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RESEARCH ARTICLE

A COMPARISON OF ETOMIDATE AND THIOPENTONE AS INDUCTION AGENTS IN LAPAROSCOPIC SURGERIES

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ABSTRACT

This study was designed to compare the hemodynamic effects of etomidate and thiopentone during induction in laparoscopic surgeries. Stimulation of laryngeal and tracheal tissues during intubation causes catecholamine discharge with an increase in sympathetico-adrenergic activity and also an increase in systemic blood pressure and heart rate. These increases begin with laryngoscopy. Various induction agents are used for laparoscopy. Etomidate is characterized by hemodynamic stability , minimum respiratory depression and cerebral protective effects. Its lack of effect on sympathetic nervous system and its effect on increased coronary perfusion makes it an induction agent of choice. Thiopentone is a barbiturate derivative having rapid onset of action and rapid awakening with single induction dose due to rapid uptake.

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INTRODUCTION

Laparoscopic surgery is minimal invasive surgery that is associated with several advantages like smaller scar, reduced bleeding, reduced postoperative pain and infection which contributes to shorter hospital stay. CO2 insufflation will cause increased abdominal pressure and hypercapnia which may contribute to undesirable hemodynamic changes. Laparoscopy leads to ventilatory changes as the pneumoperitoneum created decreases thoraco-pulmonary compliance by 30%-50% in healthy and obese patients. Reduction in functional residual capacity and development of atelectasis due to elevation of the diaphragm and changes in the distribution of pulmonary ventilation and perfusion from increased airway pressure can be expected. Various induction agents are used for laparoscopy. Etomidate, carboxylated imidazole is characterised by hemodynamic stability, minimal respiratory depression and cerebral protective effects. Its lack of effect on sympathetic nervous system and its effect of increased coronary perfusion makes it an induction agent of choice. Thiopentone is a barbiturate derivative having rapid onset of action and rapid awakening with single induction dose due to rapid uptake.

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Aims and objectives: The aim of this study is to compare and evaluate the intraoperative hemodynamic changes after induction of anesthesia with Etomidate and Thiopentone for patients undergoing laparoscopic surgeries. Objective is to compare hemodynamic parameters –Pulse, Systolic BP,Diastolic BP, Mean arterial pressure.

MATERIALS AND METHODS

Following the approval by hospital ethics committee, after obtaining written,informed consent from patient's relatives, study was done. Sixty patients,aged 20-70 years, either sex, ASA grade I-II-III, scheduled to undergo laparoscopic surgery under general anaesthesia were included in the study. Preoperative assessment was done and investigations were noted.In operation theatre intravenous cannula of proper size was inserted into the largest vein on the forearm and an infusion of DNS was started . All thepatients were pre-medicated with intravenous glycopyrrolate 0.004mg/kg, ondansetron 0.15mg/kg, fentanyl 2µg/kg. ECG, NIBP, SpO2 was monitored.Base line hemodynamic parameters were recorded. All the patients were preoxygenated with 100% O 2 for 3mins. Now patients were randomly divided to one of the following two groups 30 patients each as per study drug injected.

Group 1: Patient receiving etomidate 0.5mg/kg.
Group 2: - Patient receiving thiopentone 5mg/kg.

Patient was induced with either of the above induction agents, intubation was done with inj. succinylcholine 2mg/kg. Anaesthesia was maintained with oxygen and inhalational agent Sevoflurane. Titration of inhalational agents was targeted to maintain MAP within 20% of baseline values. Muscle relaxation was maintained by intermittent doses of Vecuronium bromide.Intraoperative ECG NIBP spo2 EtCo2 was monitored .

On completion of surgery , patient was reversed using Inj. Glycopyrrolate 0.008mg/kg IV and Inj. Neostigmine 0.05mg/kg IV. All observation were recorded and results were analysed statistically. Data was expressed as mean ± SD. For comparing data between 2 groups, Student-t test (analysis of variance) was used and p value< 0.05 was interpreted as clinically significant.

OBSERVATION AND RESULTS

In our study total 60 patients were selected.30 patients received Thiopentone and rest 30 patients received Etomidate as intravenous induction agent. All the patients completed the study.

