Original Research Paper

Volume-9 | Issue-11 | November - 2019 | PRINT ISSN No. 2249 - 555X | DOI : 10.36106/ijar

Anesthesiology

TO COMPARE THE EFFICACY OF THIOPENTONE VERSUS PROPOFOL AS ANAESTHETIC AGENTS AND COMPARE HEMODYNAMIC CHANGES AND RECOVERY PROFILE CAUSED BY THEM ON PATIENTS UNDERGOING ECT (ELECTROCONVULSIVE THERAPY).

Dr. Amey Ajit Sable Third Year Resident, Dr. D. Y. Patil Medical College Medical College And Research Centre.

Dr. (Col) V. R. R Chari* Professor Department Of Anaesthesia *Corresponding Author

Dr. Ashwini Khamborkar Third Year Resident

Dr. Smruti Govekar Third Year Resident

ABSTRACT The ECT is to provoke the generalised epileptic seizure by electrical stimulation of one or both hemisphere of the cerebellum. Several anaesthetic drugs are used in ECT. Many drugs have anticonvulsant action and may decrease the duration of ECT induce seizures . Use of larger doses of anaesthetic drugs will shorten duration of seizure activity and could adversely affect efficiency of treatment. ECT can produce many hemodynamic changes and duration of seizures.

MATERIALS AND METHODS: Sixty patients of either sex, belonging to 18 to 65 years of age, ASA grade I and II were selected after applying stringent inclusion and exclusion criteria. They were divided into two equal groups of 30 subjects each, using computer generated allocation.

RESULTS: This study was done to evaluate the hemodynamic stability, recovery profile and seizure duration. Propofol was better drug than thiopentone sodium in all over aspect. Propofol was Haemodynamically stable than thiopentone as I observed with systolic blood pressure, diastolic blood pressure, mean blood pressure as well as heart rate. The recovery profile was seen with modified Aldrete score. To shift the patient from recovery score 8 is necessary with propofol it was achieved early than thiopentone sodium. Seizure duration was more with thiopentone and less with propofol. There was no change in oxygen saturation with respect to drugs. Current stimulus was also constant for both drugs.

KEYWORDS : Thiopentone , Propofol , ECT.

INTRODUCTION

Electro convulsive therapy was introduced by Cerlitti and Bini in 1937[1].The ECT is to provoke the generalised epileptic seizure by electrical stimulation of one or both hemisphere of the cerebrum.

ECT was first described in 1938[1] and was performed without anaesthesia for 30 years. IT is for psychiatric disorders such as depressive illness, maniac disorders as well as the conditions that are threatening to life such as catatonia, neuroleptic malignant syndrome, stupor[2,3].

It was unmodified technique where the patients were conscious and without neuromuscular blockers. American society of psychiatry in its 2001 recommendation for treatment and privileging recommends that ECT should be considered as primary treatment for major depression, acute mania, schizophrenia, mood disorders, and catatonia according to severity of symptoms. Seizure activity lasting for 25 to 50 seconds is alleged to produce optimal antidepressant response. Patients experiencing an initial seizure duration of <15 seconds or >120 seconds achieve a less favourable response to ETC.

In 1937 it was "unmodified" not under sedation, anaesthesia, neuromuscular blockade, supplemental oxygenation[4,5], and no ventilation administration. There were complications like hypoxia, hypocapnia, cardiac arrhythmias, and vertebral compression fracture at mid thorax. In 1960's it was changed to "modified" i.e. under anaesthesia and neuromuscular blockade still there are some complications such as prolonged apnoea, dental injuries, tongue injuries, aspiration, status epilepticus but incidence is very much reduced with modified ECT. It was 3:10000 per patient undergone ETC.

Several anaesthetic drugs are used in ECT. Many drugs have anticonvulsant action and may decrease the duration of ECT induce seizures [6]. Use of larger doses of anaesthetic drugs will shorten duration of seizure activity and could adversely affect efficiency of treatment. ECT can produce many hemodynamic changes and duration of seizures.

PHARMACOLOGY

PROPOFOL:

Propofol is the most frequently used intravenous anaesthetic today. Work in the early 1970s on substituted derivatives of phenol with hypnotic properties resulted in the development of 2, 6-diisopropofol.

