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Original Research Article

Comparative study of thiopentone sodium, propofol, etomidate for anesthetic efficacy & effect on seizure duration in electroconvulsive therapy

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ABSTRACT

Introduction: Electroconvulsive treatment (ECT) is an entrenched mental treatment where seizures are electrically actuated in patients for restorative impacts. ECT can deliver extreme unsettling influences in the cardiovascular framework most generally a transient time of hypertension & changes in the pulse and a stamped increment in cerebral blood stream and intracranial weight. These hemodynamics changes might be adjusted utilizing different sedative medications.

Aims & Objectives: This investigation was attempted to think about the impacts of propofol, etomidate and thiopentone sodium utilized as IV sedative operators in changed ECT as respects, acceptance time & nature of sedation, adjustment of hemodynamics, seizure length & recuperation time.

Materials & Methods: After authorization acquired from the moral board of trustees for the investigation, composed assent from the patient & family members was taken. This investigation was led in the division of anesthesiology at Civil Hospital, Ahmedabad, which remembered a sum of 90 patients for the 18-60 years age gathering.

Conclusion: In our current investigation, we inferred that each of the three instigating operators had sure more than each other when the examination boundaries were individualized. Propofol had the upside of stable hemodynamic boundaries, smooth enlistment & fast recuperation in contrast with etomidate & thiopentone. Nonetheless, it was related with more limited span of seizure. The benefit of thiopentone sodium of having longer seizure length than propofol of having longer seizure span was brought about at the expense of a generally delayed recuperation period. The clear bit of leeway of a more extended seizure length with etomidate could be utilized for better clinical adequacy. Notwithstanding, it was related with myoclonic jerks during the cycle of acceptance. Further examinations ought to be planned to utilize a stage & mix of medications with the goal that the most ideal impacts of each medication can be sensibly utilized.

1. Introduction

Electroconvulsive treatment (ECT) is an entrenched mental treatment where seizures are electrically actuated in anesthetized patients for restorative impacts. The adequacy of ECT in reducing intense gloom is subject to the span of the prompted seizure. Electroencephalographic (EEG) seizure action enduring from 25 to 50s is asserted to create the ideal energizer reaction. ECT has a significant function in treatment of extreme & prescription safe despondency & craziness, self-destructive drive, schizophrenia.[1]

At first, absence of sufficient sedation or muscle unwinding during ECT lead to bone cracks, disengagement of joints, keeping quiet, & tearing of muscle strands. Likewise, absence of information about the portion boundaries of the electric incitement prompts more unfriendly intellectual impacts.

At the point when an electrical flow is applied to the mind, the resultant EEG spike & wave action is joined by a summed up engine seizure & an intense cardiovascular reaction, which brings about stamped increment in cerebral blood stream & intracranial pressure.[2] The hemodynamic

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reaction to ECT can create myocardial ischemia & even localized necrosis, just as transient neurologic ischemic deficiencies, intracerebral hemorrhages, & cortical visual impairment. Because of injury caused to the patient actually & mentally with unmodified direct ECT before, it has now been adjusted with sedation.

Sedation for ECT incorporates control of these hemodynamic changes with related entanglements, sufficient amnesia & muscle unwinding.[3] This examination was embraced to think about the impacts of Propofol, Etomidate & sodium thiopentone utilized as IV sedative specialists in changed ECT as respects to enlistment time & nature of sedation, modification of hemodynamics, seizure term & recuperation time.

2. Aims & Objectives

The current examination was embraced to think about the impacts of propofol, etomidate, sodium thiopentone utilized in electroconvulsive treatment as IV sedative operators.

2.1. Primary goal

1. Induction time.
2. Alteration of hemodynamics.
3. Seizure duration.
4. Recovery time.

2.2. Secondary goal

1. Complications of induction agents.
2. Complication of general anesthesia.
3. Complications related to ECT.

3. Materials and Methods

After authorization acquired from the moral board of trustees for the investigation, composed assent from the patient & family members was taken. This investigation was led in the division of anesthesiology at Civil Hospital, Ahmedabad, which remembered a sum of 90 patients for the 18-60 years age gathering.

The enlisted patients were isolated arbitrarily into three equivalent gatherings, comprising of thirty patients each, specifically Group A, Group B & Group C.

