www.jmscr.igmpublication.org *Impact Factcor-1.1147*
ISSN (e)-2347-176x

Journal Of Medical Science And Clinical Research
IGM Publication An Official Publication Of IGM Publication

Comparative Study of Sevoflurane and Sodium Thiopentone in Electroconvulsive Therapy

(Short Title: Comparison of sevoflurane Vs thiopentone in ECT)

Authors

Chetna Jadeja, Rashida Jadliwala, Deepak Mangal,

Dharmendra M. Gohil, V.A. Chhaya

Department of Anaesthesiology

PDU Government Medical College, Rajkot, India.

Corresponding Author

Dr Chetna Jadeja

Address: 31, University Karmachaari Society, Behind FSL, University Road,

Rajkot (Guj) India- 360005. Mobile No. 9974968442,

Email: Chetnagohil@Yahoo.Com

Abstract:
Sodium thiopentone is most commonly used agent for electroconvulsive therapy (ECT) in India, but have side effects like prolonged awakening time, arrhythmias and laryngeal spasm. Therefore keeping into view the requirements of ideal and safe induction agent for anaesthesia in ECT, new modality of induction agent like sevoflurane have been tried.
This is a randomised prospective crossover study to compare recovery profile and hemodynamics of Sevoflurane and Thiopentone sodium. 100 patients who underwent ECT were divided into two groups Group-T & Group S.
Group-T patients were induced with Inj. sodium thiopentone and inj.succinyl choline. In group-S, induction was done with Sevoflurane 8%. After loss of eye lash reflex inspired sevoflurane concentration was reduced to 2% and inj. succinyl choline 0.5 mg/kg was administered intravenously. Onset of action, seizure duration, recovery time, hemodynamic effects and side effects were noted.
Power of study was 80% and p-value <0.05 was considered significant. All data were represented as mean ± SD. The seizure duration was shorter in group S compared to Group T. The rise in heart rate (HR) was significantly more in group T as compared with group S. The rise in mean blood pressure (MBP) after delivering ECT was more in group S as compared with group T. The mean time of eye opening and response to verbal command was shorter in group S (p=0.0129, p=0.0356 respectively) than group T.
Conclusions: Sevoflurane induction was well tolerated by our patients, and its induction was associated with faster recovery. Sevoflurane does not compromise seizure induction and may offer a stable heart rate
Key-words: sevoflurane, sodium thiopentone, electroconvulsive therapy, recovery, convulsions

INTRODUCTION

The use of electroconvulsive therapy (ECT) to provoke generalised epileptic seizures was first described in 1938 and was performed without anaesthesia for almost 30 years.[1,2] In recent years, ECT has assumed an increasingly important role in the treatment of severe and medication resistant depression and mania, as well as in treatment of schizophrenia patients with affective disorders, suicidal drive, delusional symptoms, vegetative dysregulation and catatonic symptoms.[3,4,5]

Methohexital offers rapid induction and recovery from anaesthesia along with cardiovascular stability and hence it is considered as the gold standard for ECT. But due to its nonavailability in India, sodium thiopentone is most commonly used. Cost effectiveness of drug and availability at remote places, makes us to use thiopentone as most widely used anaesthetic despite its side effects[6] like prolonged awakening time, arrhythmias and laryngeal spasm. Therefore keeping into view the requirements of ideal and safe induction agent for anaesthesia in ECT, new modality of induction agent like sevoflurane have been tried.

We conducted this study with the primary aim of knowing the recovery profile of each group and secondary aims of observing the time of induction, haemodynamic profile and intraoperative/postoperative complications.

METHODS:

After institutional ethical committee approval, this randomised prospective crossover study was conducted in 100 patients aged 15 to 60 years and belonging to ASA group I & II who underwent electro convulsive therapy. Patients with heart rate <50 beats/min, systolic blood pressure < 90mmhg or >150mmhg, diastolic blood pressure <50mmhg or >110mmhg, previous history of bronchospasm / bronchial asthma or drug allergy, impaired hepatic/ renal function, pregnant woman and patient with sick sinus syndrome were excluded from the study.