Pharmaco kinetics: The alkyl phenols are oils at room temperature and insoluble in aqueous solution, but they are highly lipid soluble. The formulation that followed the removal of Cremophor consists of 1% (weight/volume) propofol, 10% soybean oil, 2.25% glycerol, and 1.2%purified egg phosphatide ,disodium edetate (0.005%) was added as a retardant of bacterial growth. This formulation has a pH of 7 and appears as a slightly viscous, milky white substance.

Metabolism:Propofol is rapidly metabolized in the liver by conjugation to glucuronide and sulphate to produce water-soluble compounds, which are excreted by the kidneys. Less than 1% of propofol is excreted unchanged in urine.Propofol oxidised into 1, 4-disopropyl quinol in liver. propofol conjugated with glucuronic acid to propofol 1-glucoronide and quinol 1- glucuronide, quinol – 4-glucuronide which all are apparently excreted by kidneys The initial distribution half-life of propofol is 2 to 8 minutes.

The elimination half-life has varied from 1.0 to 3 hours. Volume of distribution is 6-40 liters. Clearance of propofol is extremely high-1.5 to 2.2 L/min.The peak effect is 90 to 100 seconds.

ACTION:

Central Nervous System: Propofol is primarily a hypnotic. Hypnotic action is mediated by potentiating the y-amino butyric acid (GABA)-induced chloride current through binding to the p-subunit of the $GABA_A$ receptor.

Respiratory system: Apnoea is seen dependent on dose, speed of injection, concomitant premedication. Infusion of 100mcg/kg/min results in 40% decrease in tidal volume and 20% Cardiovascular system: decrease blood pressure after induction around 25-40%. Decrease arterial blood pressure is with decrease cardiac output and cardiac index by ±15% and decrease stroke volume index by ±20%, and systemic vascular resistance by 15-25%.

increase in respiratory frequency.

USES AND DOSES:

Induction: 1-2.5 mg/kg/IV dose decreased with increase in age.

Submitted : 05th June, 2019 | Revised : 22nd July, 2019 | Accepted : 12th July, 2019 | Publication : 01st November, 2019

Maintenance: 50-150 mcg/kg/min/iv combined with opioids and nitrous oxide.

Sedation: 25-75 mcg/kg/min[22]

Antiemetic: 10-20 mg / IV.

Side Effects and Contraindications: Induction of anaesthesia with propofol is associated with several side effects, including pain on injection, myoclonus, Apnoea[23], decrease in arterial blood pressure, and rarely, thrombophlebitis of the vein into which propofol is injected.

Propofol infusion syndrome is a rare, but lethal syndrome associated with infusion of propofol at 5 mg/kg/hr. Clinical features include cardiomyopathy with acute cardiac failure, metabolic acidosis, skeletal myopathy, hyperkalaemia, and hepatomegaly.

THIOPENTONE SODIUM:

It was criticized after much causality after PEARL HARBOR attack as "the cause of more fatal causalities among the serviceman at Pearl Harbor than the enemy bomb."

Chemistry and formulation: derivatives of barbituric acid (2, 4, 6 trioxohexahydropyrimidine), a hypnotically inactive pyrimidine nucleus that is formed by the condensation of malonic acid and urea.

Pharmacokinetics: Physiologic models of barbiturates describe rapid mixing of the drug with the central blood volume followed by quick distribution of the drug to the highly perfused, low-volume tissues (i.e., brain) and slower redistribution of the drug to lean tissue (muscle), which terminates the effect of the induction dose.

Metabolism: The barbiturates (with the exception of phenobarbital) are hepatically metabolized. Barbiturates are bio transformed by four processes: (1) oxidation of the aryl, alkyl, or phenyl moiety at C5; (2) N-dealkylation; (3) desulfuration of the thiobarbiturates at C2; and (4) destruction of the barbituric acid ring.

After prolonged infusions, the pharmacokinetics of barbiturate metabolism is best approximated by nonlinear MICHAELIS MENTON METABOLISM.

Mechanism of action: it acts on $GABA_A$ receptor and inhibitory neurotransmitter. CNS neurophysiologic systems have been grouped into two general categories: (1) enhancement of the synaptic actions of inhibitory neurotransmitters and (2) blockade of the synaptic actions of excitatory neurotransmitters.

ACTION:

Cerebral metabolism: the effect of barbiturates to be a dose-related depression in CMRO2, which produces progressive slowing of the EEG, a reduction in the rate of ATP consumption, and protection from incomplete cerebral ischemia.

