Original Research Article

Indian Journal of Anesthesia and Analgesia
2018; 5(3):396-401
DOI: http://dx.doi.org/10.21088/ijaa.2349.8471.5318.7

An Observational Study to Compare Etomidate and Thiopentone as Inducing Agents in General Anaesthesia for Patients Posted under General and ENT Surgeries

Kushal Hajela[1], Anuja Agrawal[2], Chinar Patel[3], Malini Mehta[4]

[1]3rd year Resident [2]Assistant Professor [3,4]Professor, Department of Anesthesiology, SBKS MI & RC, Sumandeep Vidyapeeth, Piparia, Waghodia, Vadodara, Gujarat 391760.

Abstract

Background and Objective: The clinical study was undertaken to evaluate the efficacy of Thiopentone & Etomidate with reference to time to loss of eyelash reflex, hemodynamic parameters, pain on injection, myoclonus & other side effects if any. *Material and Method:* Study was conducted on 60 patients (according to Solvin's formula) of either gender, ASA I & II, 20- 60 years old, posted for elective surgeries for general surgery and Ear Nose and Throat surgery. All the patients were premedicated with inj. Fentanyl 2 mcg/kg iv slowly along with other pre medicating drugs and divided into 2 groups. Group E induced with inj. Etomidate 0.3 mg/kg iv and the group T induced with inj. Thiopentone 5 mg/kg iv. The induction time was calculated from the start of injection to the loss of eyelash reflex. The patient's hemodynamic changes during baseline, at the time of induction and 1 min, 2 mins, 5 mins & 10 mins after the induction were recorded. Pain on injectionand myoclonus were recorded during induction and other side effects were noted. *Results:* Induction time was faster in Group E (23.23±5.2 seconds) when compared with group T (32.60±4.5 seconds) (p value<0.05). Hemodynamic changes were more stable in group E and Pain on injection and Myoclonus were observed only in group E (8 & 10 patients respectively). *Conclusion:* Etomidate causes good hemodynamic stability with rapid induction than Thiopentone.

Keywords: General Anaesthesia; Thiopentone; Etomidate; Fentanyl; Haemodynamics.

Introduction

An ideal intravenous induction agent should be rapid in onset with rapid recovery & haemodynamic stability with minimal side effects [4,5,6]. Thiopentone is the earliestultra- short acting barbiturate, producing rapid intravenous induction [7].

Recently Etomidate- a rapid acting non-barbiturate hypnotic agent was introduced into clinical practice in India. Its properties include hemodynamic stability, minimal respiratory depression, cerebral protection and rapid recovery after a single dose [8].

This study allows evaluation of Etomidate in comparison with Thiopentone as an induction agent and aims to compare hemodynamic changes and other untoward effects of both the drugs.

Material and Methodology

After permission and clearance from the ethical committee, this observational study was conducted in Department of Anesthesiology. We studied 60 patients of age 20–60 years, both the genders belonging to Grade-I and II of American Society of Anesthesiologist's (ASA) classification who were admitted for elective surgeries under general anaesthesia in general and ENT surgeries. All the patients participating in the study were explained clearly about the purpose and nature of the study

Corresponding Author: Agrawal Anuja, Assistant Professor, Department of Anesthesiology, SBKS MI & RC, Sumandeep Vidyapeeth, Piparia, Waghodia, Vadodara, Gujarat 391760.
E-mail: anujagyl@gmail.com

Received on 23.12.2017, **Accepted on** 24.01.2018

in the language they understood. They were included in the study only after obtaining a written informed consent.

Whereas patients who refused for the study, belonging to American society of anesthesiology grade III and above, allergic to anydrug, having primaryand secondarysteroid deficiencyor onsteroid medication, severe respiratory & cardiac compromised or the patients who underwent any surgery under General Anaesthesia in past 1 week or emergency surgical intervention were excluded from this study.

A cross sectional analysis was made at the time of presentation. We collected the data for 1.5 years from Nov 2015 to May 2017 and analyze the data statistically.

