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# Study of Injection Etomidate and Injection Thiopentone Sodium for Induction of General Anaesthesia

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ABSTRACT

Stability of hemodynamic during induction of general anesthesia in surgical patients is very important. Our current study was used to compare hemodynamic parameters and side effects (myoclonus and nausea / vomiting) for induction of general anesthesia by etomidate and thiopentone in surgical patients. No other class of pharmacologic agents is more central to the practice of anesthesiology than the intravenous sedatives and hypnotics. The study was performed on 80 patients between the ages of 18 and 60 under elective surgery under general anesthesia. Etomidate is characterized by good cardiovascular stability compared to thiopentone. Etomidate can be used as a safe, haemodynamically stable and effective alternative to thiopentone for induction of general anaesthesia

**Keywords:** Injection, etomidate, thiopentone, anaesthesia, haemodynamic

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## INTRODUCTION

No other class of pharmacologic agents is more central to the practice of anaesthesiology than the intravenous sedatives and hypnotics (anxiolysis, light and deep sedation and general anaesthesia). Haemodynamic stability is very important during induction of general anaesthesia. Depending on the specific agent, the dose, and the rate of administration, many sedative-hypnotics can be used to allay anxiety with minimal sedation, produce varying degrees of sedation, or rapidly induce the state of drug-induced unconsciousness (general anaesthesia). The main drawbacks are cardiovascular and respiratory depression, increased incidence of laryngospasm, bronchospasm and allergic reactions. The research for a better inducing agent which has good control of haemodynamic changes during intubation like etomidate have been tried with varied success.

## AIM OF THE STUDY

Studying induction profile of etomidate and to compare it with thiopentone sodium for induction of general anaesthesia.

## OBJECTIVES OF THE STUDY

To study the haemodynamic changes (systolic blood pressure, diastolic blood pressure and heart rate) during pre-induction, induction and immediately after intubation. And to evaluate the incidence of Myoclonus and Nausea and Vomiting.

## REVIEW OF LITERATURE

Shah et al., conducted a study on 100 out patients. Use of etomidate (induction agent) in patients undergoing endoscopies along with succinylcholine as muscle relaxant in all the cases. Maximum patients showed significant increase in the BP and HR, pain on injection was 2%, involuntary muscle movement was 18%, erythematic of face and neck was 4% and muscle over activity was present in 5%. The mean recovery time was 67 minutes and the recovery was complete without any hangover. [1]

Shah et al., conducted study on 131 patients. Etomidate (R16659) is a new water soluble potent rapidly acting IV hypnotic agent. Patients were selected for short duration procedures and the results of premedication of pentazocine, diazepam, fentanyl and atropine were observed. Double blind study was done with first three drugs. Incidence of involuntary movements was decreased significantly with premedication. They concluded that pain on inj. was minimum with fentanyl as premedication while incidence of emesis was less with diazepam group but higher with pentazocine group. [2]

Olesen et al., conducted a study on sixty one patients. The frequency of local irritation after the intravenous injection of etomidate or thiopentone was studied. The patients who received etomidate, 24% developed thrombophlebitis and the patients who received thiopentone. Post operatively, 4% developed thrombophlebitis. Pain on inj. occurred in 24% receiving etomidate. They noticed that there was no correlation between pain and the subsequent thrombophlebitis. [3]

Stockham et al., studied that the anaesthetic doses of fentanyl (46 +/- 1.3 micrograms/kg) and oxygen (group I) were compared to a moderate dose of fentanyl (3 to 4.7 micrograms/kg; mean = 3.54 +/- 0.1 micrograms/kg) + etomidate (0.4 mg/kg) intravenously (IV) (group II) during the anaesthetic induction-endotracheal intubation sequence to evaluate haemodynamic changes and the incidence of complications in 23 New York Heart Association class III and IV patients. Chest wall rigidity only occurred in group I (27%), and pain on injection (8%) and myoclonus (25%) only in group II. Patients in group I experienced transient, small increases in central venous pressure (immediately after induction) and mean pulmonary artery pressure (after tracheal intubation). Patients in group II had short and transient decrease in heart rate, mean arterial blood pressure and cardiac index after induction which returned to baseline levels immediately after tracheal intubation. The results suggested that a modest dose of fentanyl followed by inj. etomidate may be an alternative of high doses of inj. fentanyl in patients with limited cardiovascular reserve, especially when prolonged postoperative respiratory depression due to high doses of an opioid is undesirable.[4]