Group E (n=30) received Etomidate
Group T (N=30) received Thiopentone
Observations were compiled and result were analysed statistically.

Table 1. Pulse rate

	Group-E (N=30)	Group-T (N=30)	P Value
BASELINE	77.9 ± 6.01	75.8 ± 4.93	0.1444
PREMEDICATION	81.76 ± 6.98	80.56 ± 5.24	0.4545
INDUCTION	79.83 ± 5.26	80.3 ± 6.77	0.7650
INTUBATION	82.56 ± 5.72	90.63 ± 6.80	<0.0001
1 MINS	79.5 ± 6.38	94.66 ± 5.04	<0.0001
3 MINS	80.76 ± 5.96	93.1 ± 4.12	<0.0001
5 MINS	80.73 ± 4.84	91.66 ± 5.95	<0.0001
15 MINS	78.73 ± 5.67	87.93 ± 5.57	<0.0001
30 MINS	80.56 ± 5.63	82.26 ± 6.20	0.2708

Table 2. Systolic Blood Pressure

	Group-E (N=30)	Group-T (N=30)	P Value
BASELINE	118.9 ± 10.06	119.1 ± 8.26	0.6430
PREMEDICATION	127.6 ± 9.13	124.2 ± 9.21	0.1564
INDUCTION	120.2 ± 6.61	124.5 ± 9.92	0.0529
INTUBATION	120.9 ± 6.72	125.1 ± 7.79	0.0292
1 MINS	121.3 ± 7.57	128.5 ± 9.41	0.0018
3 MINS	120.1 ± 7.58	127.03 ± 7.60	0.0008
5 MINS	121.8 ± 6.9	126.43 ± 8.59	0.0308
15 MINS	122.1 ± 6.84	124.8 ± 8.50	0.1805
30 MINS	121.6 ± 8.47	123.2 ± 8.84	0.4770

Table 3. Diastolic Blood Pressure

	Group-E (N=30)	Group-T (N=30)	P Value
BASELINE	80.5 ± 7.71	81.7 ± 6.07	0.5056
PREMEDICATION	84.9 ± 7.61	84.1 ± 6.84	0.1564
INDUCTION	81.7 ± 6.75	82.6 ± 6.29	0.6701
INTUBATION	82.2 ± 6.43	81.8 ± 5.08	0.7901
1 MINS	82.6 ± 5.47	89.6 ± 5.61	<0.0001
3 MINS	80.6 ± 6.35	87.7 ± 7.96	<0.0001
5 MINS	81.1 ± 5.85	86.5 ± 5.13	0.0003
15 MINS	81.3 ± 5.16	85.1 ± 3.58	0.0016
30 MINS	81.7 ± 6.86	84.1 ± 5.95	0.1531

Table 4. Mean Blood Pressure

	Group-E (N=30)	Group-T (N=30)	P Value
BASELINE	93.4 ± 5.51	94.2 ± 4.50	0.5403
PREMEDICATION	99.2 ± 4.33	97.53 ± 5.66	0.2014
INDUCTION	94.6 ± 4.66	96.5 ± 5.73	0.1642
INTUBATION	95.2 ± 4.71	96.3 ± 4.11	0.3391
1 MINS	95.5 ± 3.55	102.5 ± 3.96	<0.0001
3 MINS	93.8 ± 4.43	100.8 ± 5.54	<0.0001
5 MINS	94.6 ± 4.31	99.8 ± 4.21	<0.0001
15 MINS	94.8 ± 3.55	98.4 ± 3.63	0.0003
30 MINS	94.8 ± 4.28	96.1 ± 4.30	0.2453

Table 1 shows the changes in heart rate in the two study groups and comparison among them to baseline value. In etomidate group heart rate did not significantly change during induction and during intubation and after 30 mins postintubation compared to pre--operative value. But in thiopentone group ,during intubation and after intubation till 15 mins heart rate increased significantly compared to pre-operative value.