60 Patients were randomized by simple random sampling method into two groups as follows:

- Group T (30 patients): induced with Thiopentone 5 mg/Kg iv.
- Group E (30 patients): induced with Etomidate 0.3 mg/ kg iv.

Keeping the power of study as 80% and confidence limit at 95%, to detect mean haemodynamic change between the two groups, the minimum sample size required was 20 in each group. For a better validation of results we included 30 patients in each group.

A routine pre-operative examination of all the patients was done as per routine protocols on the previous day of surgery. A night prior to surgery Tab. Alprazolam 0.5 mg per orally & Tab. Ranitidine 150 mg per orally were given to all the patients. And then they were kept nil by mouth at least eight hours before the operation.

On the day of surgery, patient was brought to the operation theatre. Intravenous line was secured with 18G cannula and the patients were given I.V. Fluids according to the requirement. Multipara monitors were attached and base line pulse rate, respiratory rate, non-invasive blood pressure, SPO_2 and ECG were recorded.

All the patients were premedicated with inj. Glycopyrrolate 0.004 mg/kg iv, inj. Ondensatron 0.1 mg/kg iv. Intravenous inj. Fentanyl 2 mcg/kg was given 5 minute before induction.After pre-oxygenation, Induction of anaesthesia was done either with etomidate 0.3 mg/kg iv or thiopentone 5 mg /kg iv. Loss of eye lash reflexes and lack of response to verbal commands was considered to be as end point of induction. Followed by this, inj. Succinylcholine 2mg/kg iv was given to facilitate tracheal intubation. Anaesthesia was maintained with 50% oxygen, 50% nitrous oxide along with inhalation agent and intravenous inj. Atracurium.

Time to loss of eye lash reflex, haemodynamic Parameters (HR, SBP, DBP)- Baseline, at the time of induction, one minute after induction, two minutes after induction, five minutes after induction and ten minutes after induction were monitored. Pain on injection and Myoclonus were observedduring induction. Side effects/ Complications if any were also observed.

Pain on Injection was Graded as follows

0: no pain,

1: grimace,

2: withdrawal of the arm,

3: both verbal complain and withdrawal of the arm

Severity of myoclonus was graded as follows:

0= No myoclonus;

1= Minormyoclonus; (short movement of a body segment e.g., a finger or a wrist)

2= Moderatemyoclonus; (mild movement of two different muscle groups e.g., face and arm)

3= Severe myoclonus. (intense myoclonic movement in two or more muscle groups, fast adduction of a limb).

Intraoperative fluid was calculated and replaced according to the patient weight and NBM status.

Patient was extubated as per routine protocols.

Observation and Results

The various observations were summarized as follows:-

Demographic data in two groups is comparable and no statistical difference found ($p= 0.85$).

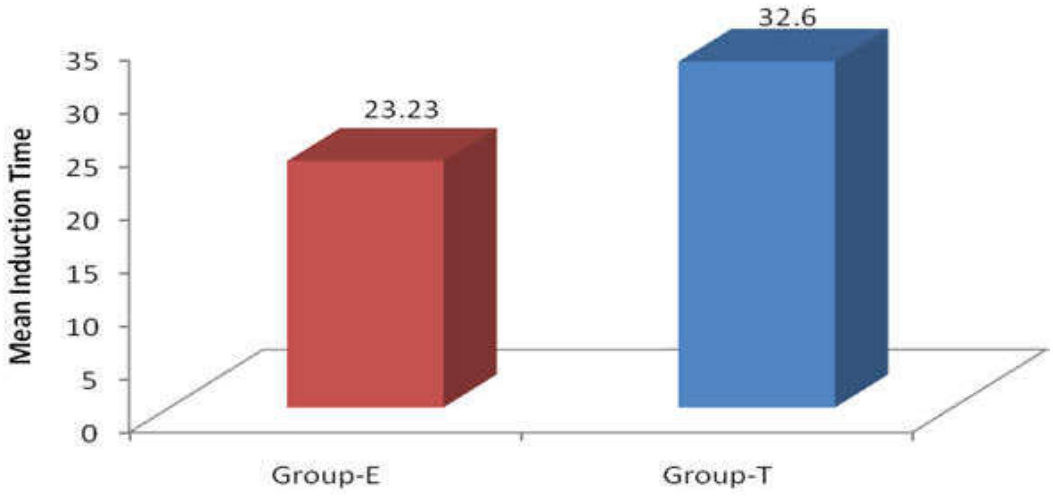
Mean induction time in Group E and Group T were 23.23±5.25 seconds and 32.60±4.59 seconds respectively. Time for induction in Group-E wasshorter compared to Group-T which was statistically significant. ($p< 0.005$) (Graph 1).