Effect on respiratory system: produce dose-related central respiratory depression. Apnea occurs during induction of anesthesia with thiopental in at least 20% of cases, but the duration of apnea is short, approximately 25 seconds. The usual ventilator pattern with thiopental induction has been described as "double apnea.

Effects on cardiovascular system: induction is peripheral vasodilation resulting in pooling of blood in the venous system. Mechanisms for the decrease in cardiac output include (1) direct negative inotropic action, (2) decreased ventricular filling because of increased capacitance, and (3) transiently decreased sympathetic outflow from the CNS Side effects: garlic / onion taste (40% of patients), allergic reactions, local tissue necrosis, transient urticarial rash, facial edema, hives, bronchospasm.

MATERIALS AND METHODS

Type of study: - Prospective Observational Study
Period of Study: - July 2017 to September 2019
Period required for data collection:-1.5years
Period required for data analysis and reporting:--6 months

Sample Size: - 60 cases.

- Group P: n=30
- Group T: n=30

By keeping the significance level of 5% power of the study at 95% the sample size was calculated by WinEpi statistical package. The minimum sample size required was 25 in each group . Keeping in mind dropouts or exclusion , we conducted the study in 60 patients after dividing 30 patients in each group.

STUDY GROUP: -

Patients between 18 to 60 years of age of either sex scheduled for ECT receiving either thiopentone or propofol as anaesthetic agent, at Dr D Y Patil Medical College, Pimpri, and Pune

PLACE OF STUDY: -

Department of Anaesthesiology and Critical Care
Dr D.Y Patil Medical College, Hospital& Research centre.
Pimpri, Pune 411018.

No extra expenditure from patients.

Budget and funding: the study was self funded and disposables and other necessary drug supply was by central pharmacy.

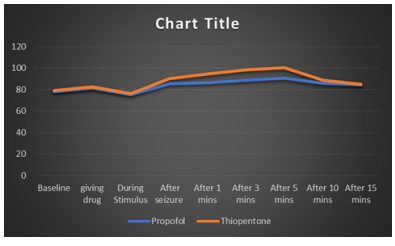
STATISTICAL DATA

Data of different parameters was summerised using arithmetic mean and standard deviation. The comparison of quantitative data was done by using test of significance based on 'T'-test. Unpaired T-test for intergroup & paired T-test for within the group comparisons. Qualitative parameters were analysed by chi-square test.

RESULTS :

Table1:Heart rate wise distribution between Propofol group and the Thiopentone group

HEART RATE	GROUP	MEAN	SD	T TEST	P VALUE
Baseline	Propofol	78.40	2.647	-1.344	0.184
	Thiopentone	79.33	2.733		
giving drug	Propofol	81.40	2.647	-1.254	0.193
	Thiopentone	82.33	2.733		
During stimulus	Propofol	75.40	2.647	-2.345	0.243
	Thiopentone	76.33	2.733		
After seizure	Propofol	85.40	2.647	-7.101	<0.001
	Thiopentone	90.33	2.733		
After 1 mins	Propofol	86.63	2.553	-11.277	<0.001
	Thiopentone	94.33	2.733		
After 3 mins	Propofol	88.80	2.618	-13.795	<0.001
	Thiopentone	98.33	2.733		
After 5 mins	Propofol	90.80	2.618	-13.567	<0.001
	Thiopentone	100.33	2.733		
After 10 mins	Propofol	85.90	3.708	-2.447	0.071
	Thiopentone	88.77	5.237		
After 15mins	Propofol	84.37	2.710	-1.058	0.294
	Thiopentone	85.13	2.897		



Heart rate is insignificant before the application of stimulus of current. It was significant after

Seizures for 5 minutes post seizures for both drugs. And patient given thiopentone shows more tachycardia than propofol. After 10 minutes of stimulus it is insignificant for both drugs.

Table 2: Mean arterial Blood pressure distribution between propofol group and the Thiopentone group

MEAN ARTERIAL BLOOD PRESSURE	GROUP	MEAN	SD	T TEST	P VALUE

Baseline	Propofol	98.24	3.495	-1.54	0.128
	Thiopentone	99.64	2.535		
giving drug	Propofol	100.24	3.495	-1.776	0.081
	Thiopentone	101.64	2.535		
During stimulus	Propofol	94.91	3.495	1.066	2.91
	Thiopentone	92.98	25.113		
After seizure	Propofol	102.24	3.495	-4.736	<0.001
	Thiopentone	105.98	2.535		
After 1 mins	Propofol	102.91	3.495	-7.696	<0.001
	Thiopentone	108.98	2.535		
After 3 mins	Propofol	104.91	3.495	-10.656	<0.001
	Thiopentone	113.31	2.535		
After 5 mins	Propofol	105.58	3.495	-13.616	<0.001
	Thiopentone	116.31	2.535		
After 10 mins	Propofol	98.96	5.417	-1.655	<0.92
	Thiopentone	101.64	2.535		
After 15 mins	Propofol	98.16	4.279	-1.640	0.107
	Thiopentone	99.64	2.535		
	Thiopentone	98.42	2.73		

