taken for induction was recorded.

Once patient was induced depolarizing muscle relaxant Inj. Succinylcholine 0.75 mg/kg was given IV(12). During apnea oxygenation was maintained by 100% oxygen via bag mask ventilation with Bain's circuit and handed over to psychiatrist for delivering electroconvulsive therapy. ECT stimulus was delivered once the muscle fasciculation disappeared, using ECT machine. A brief pulse stimulus was delivered using constant current 120 to 260MA with a frequency of 70 Hz/sec and pulse width of 1.0 ms, stimulus time is 1.0 sec. The stimulus charge is 120MC. >20 sec of motor seizure is adequate and this was delivered via Bitemporal electrode placement. The vital parameters of the patient i.e. PR, SBP, DBP, SPO2 was taken at baseline, 3 min after injection glycopyrolate, at induction, just after relaxant, post ECT and on spontaneous respiration. Any side effects like breath holding, increase in tone, coughing, irritability, confusion and nausea were noted and treated accordingly. Statistical analysis was carried out with student t- test. Demographic characteristics, hemodynamic parameters, recovery score were compared between two groups and data was analyzed statistically for categorical data. $P<0.05$ was statistically significant.

RESULTS

TABLE 1: Demographic data

Gender/ Groups	**Group S** No. of patients	**Group T** No. of patients	P Value	Significant
Male: Female	9:6	6:9	0.27	Insignificant
ASA Grading	15	15	-	-
Age (years)	27.13±7.26	28.73±9.27	0.30	Insignificant
Weight (Kg)	55.67±5.55	52.53±9.76	1.08	Insignificant

P value ≥ 0.05 insignificant

Table 1 compares demographic profile between two groups.

There was no significant difference in age, sex, weight and ASA grading (P value >0.05).

TABLE 2: Vital parameters

Parameters	Pulse Rate			Systolic BP			Diastolic BP			Spo2		
	Group S	Group T	P Value	Group S	Group T	P Value	Group S	Group T	P Value	Group S	Group T	P Value
Baseline	83.48 ± 7.73	80.48 ± 9.99	0.08	119.98± 9.3	115.67± 9.3	0.11	71.29± 9.17	76.7± 8.39	0.05	99.34± 0.66	99.81± 0.36	0.01*
3 Min After Glycopyrolate	88.39 ± 7.58	85.93 ± 7.87	0.2	119.73± 9.89	128.78± 11.33	0.01*	76.2± 7.26	82.25± 7.76	0.02*	99.33± 0.70	99.92± 0.18	0.00*
At Induction	93.94 ± 8.8	94.21 ± 6.12	0.48	124.89± 12.95	126.63± 7.75	0.33	75.99± 7.88	78.92± 8.88	0.17	99.21± 0.83	99.77± 0.9	0.00*
Just After Relaxant	104.8 ± 8.46	108.16 ± 5.10	0.10	129.91± 10.75	122.94± 4.84	0.01*	82.09± 7.76	76.07± 6.56	0.01*	99.26± 0.73	99.99± 0.04	0.00*
Post ECT	108.93 ± 6.49	114.6 ± 6.63	0.01*	141.56± 13.01	134.82± 6.57	0.04*	86.47± 7.20	81.13± 5.9	0.03*	99.18± 0.86	99.96± 0.01	0.00*
Spontaneous Respiration	105.22 ± 10.56	106.9 ± 0.95	0.34	146.79± 11.11	118.92± 0.6	0.6	91.08± 5.37	76.37± 8.45	0.00*	99.53± 0.70	99.89± 0.21	0.17