Graph 2 shows that there was an increase in HR in both the groups just prior to induction. However in Group E, it touches the pre induction value at 1 minute after induction and remained below baseline upto 10 minutes, whereas in Group T there was

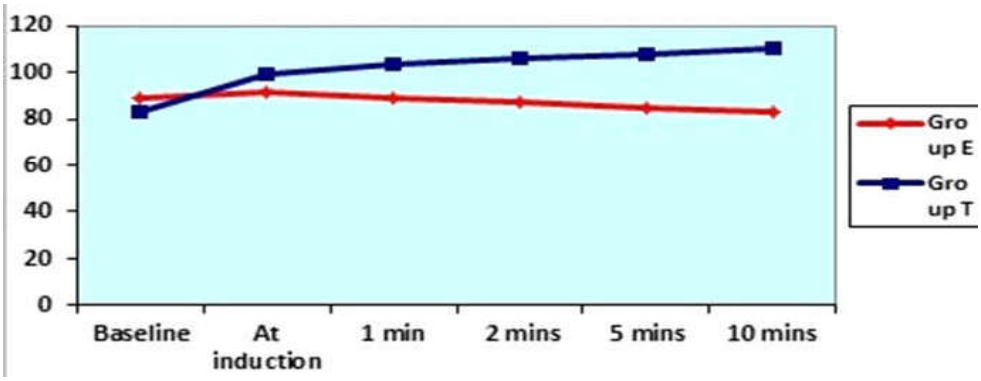
persistent increase even upto 10 mins which was statistically significant (p<0.05); Graph 3 & 4 shows SBP and DBP in Group T at induction, 1, 2, 5 &10 mins decreased in group-T> 20% which was statistically highly significant (P <0.001), whereas In Group E, it remained stable.

Pain on injection in the Group-E was observed in 26.66% patients, but none in Group-T. Which was statistically significant (p<0.05) (Graph 5).

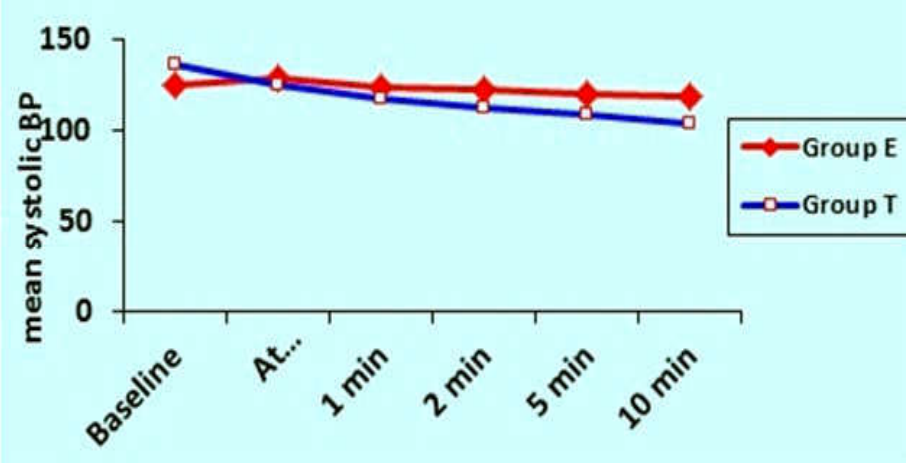
Incidence of side effect like myoclonus occurred in Group-E was 33.33% patients and in Group-T 0% which was statistically significant. (Graph 6).