Table 2 shows change in Systolic blood pressure in the two study groups. In etomidate group , induction and after 30 mins postintubation systolic blood pressure did not change significantly as compared to baseline. In thiopentone group, during and after 5mins postintubation there is significant increase in systolic blood pressure compared to baseline. Table 3 shows the changes in diastolic blood pressure in the two study groups and comparison of them with preinduction (baseline) value. In etomidate group, there was no significant changes in diastolic blood pressure during induction or after 30mins postintubation. But in thiopentone group there is significant increase in diastolic blood pressure after intubation till 15 mins. Table 5 shows changes in mean blood pressure in the two study groups. In etomidate group, there is no significant changes in mean blood pressure after induction or post intubation. But in thiopentone group there is significant increase in mean blood pressure following intubation.

DISCUSSION

Early mobilization and shorter hospital stay are the main advantages of laparoscopic surgery. Being minimal invasive surgery, laparoscopic surgeries are very popular now a days. The main drawback is intra-operative hemodynamic instability due to pneumoperitoneum. Now a days many laparoscopic surgeries are conducted as a daycare surgery. Therefore, anesthesiologist must choose anesthetic agent which provide hemodynamic stability and rapid recovery. We compared 60 patients of ASA physical status I-II -III undergoing either laparoscopic surgery under general anesthesia for hemodynamic stability of etomidate and thiopentone. In the two groups heart rate and blood pressure were taken in stepwise manner, at baseline, premedication , induction, intubation and after intubation at 1,3,5,15 and 30 mins. The recorded values were tabulated for age, weight, sex, heart rate, systolic blood pressure, diastolic blood pressure and mean blood pressure. The result of the study was compared with the observation of other workers in the field of work taking into account for the differences as far as possible.

The discussion of the study is as follows:

Haemodynamic Parameters

Heart Rate: As shown in table 1, baseline values of mean heart rate were comparable between both the groups with no statistically significant difference (P>0.05). Changes in the heart rate during induction were also not statistically significant between both the Groups(P>0.05). During intubation and after intubation there was significant increase in heart rate values in the group thiopentone compared to the group etomidate. During intubation and after intubation 1,3, 5, 15 and 30 mins heart rate values were 82.56±5.72,79.5±6.38,80.76±5.96,80.73±4.84,78.73±5.67,80 .56±5.63 in the group etomidate respetively. In group T(thiopentone) during intubation and after intubation 1,3,5,15,30 minutes mean heart rate values were 90.63±6.80,94.66±5.04,93.1±4.12,91.66±5.95,87.93±5.57,82 .26±6.2 respectively. Comparing the heart rate of two groups P value was calculated and was found to be significant as P value is <0.05. P value during and after intubation was found to be <0.0001 till 15 minutes and at 30 minutes after was 0.2708. This showed that heart rate remained stable throughout 30 mins post intubation in etomidate group while a significant increase was seen in thiopentone group following intubation. Mousami das, Basant ku in their study showed post induction and after intubation ,in etomidate group heart rate did not significantly change compared to pre induction. In thiopentone group , post induction and after intubation heart rate increased significantly compared to pre-induction.[35]

Systolic Blood Pressure: As shown in table 2, baseline values of systolic blood pressure were comparable between both the groups with no statistically significant difference (P>0.05).Changes in the systolic blood pressure after giving study drug i.e during induction were also not statistically significant between both the groups(P>0.05). Systolic blood pressure during induction in group E was (120.2 ± 6.61) and in group T was(124.5 ±9.92) which showed a mild increase in thiopentone group but was insignificant as P value is 0.0529. During intubation and after intubation till 5 mins there was significant increase in systolic blood pressure values in the group thiopentone compared to the group etomidate. During intubation and after intubation 1,3, 5,15 and 30 mins systolic blood pressure values were 120.9±6.72,121.3±7.57,120.1±7.58,121.8±6.9,122.1±6.84,12 1.6±8.47in the group etomidate. In group T(thiopentone) during intubation and after intubation 1,3,5,15,30 minutes systolic blood pressure values were 125.1±7.79,128.5±9.41 ,127.03±7.60, 126.43±8.59, 124.8±8.5 and 123.2±8.84 respectively. Comparing the systolic blood pressure during and after intubation of two groups P value was calculated and was found to be significant as P value is <0.05. P value during and after intubation was found to be 0.0292,0.0018,0.0008,0.0308 till 5 minutes and at 15 and 30 minutes after was 0.1805 and 0.4770 which suggested that while using etomidate systolic blood pressure remained stable throughout and with thiopentone there was significant increase till 5 minutes after intubation and settled to baseline within 15 minutes. Haris et al detected in their study that there were significant increases in SAP values in the group receiving thiopentone after intubation.[3] Mehmet Levent ugyur et al in their study showed remarkable increase in SAP in 1st and 5th minute postinduction in the group receiving thiopentone .[37]