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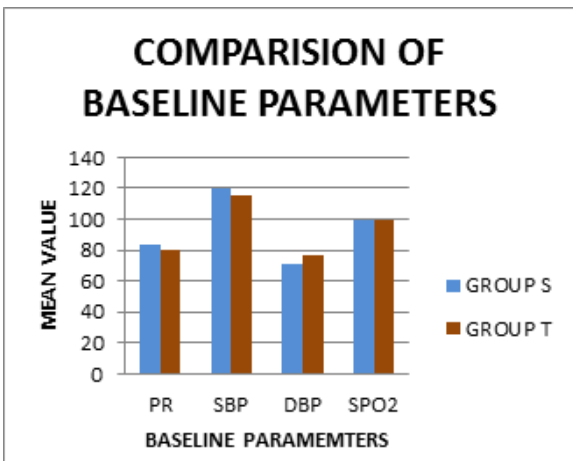
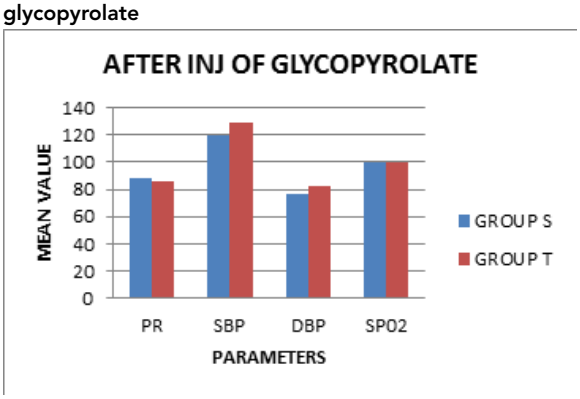
Table 2 compares the hemodynamic parameters between two groups.

Graphical presentation of baseline parameters



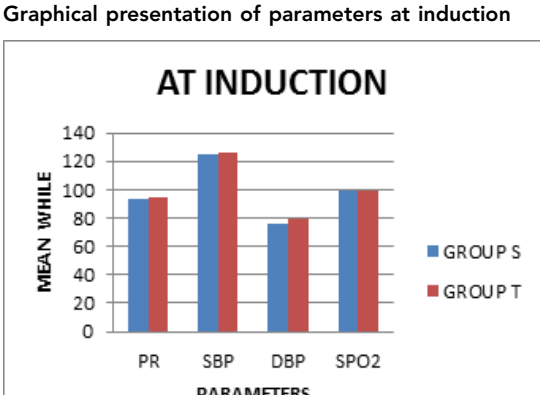
There was no significant difference in baseline hemodynamic parameters except SPO2 between two groups. Even though SPO2 was statistically significant, it was clinically insignificant.

Graphical presentation of parameters 3 min after inj glycopyrolate



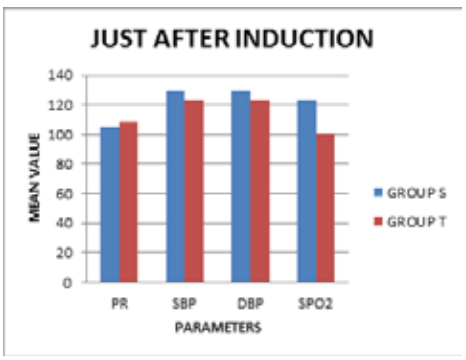
Inj. glycol-pyrolate was given as a premedication. After the injection of gycopyrolate there was statistically significant difference in all hemodynamic parameters between two groups i.e systolic blood pressure (119.73 ± 9.89, 128.78±11.33), diastolic blood pressure (76.20± 7.26, 82.25±7.76), Spo2 (99.33± 0.70, 99.92± 0.18) except in pulse rate (88.39±7.58, 85.93 ±7.87). Group S values were significant less than Group T, but clinically insignificant.

Graphical presentation of parameters at induction



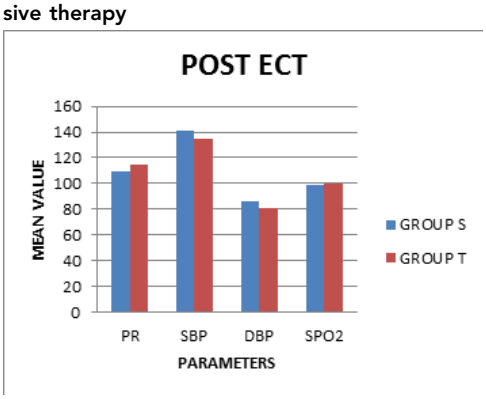
At induction, there was no significant difference in hemodynamic profile between both groups. Spo2 was higher in Group T as compared to Group S, though statistically significant but clinically insignificant.