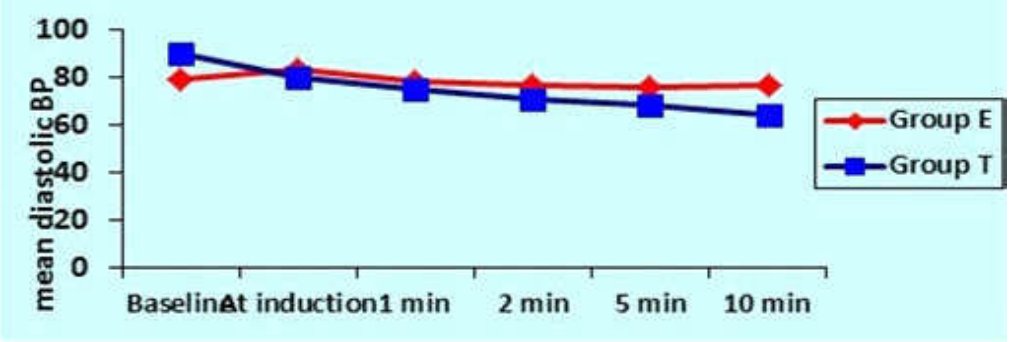
Graph 1: Induction time in both the groups



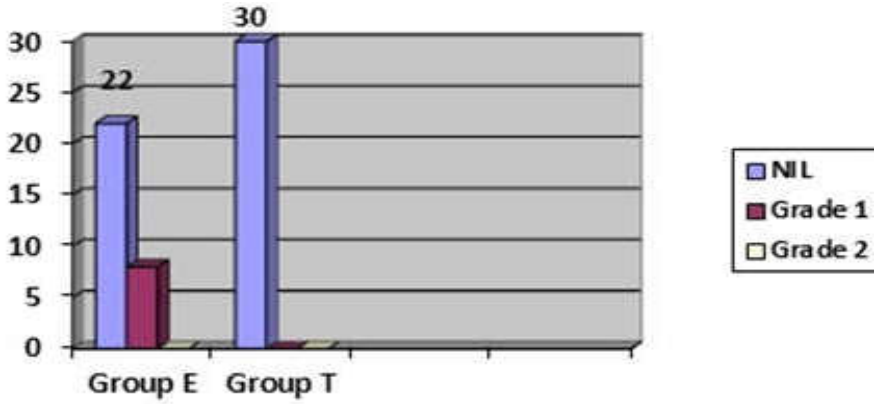
Graph 2: Heart Rate at different time intervals



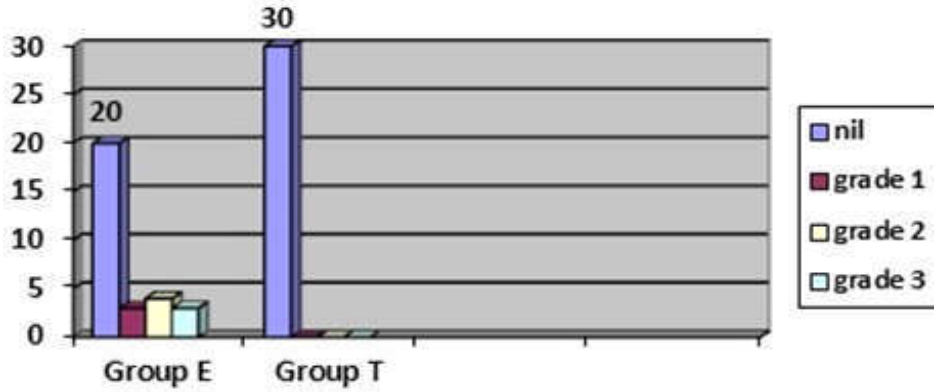
Graph 3: Mean systolic blood pressure at different intervals in both the groups