Kaushal et al., studied on 60 patients (age: 20–60 years, weight: 40–70 kg) of American Society of Anesthesiologists Grade II and III scheduled for elective coronary artery bypass grafting (CABG)/mitral valve replacement (MVR)/aortic valve replacement (AVR) on cardiopulmonary bypass (CPB) were enrolled in this prospective randomized study. Group I: Injection propofol (P) group (2 mg/kg) IV. Group II: Etomidate (E) group (0.2 mg/kg) IV.

They observed that etomidate, when used for induction of anaesthesia provides more stable haemodynamic parameters as compared to propofol in patients with poor LV function. There is a rise in serum Cortisol levels on the initiation of CPB after induction of anaesthesia with propofol. This was absent in the etomidate group, where the serum Cortisol levels reduced. Serum Cortisol levels returned to near normal range at 24 h without any untoward effects. [5]

The values though were almost twice the baseline.

### Myoclonus

In my study the frequency of myoclonus observed in etomidate group was 7 patients (17.5%) and there was no myoclonus observed in thiopentone group.

Giese [6] et al., inferred that patients induced with etomidate had greater incidence of myoclonus compared with thiopentone.

Choudhary [7] et al., found that involuntary muscle movements in 18% of the patients.

Shah [2] et al., reported the frequency of 18 to 59% of involuntary movements when induced with injection etomidate. Without pre-medication amongst the involuntary movements the frequency of myoclonus was high. While induction with etomidate with pre-medication resulted in a significantly lower incidence of involuntary movements.

## MATERIALS AND METHODS

### Sample size

To determine 20% difference in hemodynamic parameters for α value of 0.05 and power of 80%, according to previous study a sample size of 80 patients (40 patients in each group) were included in our study.

### Study design

Prospective, Comparative, Single blinded, Randomized study.

### Source of data and duration of study

This study was conducted on 80 patients aged between 18 to 60 years undergoing elective surgeries under general anaesthesia in KIMS Hospital, Karad, Maharashtra. The study was carried out for a period of 18 months i.e. from December of 2016 to July of 2018.

Randomization was done with the help of Microsoft Excel. The performas were labelled either group "T" or group "E" according to randomization or was put in the concealed envelope. At the time of performing the study the envelopes were taken serially and inj. thiopentone or inj. etomidate was used accordingly.

## OBSERVATIONS AND RESULTS

In study 80 patients belonging to ASA physical status grade I or II undergoing elective surgeries under general anaesthesia was done in table-1.

**Table 1: Distribution of study subjects according to demographic and drugs used.**

| Demographic characteristics | Type of drug used Thiopentone (n=40) | Etomidate (n=40) | P Value |
|---|---|---|---|
| Male | 22 | 21 | |
| Female | 18 | 19 | 0.50 |
| Mean age in years | 44.12 ± 13.93 | 39.92 ± 14.43 | 0.18 |
| Mean wt. in Kg | 64.2 ± 9.85 | 61.42 ± 9.32 | 0.19 |

The mean weight was 64.2 ± 9.85 kgs in group T and 61.42 ± 9.32 kgs in group E respectively. The difference was not significant (p value >0.05).

The minimum and maximum age was 18 yrs and 60 yrs in both group T and group E respectively. The mean age in group T was 44.12 ± 13.93 yrs and in group E was 39.92 ± 14.43 years.