Graphical presentation pf parameters just after relaxant



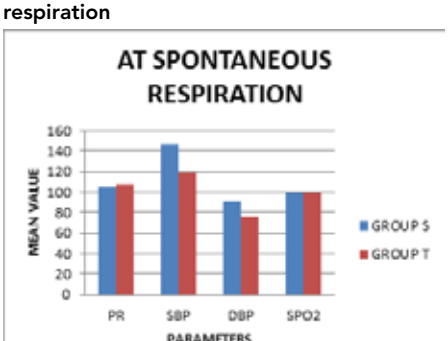
After injection of relaxant, there was no significant difference in PR between two groups. However, there was statistically significant difference in SBP and DBP. The increase is being more in Group S as compared to Group T. Although difference in Spo2 in Group S & T was significant statistically but clinically insignificant.

Graphical presentation of parameters after post convulsive therapy



Post ECT the difference in PR between two groups was significant statistically (118.93±6.49, 114.62±6.32). Values were higher in Group T as compared to Group S. SBP (141.56±13.01, 134.82±6.57), DBP (86.47±7.20, 81.13±5.9) were found to be higher in Group S as compared to Group T, which was significant statistically. The difference in SPO2 although was statistically significant but clinically insignificant.

Graphical presentation of parameters at spontaneous respiration



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At the return of spontaneous respiration, there was no statistically significant difference in PR. The PR decreased from post ECT values in both groups, and the fall was more in Group S as compared to Group T. There was significant difference in SBP (146.79± 11.11, 118.92± 0.60) and DBP (91.08± 5.37, 76.37±8.45). The fall in SBP and DBP was more marked in Group T as compared to Group S. There was no significant difference in Spo2 between two groups.

TABLE 3: MODIFIED ALDRETE SCORE:

Recovery score	Group S	Group T	P value
Alderte score at 10 minutes	7.92 ± 0.71	6.99 ± 0.62	0.0003 *
Alderte score at 20 minutes	10.00 ± 0.00	8.31 ± 0.75	0.00 *
Alderte score at 30 minutes	10.00 ± 0.00	9,85 ± 0.36	0.0001 *

In Group S patients had higher recovery score than Group T at 10 min, 20 min and at 30 min on modified Aldrete score system. The patient in Group S achieved maximum score at around 20 min, whereas in Group T patients' maximum recovery score was not achieved even after 30 min. This is of great clinical significance as far as quality of recovery from GA is concerned.

TABLE 4: Adverse effects

Table 4 shows the incidence of complications in both groups, which were not serious enough to warrant any intervention. There was no morbidity.

ADVERSE EFFECT	Group S	Group T	P value	Significance
Increase in tone during induction	4	1	0.82	Insignificant
Breath holding spell	2	0		
Coughing and hyperirritability	1	0		
Apnea	0	2		
Drowsy at recovery	0	1		
confusion	0	1		
nausea	1	2		

DISCUSSION

The administration of general anesthesia for ECT poses a challenge for the anesthesiologist due to disturbed psychological behavior of the patient, non-cooperation that make IV access difficult, patient on anti-depressive medication complicating the recovery period and OPD procedure. Our concerns is whether we can help in performing modified ECT, in the sense that seizures are not violent, maintaining hemodynamic stability and final aim being complete and faster recovery of patients. Existing method of providing general anesthesia with IV induction agent like thiopentone or propofol have problems like pain on injection, drowsiness, confusion sometimes delayed recovery. Therefore, we tried to evaluate the efficacy of sevoflurane and compare it with thiopentone with encouraging results.