Graph 4: Mean diastolic blood pressure at different time intervals in both the groups



Graph 5: Pain on injection in both group



Graph 6: Myoclonus in both the groups

Discussion

In appropriate dosage, intravenous anaesthetic induction agents cause loss of consciousness. As discussed earlier, an ideal iv induction agent should have minimal disturbance to cardiovascular and respiratory functions, they should induce sleep in one arm brain circulation time, should be chemically stable, non -inflammable, non- toxic & easy to administer. However, in the choice of the induction agent, apart from desirable characters like rapid onset and recovery, analgesia as well as lack of excitatory phenomenon, cumulation, interaction with relaxants, post op vomiting, delirium etc, one of the main considerations will centre on cardiovascular stability that the drug possesses [4,5,6]. Etomidate is a unique drug used for induction of general anesthesia and sedation. The first report on etomidate was published in 1965 and introduced into clinical practice in 1972. Etomidate is known as propofol of 70s and 80s because of its reputation for non-cumulative and cardiostable properties, rapid onset with no stimulation of epileptiform properties. Etomidate causes

depression of reticular activating system and mimics inhibitoryeffectsof GABA. It appears to bind to a subunit of GABA type Areceptor, thus increasing its affinity for GABA. It also has disinhibitory effects on parts of nervous system that control extrapyramidal motor activity [8,10].

Etomidate has cardiovascular stability and produce minimal respiratory depression. These properties suggest that it is a useful alternative to thiopentone [8].

Since 1934, after the introduction of Thiopentone in to clinical practice by John Lundy, it has been the gold standard for induction. It is a safe, reliable and relatively inexpensive drug [7].

Thiopentone has some absolute contraindication for its use like:- Barbiturate sensitivity, hereditary intetermittent porphyria, status asthmaticus, severe anemia.

Because of cardio respiratory depressive effects of Thiopentone, it is not the drug of choice in patients with shock or patients with associated cardio respiratory disease.

The recommended induction dose is 3-6mg/kg for thiopentone and 0.2-0.5 mg/kgfor etomidate. Taking into account there levant literature and clinical experience wehave used etomidate 0.3 mg/kg and thiopentone 5mg/kg to do a randomized observational study.

All the patients in our study were similar in terms of Demographic data.

According to our study the mean time of induction (time to loss of eyelash reflex) with Inj. Etomidate was statistical significantly shorter when compared with Inj. Thiopentone ($P<0.05$).

The similar study was done by S. C Shah, et al (1980) showed Etomidate in the dose 0.3 mg/kg used achieved a fast and smooth induction of anesthesia. The average time from induction to loss of consciousness was 20 seconds. These results were consistent with our study the mean induction time with Etomidate was shorter than the mean induction time with Thiopentone (p value< 0.05).

Also similar to Shilpashri AM et al (2015) conducted a study of 60 ASA I & II patients. Induction was done with inj. Thiopentone 5 mg/kg in Group T and Group E- with inj. Etomidate 0.3 mg/kg. Induction time was faster in Etomidate group than Thiopentone group. SBP & mean HR were significantly increased in Group T, whereas in Group E there was minimal change. (p value< 0.05)

However, Batra, R.K et al (1984) showed no difference in the mean induction time between Thiopentone and Etomidate.

In the present study, both Group T and Group E were premedicated with inj. Glycopyrollate, inj. Ondensetron, inj. Midazolam & inj. Fentanyl. Hence the hemodynamic parameters were comparable post premedication.

In our study, herat rate in Group E increased at the time of induction, but then gradually decreased and remained below the baseline valueupto 10 minutes.

However heart rate in Group T increased at the time of induction as compared to baseline value and remained above the baseline value upto 10 minutes.

Our study was comparable to the study conducted byPrys Roberts et al (1971) (p value< 0.05). Whereas RP Kaushal et al (2015) observed significant increase in heart rate after administration of etomidate.