Gathering A got inj propofol 1% (1.5 mg/Kg), Group B got inj etomidate (0.2 mg/Kg) furthermore, Group C got inj thiopentone (5 mg/Kg).

All the patients were saved NBM for 6 h alongside proceeding with their endorsed antipsychotic treatment until the day of the method (1 h before ECT).

3.1. Inclusion criteria

Period of patients: 18-60 years

Either sexual orientation

ASA (American Society of Anesthesiologist) grade l & II Mallampatti grade I or II. Understanding posted for ECT for gloom, bipolar confusion, sleep deprivation & other mental ailment.

3.2. Exclusion criteria

1. Patients with full stomach,
2. Hypertension & other cardiovascular problems
3. Neuromuscular problems
4. Epilepsy
5. Drug allergy
6. Pregnancy
7. Major sicknesses like bronchial asthma & tuberculosis,
8. Patient having cochlear implant
9. Patient ingesting medications like SSRI, anti-inflamatory medicine, lithium, tricyclic stimulant, monoamine oxidase inhibitor, meperidine, tramadol
10. Patient having any kind of shock.

3.3. Procedure

Point by point preoperative evaluation of the patient, comprehensive of physical & general assessment, routine examinations, trailed by composed & educated assent was taken. The standard screens that were appended to the patient in the technique room were - electrocardiogram, oxygen immersion (SpO2) & noninvasive circulatory strain. After the IV line was set up, the premedication that was managed to the patients were inj glycopyrrolate 0.2 mg iv & inj ondansetron 0.15mg/kg iv.

After preoxygenation with 100% oxygen for 3 min, according to the dispensed gatherings, general sedation was instigated with the particular gatherings of iv sedative operators, till the loss of eyelid reflexes & the enlistment time was noted. For neuro-strong unwinding, iv succinylcholine (0.5 mg/kg) was given to all the patients for neuromuscular unwinding. At the point when sufficient neuromuscular unwinding was gotten, an enough measured nibble block was embedded to forestall tongue chomp.

A brief span beat upgrade for around 1–3 s, having recurrence of 60–90 Hz & a heartbeat width of 1 was given to deliver seizures.

Disengaged appendage technique was utilized to screen the term of seizure. Hence, all the patients were ventilated with 100% of oxygen utilizing a face cover at a pace of 14–16 breaths/min until unconstrained breathing returned & the patient clinically recuperated from the condition of sedation.

The adjustments in pulse, respiratory rate, systolic circulatory strain (SBP), diastolic circulatory strain (DBP), & SpO2 were checked in all the patients at basal, after acceptance & 1 min, 2 min, 3 min, 5 min, 10 min, 20 min, & 30 min following ECT.

Length of recuperation was archived from infusion of sedative specialist to time taken to comply with vocal orders, time for capacity to sit independent & time taken to meet release standards.

The gathered information were measurably examined. The estimation of $P < 0.05$ was considered as factually critical.

All the patients' information was recorded in the proforma of study. The information got was communicated as mean qualities ± standard deviation (SD) & was Quantitatively investigated utilizing t-test & subjective by chi-square test. Changes in hemodynamic factors from benchmark & examination of means were investigated by combined t-test for each time span.

4. Observation & Results

An absolute number of ninety patients were chosen for the current investigation, who were then haphazardly partitioned into three gatherings having thirty patients each, equivalent to one another regarding age, weight & sex.

4.1. Induction time

The mean enlistment time in Group A was 41.9 s, in Group B was 50.9 s while in Group C was 48 s. The distinction in the enlistment times between the three gatherings was measurably huge ($P < 0.001$).