Sevoflurane, inhalational agent is colorless, noninflammable and liquid at room temperature. It has a boiling point of 58.5oC and saturated vapor pressure of 21.3 Kpa at 20oC. It predicts rapid uptake and elimination.

Induction time was slightly longer in sevofluraneas compared to thiopentone. Although this difference in induction time is statistically significant but in clinical practice it does not matter as far as quality of induction and safety of patient is concerned.

We took convergence of eyeball as the optimum time to give succinylcholine because loss of eyelash reflex with sevoflurane achieved very early that is at a lighter plane of anesthesia and if this was taken as the cutoff time for giving inj. Succinylcholine the patient recovered from sevoflurane very early even before completion of procedure. The finding of induction time in our study comparable with study of Robert P. et ab 2000, Hodgson RE ep ab 2004.

In hemodynamic parameters, Heart rate was significantly increased post ECT more in group T (thiopentone) than group S (sevoflurane). SBP increased more in sevoflurane group (S) as compared with thiopentone group (T), raise was more pronounced at post ECT and at return of spontaneous respiration in group S. The values of SBP were declining and approaching the baseline values at return of spontaneous movement and response to verbal commands in both groups. DBP increased more in sevoflurane group (S) than thiopentone group (T). In sevoflurane group, DBP reached its peak value at return of spontaneous respiration and there after DBP decreased but not returned to baseline. In thiopentone group, DBP increased from its baseline 3 min after inj. Glycopyrolate and decreased prior to the injection of relaxant. Then again significantly increased at post ECT and then fall to baseline at return of spontaneous respiration. Tanaka N. et al. 1997 found same result.

In our study, there was highly significant difference in recovery time between both groups. In sevoflurane group time required to recovery was markedly shorter as compared to thiopentone group.

In our study, no major adverse effects were noted. Minor side effects were noted in both groups. In sevoflurane group increased tone during induction, increased BP, breath holding spells, coughing and irritability.

In thiopentone group transient apnea, pain on injection, nausea, drowsiness and confusion were noted. The complications in both groups were not serious enough to warrant any intervention. Our findings were similar to Thwaites, et al. 1997 study. Still more number of patients and study are required to evaluate regarding the current treatment.

THE MODIFIED ALDRETE SCORE –

The Aldrete scoring system, named for Dr. J. Aldrete, is commonly used for determining when a patient can safely be discharged from the post-anesthesia care unit (PAC) to the postsurgical ward or to the second stage recovery area.

The Aldrete scoring system takes into account the patient's ability to move, respiration, circulation, consciousness, and oxygen saturation. A maximum of two points are awarded in each category and a score of >8 is required for discharge. Best score is 10.

	2	1	0
RESPIRATION	Able to take deep breath and cough	Dyspnea/ shallow breathing	Apnea
	2	1	0
O2 SATURATION	Maintains >92% on room air	Needs O2 inhalation to maintain O2 saturation >90%	Saturation<90% even with supplemental O2

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CONCIOUS-NESS	2	1	0
	Fully awake	Arousable on verbal com-mands	Not respond-ing
CIRCULA-TION	2	1	0
	BP ± 20mmHg pre op	BP ± 20-50mmHg pre op	BP ± 50mmHg pre op
ACTIVITY	1	2	0
	Able to move 4 extremities voluntarily or on command	Able to move 2 extremities voluntarily or on command	Able to move 0 extremities voluntarily or on command

CONCLUSION

Existing method of providing GA with IV induction agent like Thiopental Sodium have problems like pain on injection, drowsiness, apnea, confusion and sometimes delayed recovery. Therefore, we tried to evaluate the efficacy of sevoflurane as an inhalational anesthetic agent and compared it with Thiopental sodium with encouraging result. The recovery in sevoflurane group is two to three times faster than Thiopental sodium group, which was significant both statistically and clinically. There was no major adverse effect found in either group.

This implies sevoflurane can be another better alternative than thiopentone and other induction agents for patient undergoing ECT, whenever available.

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