Written informed consent of the patient or guardian as appropriate was taken. Patients were kept nil orally for 6 hours pre ECT. On arrival in ECT room, standard non-invasive monitoring (pulse oxymetry, NIBP) were applied and reading were noted every 2 minutes. Premedication in form of Inj.glycopyrrolate 0.004mg/Kg and Inj.ondensatron 0.08mg/Kg were given. Pre oxygenation was done with 100% O_2 for 3 minutes.

Group-T, patients were induced with Inj. sodium thiopentone 3mg/kg i.v. After loss of eyelash reflex, Inj.succinyl choline 0.5mg/kg was given intravenously. In Group-S, at time zero the anaesthetist turned the sevoflurane vaporiser to 8% concentration. After loss of eye lash reflex inspired sevoflurane concentration was reduced to 2% and inj. succinyl choline 0.5 mg/kg was administered intravenously.

After fasciculation disappeared, sevoflurane was turned off and ECT delivered bitemporally. Duration of motor activity (seizure) was noted when patient had generalised tonic clonic movement. When there was no seizure following optimal stimulus, only "masseter spasm" was observed which was correlated with other parameters like decreased oxygen saturation, initial bradycardia followed by tachycardia, conjunctival congestion and pupillary dilatation which signifies that patient had sustained seizures. The patient was monitored and ventilation assisted, until spontaneous respiration returned. Time to eye opening and time to following verbal command were recorded. When the patient maintained the airway independently with >95% SPO_2, they were transferred in the recovery room. Intraoperative complications like coughing during induction, arrhythmias, hypoxia and bradycardia were noted if any. All the patients were observed for nausea, vomiting, agitation, hypoxia and bradycardia in the postoperative period.

RESULTS

In the present study the demographic data were comparable for age and sex in both the groups (table I).

Table I: Demographic profile

	Group S	Group T	P-value	Significance
Age (years) (Mean ± SD)	35.44± 10.91	35.24± 7.97	0.9168	Not significant
Sex (M:F)	22:28	14 :36	0.0956	Not significant

In our study, time to loss of eye lash reflex was longer in group S than group T (table II) and it was statistically significant, suggesting faster induction with sodium thiopentone.

The charge delivered in ECT (p-value 0.8772) and the duration of shock delivered (p-value 0.2191) were comparable between both groups.

The time of motor activity (seizure duration) was shorter in Group S compared to group T. On statistical analysis p value is <0.0001 which is very significant.

There was a transient increase in Heart rate (HR) and Mean blood pressure (MBP) just after delivering the ECT shock in both groups. The rise in HR was significantly more in thiopentone group as compared with sevoflurane group. However the rise MBP after delivering ECT was significantly more in sevoflurane group as compared with thiopentone. After recovery the HR and MBP returned to baseline level.

The mean time of eye opening in sevoflurane Group was significantly shorter (p=0.0129) than thiopentone group (table II).

Table II : Induction, seizure duration and recovery profile.

	Group S Mean ± SD	GroupT Mean±SD	P values
Induction time (sec)	53.52±4.88	39.36±6.50	<0.001
Seizure duration (sec)	30.80±7.76	39.20±5.80	<0.001
Mean time of eye opening (sec)	322.08±71.47	347.52±38.11	0.0129
Mean time of following verbal command (sec)	344.90±68.44	364.74±35.71	0.0356

The mean time of following verbal command in sevoflurane group was significantly shorter (p=0.0356) than thiopentone group (table II). Three out of fifty (Six percent) patients in sevoflurane group had coughing during induction. No other complications were observed in either of the groups intraoperatively or postoperatively.

DISCUSSION:

Today 70% of the involutional depressives remit with electrical treatment-The Electro convulsive therapy [7]. There is need for modifying the fits of ECT under general anaesthesia of high quality administered by a skilled anaesthesiologist with a suitable intravenous induction agent or inhalational agent so that passage from consciousness to unconsciousness should be short and pleasant for the patient without any hazards of life. [8, 9] In an effort to meet these needs, sevoflurane induction via face mask was chosen as induction agent to compare with time tested sodium thiopentone.