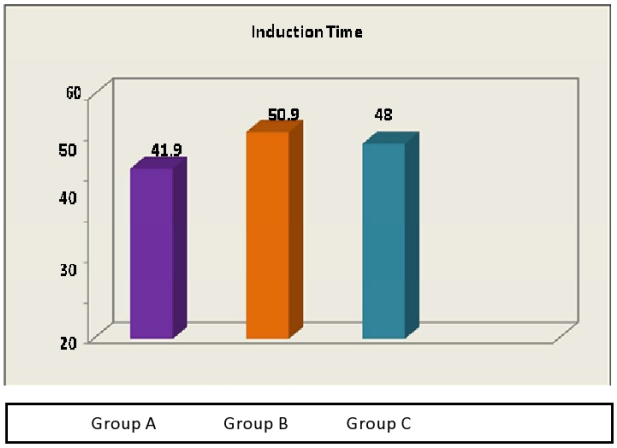

Fig. 1:

4.2. Incidence of side effects during induction

Induction was smooth in Group A contrasted with Group B & Group C. In any case, Group A displayed high frequency of agony on infusion (18%). Gathering B had high occurrence of myoclonus (20%) while Group C had higher frequency of hack, tears & gag reflex. Patients of Group C (40%) created arrythmias & delayed recuperation.

4.3. Heart Rate (HR)

1. After the administration of ECT, a significant ($P < 0.05$) change in Heart Rate from the baseline value was noticed in all the three groups.
2. There was an increase in Heart Rate for up to 2 min after ECT, which was followed by a descending trend & reaching back to baseline values at the end of 10 min.
3. However, there was less rise in Heart Rate with propofol in comparison to etomidate & thiopentone.

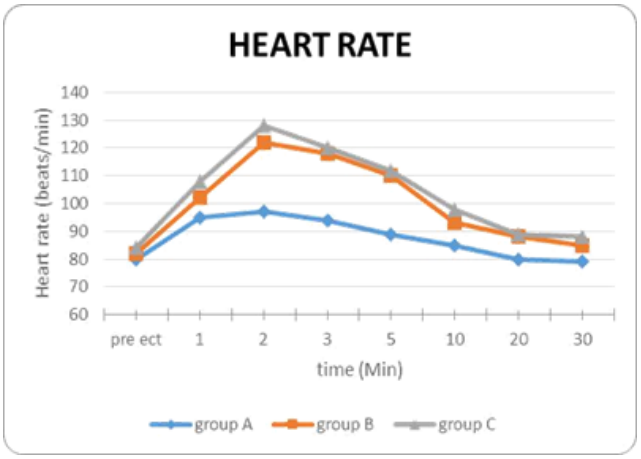

Fig. 2: Comparison of HR in three group (Group A: Propofol; Group B: Etomidate; Group C: Thiopentone)

Table 1:

Time (min)	Heart Rate (beats/min)		
	Group A	Group B	Group C
PRE ECT	80±10.33	82±14.49	84±15.74
1	95±11.81	102±10.32	108±14.2
2	97±14.21	122±14.20	128±15.4
3	94±9.86	118±11.21	120±11.92
5	89±10.92	110±15.63	112±11.98
10	85±10.07	93±15.74	98±11.98
20	80±12.37	88±12.94	89±13.55
30	79±10.42	85±10.94	88±13.63

4.4. Systolic blood pressure (SBP)

1. Initially, rise in SBP from the baseline value for up to 02 mins & then it declined back to baseline in 30 mins.
2. This variability was statistically significant ($p<0.05$), but was more pronounced in thiopentone & etomidate group, not as much of rise in SBP was seen in Propofol.

4.5. Diastolic blood pressure (DBP)

1. Similar to SBP, DBP also showed statistically significant variability for up to 2 min from the baseline

Table 2:

Time (min)	Mean systolic blood pressure (mm hg)		
	Group A	Group B	Group C
PRE-ECT	120±12.5	126±11.5	119±13.4
1	144±18.6	160±10.06	164±14.5
2	149±20.5	164±15.4	168±13.4
3	136±16.9	151±16.2	154±12.3
5	128±15.2	142±20	144±13.4
10	121±9.82	130±12.5	129±14.2
20	120±10.8	125±10.4	122±10.8
30	118±8.7	123±6.5	120±7.5

value following ECT & it was highly significant in thiopentone & etomidate group.