The p value is insignificant before stimulus regarding mean blood pressure for both drugs. But after stimulus the rise in mean blood pressure is significant for both drugs and is more with thiopentone than propofol. After 10 minutes it is again insignificant for both drugs.

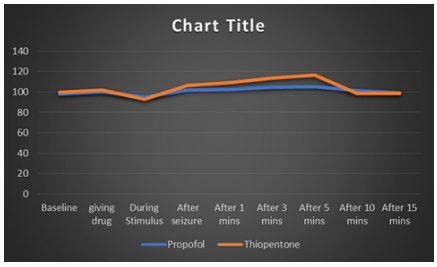
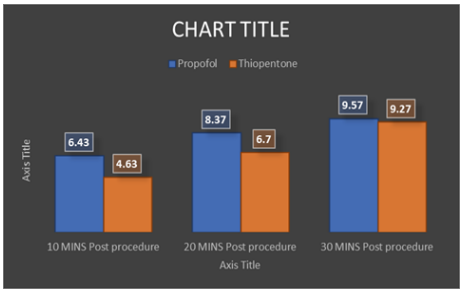


Table 3: Modified Aldrete Score between Propofol group and the Thiopentone group

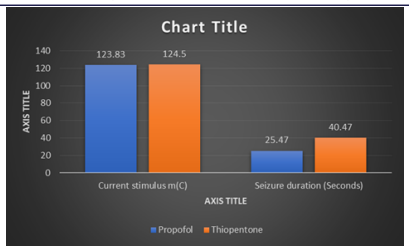
MODIFIED ALDRETE SCORE	GROUP	MEAN	SD	T TEST	P VALUE
10 MINS Post procedure	Propofol	6.43	1.040	6.61	<0.001
	Thiopentone	4.63	1.066		
20 MINS Post procedure	Propofol	8.37	.809	7.30	<0.001
	Thiopentone	6.70	.952		
30 MINS Post procedure	Propofol	9.57	.504	2.267	0.027
	Thiopentone	9.27	.521		



According to modified Aldrete score p value suggests those 10 mins and 20 mins are significant calculated by T test.

Table 4: Distribution of ECT Parameters between Propofol group and the Thiopentone group

ECT Parameters	GROUP	MEAN	SD	T TEST	P VALUE
Current stimulus m(C)	Propofol	123.83	17.718	-0.15	0.88
	Thiopentone	124.50	16.727		
Seizure duration (Seconds)	Propofol	25.47	5.563	-10.44	<0.001
	Thiopentone	40.47	5.563		



According to T test current stimulus is insignificant but the duration of the seizures is significant as p value is less than 0.001 .

DISCUSSION:

We have taken 60 patients of age 18 to 60 years of age of either sex ASA grade I & II scheduled for ECT receiving either thiopentone or propofol as anaesthetic agent, at Dr D Y Patil Medical College, Pimpri, and Pune

PLACE OF STUDY: -

Department of Anaesthesiology and Critical Care at Dr D.Y Patil Medical College, Hospital& Research, Pimpri, Pune 411018. I found that propofol is better than thiopentone for ECT. As propofol has better hemodynamic stability and better recovery profile than thiopentone.

ECT has very much important role in the treatment of disorders like catatonia, neuroleptic disorders, schizophrenia, and major depression. So here we have determined anaesthetic drug for induction which is having advantages like less hemodynamic responses, less effects on seizures and rapid recovery from drug used for induction.

W.K.Boey et all came with conclusion propofol is without any side effects. Even thiopentone shows many hemodynamic variations. But he came with conclusion the seizure duration was reduced but he was not so sure about efficiency when I observed this efficiency was hampered.

Villalonga et all he studied about hemodynamic variations are less with propofol and shows decreased seizure durations with propofol I confirmed his findings.