In etomidate group SBP gradually decreased at 1 minute after inductionand was well maintained near baseline values upto 10 mins.

In thiopentone group baseline SBP continuously decreased > 20% of the baseline value. There was significant fall in BP noted after 10 mins of induction. (This fall in Blood Pressure is may be beacause of the vasodilatory effect of Thiopentone)

Similar to our study, Batra et al (1984) reported arterial pressure remained steady throughout the anesthesia in Etomidate group, a fall in BP 80% patients with Thiopentone.

Similarly, Mousumi Das et al (2015) conducted a study in 90 ASA I & II patients using either Etomidate 0.3 mg/kg or Thiopentone 5 mg/kg as induction agent. There was no significant change in, Systolic blood pressure, in post induction and after intubation in etomidate group when compared to thiopentone group [9].

In this study the incidence of pain at the time of injection was higher with Etomidate i.e. In 8 patients out of 30 patients (26.66%) and none in Thiopentone group.

This correlates with the report by Batraet al (1984) observed that pain at the site of injection was noted in more number of cases of Etomidate (36%).

Myoclonus is induced by Etomidate in a dose dependent manner during induction of GA is undesirable. The consequence of this side effect can be serious in non-fasted emergency patients, patients with open eye injuries or with limited

cardiovascular reserve. Pretreatment with fentanyl and benzodizapine has shown to reduce the incidence to some extent.

Hence we premedicated all patients with inj. Midazolam and inj. Fentanyl 5 mins before induction.

One of the mechanisms proposed for Myoclonus, it is reported that it resulted from subcortical disinhibition similar to irritable leg syndrome.

In our study the incidence of myoclonus occurred in 30% of patients in Etomidate group and 0% in Thiopentone group, may be because we used 2 mcg/kg dose of fentanyl in premedication.

This is similar to reports by Batraet al (1984) Incidence of myoclonus is 28% of patients of Etomidate group and none in Thiopentone group.

No side effects were observed in any patient in both the groups.

References

1. Waxman K, Shoemaker WC, Lippmann M: Cardiovascular effects of anesthetic induction with ketamine. AnesthAnalg 1980;59:355-358.
2. Lopatka CW, Muzi M, Ebert TJ: Propofol, but not etomidate, reduces desflurane-mediated sympathetic activation in humans. Can J Anaesth 1999;46:342-347.
3. Ebert TJ, Muzi M, Berens R, et al: Sympathetic responses to induction of anesthesia in humans with propofol or etomidate. Anesthesiology 1992;76: 725-733.
4. Lee AJ, S Atkinson, Rushman GB, NJH Davies. Lee's Synopsis of Anaesthesia. 11thed. Butterworth-Heinemann international; 1993;157-170.
5. Stoelting RK, Simon MD, Hillier MB. Pharmacology and Physiology in Anesthetic practice. 4th ed. Lippincott Williams and Wilkins C; 2006;126-139, 163-167.
6. Thomas E J Healy and Paul R Knight, Andrew R A Rushton and Robert Sneyo Wylie and Churchill-Davidson's A Practice of Anesthesia Seventh Edition, chapter 35 clinical pharmacology and anesthetic techniques 2003.p.572-577.
7. John W Dundee; Thiopentone & other Thiobarbiturates; British Journal of surgery 1956; 44(183).
8. Stuart A. Forman: Clinical and Molecular Pharmacology of Etomidate. REVIEW ARTICLE; David S. Warner, M.D., Editor the American Society of Anesthesiologists, Inc. Lippincot Williams & Wilkins. Anesthesiology 2011;114:695–707.
9. Mousumi Das et al. Comparative study on haemodynamic responses during intubation using etomidate, propofol and thiopentone in laproscopic cholecystectomy surgeries. Innovative Journal of Medical and Health Science 2015 July-August; 5(4):150-158.
10. Ronald D. Miller, J.G. Peter S, et al. Millers Anesthesia 6 Edition chapter 10 Intravenous non opioid anesthetic Elsevier Churchill Livingstone. 2005;1:317-355.