2. Less rise in DPB was seen in Propofol.

Table 3:

Time (min)	Mean systolic blood pressure(mmhg)		
	Group A	Group B	Group C
PRE-ECT	120±12.5	126±11.5	119±13.4
1	144±18.6	160±10.06	164±14.5
2	149±20.5	164±15.4	168±13.4
3	136±16.9	151±16.2	154±12.3
5	128±15.2	142±20	144±13.4
10	121±9.82	130±12.5	129±14.2
20	120±10.8	125±10.4	122±10.8
30	118±8.7	123±6.5	120±7.5

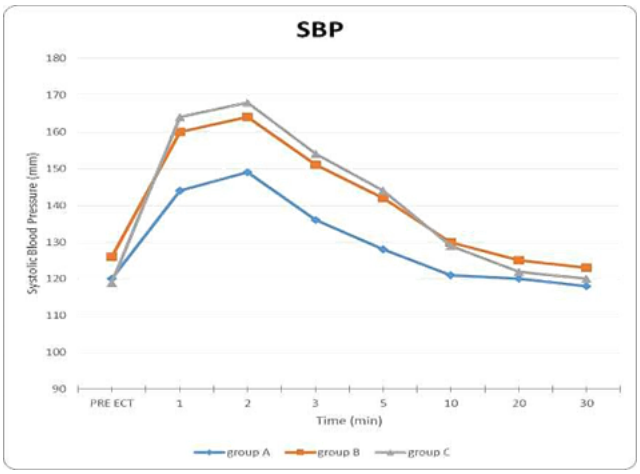

Fig. 3: Comparison of SBP in three group (Group A: Propofol; Group B: Etomidate; Group C: Thiopentone)

4.6. Seizure duration

Mean of seizure duration was found to be 27.6 sec in case of Group A, 56.5 sec in Group B & 30.2 sec in Group C, respectively and was significantly shorter in propofol & thiopentone group as compared to etomidate group.

Table 4:

Group	Seizure duration (mean ± sd) in secs
A	27.6 ±3.2
B	56.5±5.6
C	30.2±4.8

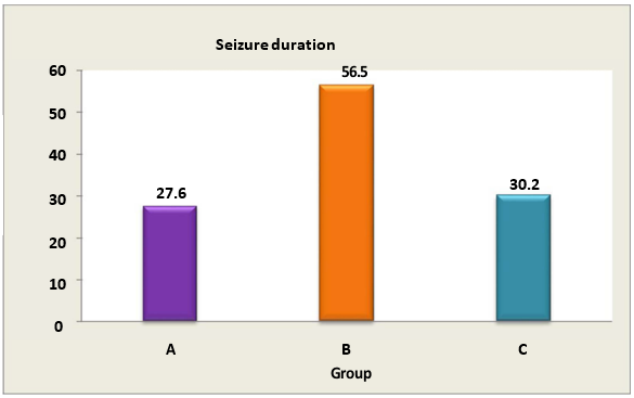

Fig. 4: Seizure duration in three group (Group A: Propofol; Group B: Etomidate; Group C: Thiopentone

4.7. Recovery

The recovery of cognition, orientation, & neuromuscular coordination was significantly fast in propofol group followed by etomidate & thiopentone group.

Table 5:

Group	Recovery Time (mean ± sd)
A	7.44 ± 1.01
B	10.43 ± 0.29
C	9.28 ± 0.52

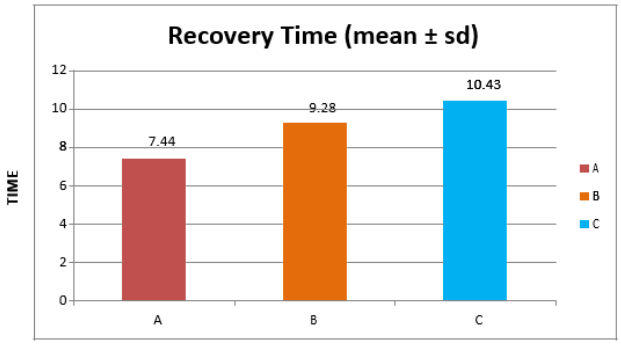

Fig. 5: Recovery time in three groups (Group A: Propofol; Group B: Etomidate; Group C: Thiopentone)

5. Discussion

In the current examination, we found that quick acceptance was seen with propofol (41.9 ±3.5 sec) when contrasted with etomidate (50.9±4.2 sec) & thiopentone (48 ± 3.9 sec) & it was factually huge. Comparable outcome was found in similar investigation of thiopentone sodium & propofol by Patel et al., 2015, in which the acceptance time for propofol was 40.9±5.21 & for thiopentone 47.4±5.68.[4]