Michail N Aviramov studied thiopentone, propofol and etomidate for ECT induction to find out dose dependent hypnosis. In my study I confirmed postoperative hypnosis by modified Aldrete score. So I found recovery profile with propofol is better seen with modified Aldrete score.

Ingram et all came with result that thiopentone is better drug than propofol. But it was small study; on the basis of my study propofol is better drug than thiopentone for hemodynamic stability and recovery profile.

Bauer ET all came up with result of decreased seizure duration and requirement of higher electrical charge. But it in my study I seen that only seizure duration was increased with thiopentone and not required higher charge.

Vishal Uppal et all shows anaesthetic agents influence the efficiency of ECT, in my study I found out anaesthetic induction agents has variable hemodynamic responses and seizure duration was also affected by it.

Benhur Premendran is studied about short recovery period he talked about difficulties in non-operating room anaesthesia. I found out that propofol has easy drug recovery than thiopentone.

Guy sender et all showed the motor seizure duration was longer in thiopentone compared to other anaesthetic induction agent and he collected data about duration of seizures with electroencephalogram. My study just confirmed his findings.

Altaf Hussain came with conclusion about induction agents does not show any advantages. On the other hand my study showed up with propofol as better induction agent than thiopentone.

In my study I observed that gender , age , ASA grading does not affect efficiency , hemodynamic stability , recovery profile .propofol was Haemodynamically stable drug than thiopentone as data observed with systolic blood pressure, diastolic blood pressure, mean arterial blood

pressure. Saturation is not significant for either drug. Modified Aldrete score shows recovery profile is better with propofol than thiopentone whether it may be 10 mints or 20 mints.

Current stimulus was parameter which was not altered with drug. Seizure duration with thiopentone lasts more than propofol.
So propofol is better drug than thiopentone in hemodynamic stability, recovery profile and seizure duration.

CONCLUSION :

- **Heart rate wise distribution between Propofol group and the Thiopentone group:** Heart rate is insignificant before the application of stimulus of current. It was significant after Seizures for 5 minutes post seizures for both drugs . And patient given thiopentone shows more tachycardia than propofol. After 10 minutes of stimulus it is insignificant for both drugs.
- **Mean arterial Blood pressure distribution between propofol group and the Thiopentone group:** The p value is insignificant before stimulus regarding mean blood pressure for both drugs. But after stimulus the rise in mean blood pressure is significant for both drugs and is more with thiopentone than propofol. After 10 minutes it is again insignificant for both drugs.
- **Modified Aldrete Score between Propofol group and the Thiopentone group:** According to modified Aldrete score p value suggests that 10 mins and 20 mins are significant calculated by T test.
- **Distribution of ECT Parameters between Propofol group and the Thiopentone group:** According to T test current stimulus is insignificant but the duration of the seizures is significant as p value is less than 0.001 .
- This study was done to evaluate the hemodynamic stability, recovery profile and seizure duration. Propofol was better drug than thiopentone sodium in all over aspect. Propofol was Haemodynamically stable than thiopentone as I observed with systolic blood pressure, diastolic blood pressure, mean blood pressure as well as heart rate. The recovery profile was seen with modified Aldrete score. To shift the patient from recovery score 8 is necessary with propofol it was achieved early than thiopentone sodium. Seizure duration was more with thiopentone and less with propofol. There was no change in oxygen saturation with respect to drugs. Current stimulus was also constant for both drugs.

REFERENCES

1. Thomas .E Honan .B.F.: Electro Convulsive Therapy. BMJ 1953; 2:97.
2. Zinkin.S and Birtchnell .J: Electro Convulsive Therapy: its effect on memory and its therapeutic efficacy. Br. J. Psychiatry 1968; 14; 973.
3. Vipul uppal. Et.al. Anaesthesia for ECT Advance Access publication 20 September, 2010. American Psychiatry Association Committee on Electroconvulsive Therapy.
4. The practice of electroconvulsive therapy: recommendations for treatment, training, and privileging. 2nd ed. Washington, DC: American Psychiatric Association, 2001.
5. American Psychiatry Association Committee on Electroconvulsive Therapy. The practice of electroconvulsive therapy: recommendations for treatment, training, and privileging. 2nd ed. Washington, DC: American Psychiatric Association, 2001.
6. Segman RH, Shapira B, Gorfine M, Lerer B. Onset and time course of antidepressant action: psychopharmacological implications of a controlled trial of electroconvulsive therapy. Psychopharmacology 1995; 119: 440-8