Sevoflurane is a volatile anaesthetic agent ideally suited for induction of anaesthesia as it induces minimal irritation of airways, has an easily tolerated odour and low blood-gas solubility. It induces rapid and smooth induction and is rapidly eliminated for ease of recovery. [10]

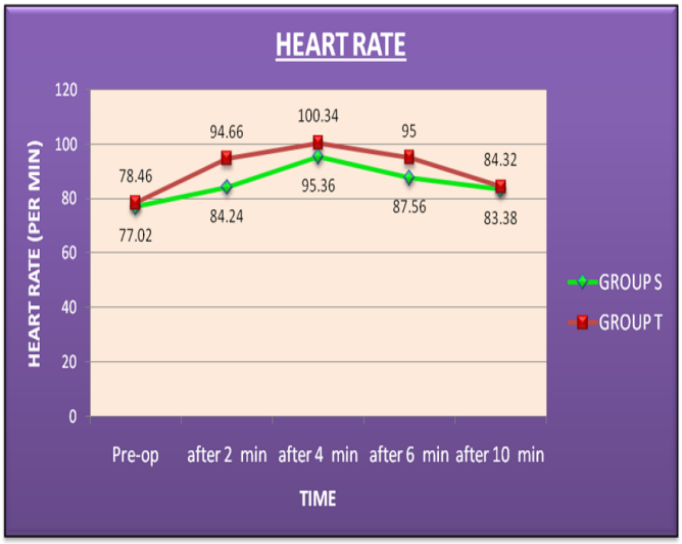
It is indicated that intravenous route of induction is faster than inhalational agent. In our study, sevoflurane induction was slower compared to thiopentone (p value <0.001), which correlates with findings of Hodgson RE, Dawson P (2004)[11] and Lewis MC, TerRiet M, (2004)[12] study.

Although the current ECT handbook suggests that a seizure of at least 15 seconds peripherally or 25 seconds on electroencephalograph (EEG) is likely to produce a consistently beneficial effect [13], there is no current substantive evidence for a minimum effective seizure length. It should be noted that measurable seizure quality indices that relates as to how generalised a seizure is, rather than to its length, such as mean integrated amplitude and postictal suppression (how quickly the EEG flattens after a seizure), are not affected by anaesthetic agent choice. It has become increasingly clear that seizure duration has limited relevance to the efficacy of ECT.[2] Although the seizure duration is not significant in treatment of ECT but in our study seizure duration was still in acceptable range (>25-35) and it was generalized in nature. Similar findings were observed by Sakeim[14] [mean 26.9] and Petrides[15] [mean 39.9] albeit using different induction agent, viz sevoflurane versus methohexital.

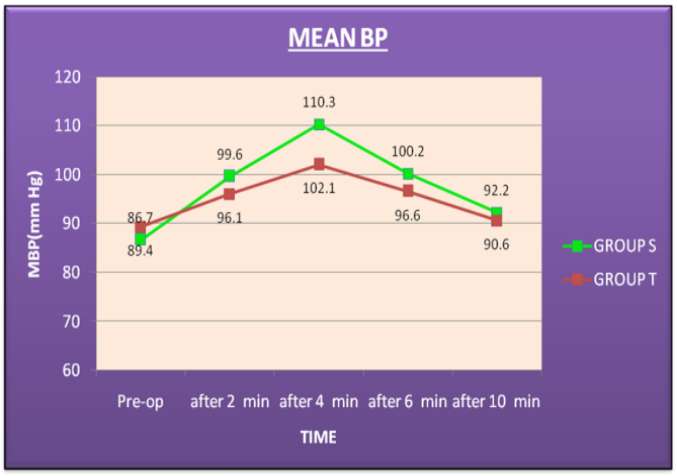
In our study, the mean time of eye opening in sevoflurane group (322.08±71.47) was significantly shorter (pvalue-0.0129) than thiopentone group (347.52±38.11), due to low blood gas solubility of sevoflurane. This indicates quicker recovery in sevoflurane group compared to thiopentone group in our study as well as study by Rasmussen et al.[16]

The cardiovascular response during ECT is associated with the release of catecholamines and occasional cardiac arrhythmias. [17,18] Systolic blood pressure (SBP) is transiently increased by 30%–40%, and heart rate (HR) is increased by 20% or more.[17-19] In our study there is a transient increase in heart rate and mean blood pressure just after delivering the ECT shock. This rise in MBP was more in sevoflurane group then thiopentone group which is statistically significant at 2, 4 and 6 minute after induction, thereafter it was in normal range. However the heart was more stable with sevoflurane as compared with thiopentone. Robert P.,Samir D. Gergis,et al.[20] had studied sevoflurane : an Alternative Anaesthetic for Electroconvulsive Therapy and speculated that sevoflurane offer a more stable heart rate in induction. Calarge, Chadi A. & his colleagues (2004)[21] have studied the comparative effect of sevoflurane and methohexital for electroconvulsive Therapy and found sevoflurane could have advantages over intravenous anaesthesia in terms of ease in anesthetizing agitated patients and reduction of post-ECT tachycardia, systolic hypertension, and thus the rate-pressure product.