In an examination led by Altaf Husain Mir Nida Farooq Shah, 2017, comparative outcomes were found for the acceptance time for propofol 41.6 sec, etomidate 50.9 sec & thiopentone 48.2sec, proposing rapid enlistment in propofol in contrast with etomidate & thiopentone sodium.[5]

In our investigation the acceptance was nearly smooth with propofol ($P < 0.001$) contrasted with thiopentone & etomidate. In concentrate by Jignesh Patel et al., 2015, they additionally found that enlistment was smoother in propofol when contrasted with thiopentone.[4]

In our investigation, we found that the seizure length was more limited in propofol (27.6±3.2 sec) in contrast with etomidate. (56.5±5.6) & thiopentone (30.2±4.8 sec). Comparable outcomes were found by Altaf Husain & Nira Farooq Shah, 2017[40] & by Baeur, 2009.[6]

In our investigation, we found that the recuperation time was fundamentally delayed in thiopentone sodium (10.43 min) in contrast with Propofol (7.4 min) ($p<0.001$) & etomidate (9.2 min). Comparative outcomes were found by 7. Mokriski et al., 1992.[7]

The cardiovascular unsettling influences during ECT are the consequence of exceptional incitement of the autonomic sensory system & an expansion in catecholamines.

Intense expansions in blood vessel pressure or potentially Heart Rate might be unsafe in patients with extreme cardiovascular illness. Ventricular dysrhythmias & myocardial dead tissue are the most well-known reasons for mortality following ECT.

In our investigation, Heart Rate changes were essentially lower following propofol (15-18 thumps/min) over the benchmark esteems in the initial two min of ECT. In any case, with etomidate & thiopentone, the mean change in HR after ECT fluctuated from 40 to 45 beats/min above pre-enlistment esteems. This was trailed by a decline in pulse throughout the following ten mins. Critical ascent in Heart Rate after ECT with thiopentone sodium & etomidate contrasted with propofol was additionally noted by 8. Dwyer et al., 1988.[8]

In our investigation, rise in the foundational blood vessel pressure following ECT, was relatively less with propofol, than with etomidate & thiopentone.

In propofol, change in the mean SBP was 25–30 mm Hg over the benchmark esteem in the initial 2 min & came to down to the gauge an incentive at 30 min. On account of etomidate, mean SBP esteem expanded by 40–45 mm Hg over the benchmark esteem in the initial 2 min though with thiopentone, the adjustment pattern in the mean SBP an incentive in the initial 2 min was 45–50 mm Hg.

Little expansion in mean DBP was seen in Propofol with the mean change mean being 9–13.

mm Hg over the benchmark esteem in the initial 2 min. Be that as it may, with etomidate, the expansion in mean DBP was by 15–20 mm Hg over the pattern an incentive in the initial 2 min & with thiopentone, increment of 24–26 mmHg was watched.

The expansion in Heart Rate, SBP, & DBP was seen in all the three gatherings. In any case, was measurably exceptionally huge in etomidate gathering & thiopentone gathering. Lesser expansion in pulse, SBP & DBP was found with propofol as it blunts the thoughtful reaction much productively.

No dysrhythmias were seen during ECT.

In our current investigation, to the extent lessening the physiological reaction to ECT with insignificant hemodynamic changes was concerned, propofol appeared to be better than thiopentone & etomidate.[6]

6. Conclusion

In our current investigation, we inferred that each of the three instigating operators had sure more than each other when the examination boundaries were individualized.

Propofol had the upside of stable hemodynamic boundaries, smooth enlistment & fast recuperation in contrast with etomidate & thiopentone. Nonetheless, it was related with more limited span of seizure. The benefit of thiopentone sodium of having longer seizure length than propofol of having longer seizure span was brought about at the expense of a generally delayed recuperation period. The clear bit of leeway of a more extended seizure length with etomidate could be utilized for better clinical adequacy. Notwithstanding, it was related with myoclonic jerks during the cycle of acceptance. Further examinations ought to be planned to utilize a stage & mix of medications with the goal that the most ideal impacts of each medication can be sensibly utilized.

7. Source of Funding

None.

8. Conflict of Interest

The authors declare that there is no conflict of interest.

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