The distribution was 22 males and 18 females in thiopentone group and 21 males and 19 females in etomidate group in table 2.

**Table 2: Comparison on the basis of types of surgeries.**

| Types of surgeries | Group-T | Group-E |
|---|---|---|
| Abdominal surgeries | 8 | 10 |
| Neuro surgeries | 5 | 12 |
| Urology surgeries | 3 | 4 |
| Orthopedic | 7 | 3 |
| ENT | 1 | 3 |
| Others | 16 | 8 |
| Total | 40 | 40 |

The surgeries in the thiopentone groups are mainly abdominal, orthopedic and neurosurgeries and in etomidate groups are neurosurgery, abdominal and urology surgeries.

**Table 3: Distribution of study subjects according to ASA physical status grading and drugs used.**

| ASA | Types of drug used Thiopentone (n=40) | Etomidate (n=40) | Total |
|---|---|---|---|
| I | 9 | 9 | 18 |
| II | 31 | 31 | 62 |
| Total | 40 | 40 | 80 |

The distribution of ASA physical status grade I & II was equal in thiopentone and etomidate group in table 3.

**Table 4: Distribution according to nausea/vomiting and myoclonus**

| Adverse effects | Type of drug used Thiopentone Number (%) | Etomidate Number (%) |
|---|---|---|
| Nausea or vomiting | 2 (5) | 10 (25) |
| Myoclonus (MC) | 0(0) | 7(17.5) |
| Total | 2 | 17 |

(Fisher exact test, $p<0.05$)

Compare to etomidate group post-operative nausea and vomiting was less in thiopentone group. In thiopentone group nausea and vomiting was present in 2 patients (5%) while in etomidate group it was in 10 patients (25%) in table 4.

In etomidate group incidence of myoclonus observed in 7 patients (17.50%) but there was not anyone in the thiopentone group. Statistically it was significant for both nausea or vomiting and myoclonus. (Fisher exact test, $p<0.05$).

## DISCUSSION

Usually the route of administration of medication in general anesthesia in adult subjects is via. Intravenous route. Near ideal intravenous induction agent should possess certain features such as: it should produce minimal hemodynamic changes, should induce unconsciousness in one arm-brain circulation, should be chemically inert, non-inflammable, non-toxic, easy to administer and easily available. Thiopentone has been the standard for induction agents. It is safe, reliable and is relatively inexpensive. Absolute contraindications for use of this drug are barbiturate sensitivity and hereditary intermittent porphyria. Thiopentone also causes cardiorespiratory depression. So it is not the "first line drug" in the patients who are associated with cardiorespiratory disease or in shock.

This study was lead to determine the features of etomidate as intravenous agent in elective surgeries when injected in a dose of 0.3 mg/kg compared to injection thiopentone 5 mg/kg. The following parameters were observed amongst the two groups- Induction time, haemodynamic changes during pre-induction, induction and immediately after intubation and complications (myoclonus and nausea/vomiting). Batra [8] et al., found that etomidate is more cardio stable than thiopentone. Arterial blood pressure in etomidate group was steady and there was fall of about 80% in blood pressure in thiopentone group with more episodes of hypotension. The incidence of hypotension was more after thiopentone. Insignificant fall in BP has been observed in etomidate group. According to report by Korgaonkar [9] et al., changes in heart rate were not remarkable after injection of etomidate. A rise of 10-20 beats/min was seen in 12% whereas there were no changes in 87% patients. Das [10] et al., found that after induction heart rate did not significantly change compared to pre-induction in etomidate group but in thiopentone group heart rate increased significantly.

## CONCLUSION

In our study it can be concluded that the induction time was comparatively lesser in etomidate group. Etomidate is effective as a rapid acting induction anaesthetic agent compared to thiopentone. Etomidate is characterized by good cardiovascular stability compared to thiopentone. So etomidate can be used as a safe, haemodynamically stable and effective alternative to thiopentone for induction of general anaesthesia.

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