Graph 1 : Heart Rate changes



Graph 2: changes in mean Blood Pressure



REFERENCES

1. Khan A, Mirolo MH, Hughes D, Bierut L. Electroconvulsive therapy. Psychiatr Clin North Am 1993; 16: 497–513.
2. American Psychiatric Association Committee on Electroconvulsive Therapy. The practice of electroconvulsive therapy: recommendations for treatment, training, and privileging. 2nd ed. Washington, DC: American Psychiatric Association, 2001: 133.
3. Thompson JW, Weiner RD, Myers CP. Use of ECT in the United States in 1975, 1980 and 1986. Am J Psychiatry 1994; 151: 1657–61.
4. 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.
5. Gaines GY 3rd, Rees DI. Electroconvulsive therapy and anesthetic considerations. Anesth Analg 1986; 65: 1345–56.
6. Dr. T.M.Omprakash, dr mohammad inayatali et.al.; Comparison of thiopentone sodium and propofol in ECT anaesthesia; Indian journal of psychological medicine, January-June 2008, 30(1):48-51
7. William Sergent and Slator, E.(1954) physical Methods of treatment in psychiatry, Page 77.
8. Kalinowasky, L.B.(1969) pharmacological and other treatments in psychiatry, American hand book of psychiatry Vol-II, basic books inc. Newyork, 1499-1516.
9. Macalay,W.S. (1953) Death due to treatment, prof.Roy. Page 348-350
10. Martindale, The Complete Drug Reference 33rd edition, Edited by Sean C Sweetman, London, Chicago, Pharmaceutical Press The Bath Press, 2002; 1265-1267.
11. Hodgson RE, Dawson P, Hold AR, Rout CC, Zuma K, Anaesthesia for electroconvulsive therapy: a comparison of sevoflurane with propofol, Anaesthesia and Intensive Care ,2004, 32(2):241-245
12. Lewis MC, TerRiet MF, DeLaCruz L, Matadial CM, Gerenstein R, DeSouza GJA, Chidiac GJ. Rapid sevoflurane induction compared with thiopental. J Clin Anesth 2004;16:271-275.
13. Lock, T (1995). "Stimulus dosing". In C Freeman (ed.) The ECT handbook. London: Royal College of Psychiatrists, 72–87.
14. Sackeim H.et al. seizure threshold in ECT : effect of age, sex, electrode placement and number of treatment. Arch Gen Psychiatry 1987;44;355-360
15. Petrides G et al.The half age stimulation strategy for ECT dosing. Convulsive therapy 1996;12;138-146
16. Rasmussen,Keith G; Spackman,Thomas N et al.The clinical utility of inhalational anaesthesia with Sevoflurane in ECT. The journal of ECT: December 2003 – Volume 19 – issue 4-pp-221-225
17. Wells DG, Davies GG. Hemodynamic changes associated with electroconvulsive therapy. Anesth Analg 1987; 66: 1193–5.
18. Mayur PM, Gangadhar BN, Girish K, et al. Acute post-ECT cardiovascular response: a comparison of threshold right unilateral and bilateral ECT. J ECT 1998; 14: 94–8.
19. Swartz CM. Physiological response to ECT stimulus dose. Psychiatry Res 2000; 97: 229–35
20. Robert P. From, Samir D. Gergis, Raymond R. Crowe, Scott J. Persing, Sevoflurane: An Alternative Anesthetic for Electroconvulsive Therapy, Anesthesiology: September 2000 - Volume 93 - Issue 3A - pg A-91
21. Calarge, Chadi A., Crowe, Raymond R. et al. The comparative effect of Sevoflurane and Methohexital for ECT. The Psychiatrist (2004) 28: 326-328.