DIASTOLIC BLOOD PRESSURE: As shown in table 3, baseline values of diastolic blood pressure were comparable between both the groups with no statistically significant difference(P>0.05).Changes in the diastolic blood pressure after giving study drug i.e during induction were also not statistically significant between both the groups(P>0.05).Diastolic blood pressure during induction in group E was (81.7± 6.75) and in group T was(82.6±6.29) with insignificant P value 0.6701. After intubation from 1 min till 15 mins there was significant increase in diastolic blood pressure values in the group thiopentone compared to the group etomidate.

After intubation 1,3, 5,15 and 30 mins diastolic blood pressure were 82.6±5.47,80.6±6.35,81.1±5.85,81.3±5.16, 81.7±6.86 in the group etomidate respectively. In group T(thiopentone) after intubation 1,3,5,15,30 minutes mean diastolic blood pressure values were 89.6±5.61,87.7±7.96,86.5±5.13,85.1±3.58, 84.1±5.95 respectively. Comparing the diastolic blood pressure after intubation of two groups P value was calculated and was found to be <0.0001,<0.0001,0.0003,0.0016,0.153 which suggested that while using etomidate diastolic blood pressure remained stable throughout till 30 mins postintubation and with thiopentone there was significant increase till 15 minutes after intubation and settled to baseline within 30 minutes. Lindgren L et al. studied hemodynamic and catecholamine changes after induction of anesthesia with either thiopentone or propofol. With thiopentone , heart rate was greater than propofol before intubation. During induction systolic and diastolic blood pressure decreased more with propofol than with thiopentone[25]

MEAN BLOOD PRESSURE

As shown in table 4, baseline values of mean blood pressure were comparable between both the groups with no statistically significant difference (P>0.05).Changes in the mean blood pressure after giving study drug i.e during induction was also not statistically significant between both the groups(P>0.05). Mean blood pressure during induction in group E was (94.6±4.66) and in group T was(96.5±5.73) with insignificant P value 0.1642. During intubation there was no significant changes in both the groups. After intubation there was significant increase in mean blood pressure values in the group thiopentone compared to the group etomidate. After intubation 1,3, 5,15 and 30 mins were 95.5±3.55,93.8±4.43,94.6±4.31,94.8±3.55,94.8±4.28 in the group etomidate respectively. In group T(thiopentone) after intubation 1,3,5,15,30 minutes mean blood pressure values were 102.5±3.96,100.8±5.54,99.8±4.21,98.4±3.63,96.1±4.3 respectively. Comparing the mean blood pressure after intubation of two groups P value was calculated and was found to be significant as P value is <0.05. P value after intubation was found to be <0.001 for 1,3,5 minutes and 0.0003 at 15 minutes till which suggested that while using etomidate mean blood pressure remained stable throughout till 30 minutes postintubation and with thiopentone there was significant increase till 15 minutes after intubation and settled to baseline within 30 minutes. Brossy MJ et al. In their study found that heart rate increased significantly above baseline after induction and intubation in both groups but there were no differences between groups. Arterial pressure

increased significantly at 1 min after intubation in both groups and at 2 min in the thiopentone group only.[36]

Summary

This study was designed to study and compare the effectiveness of intravenous Etomidate and Thiopentone in attenuating hemodynamic response to direct laryngoscopy and endotracheal intubation in patients undergoing laparoscopic surgical procedures under General Anaesthesia.

Conclusion

- The demographic profile of the patients in terms of age, body weight and sex were comparable in both the groups.
- There was no significant change in heart rate, systolic blood pressure, diastolic blood pressure and mean blood pressure in post induction and after intubation in Etomidate group.
- In Thiopentone group heart rate, systolic blood pressure, diastolic blood pressure, mean blood pressure increased significantly post intubation compared to preoperative values.
- From the above observations and discussion , it is concluded that Etomidate attains most properties of an ideal induction agent in comparison to Thiopentone as far as the haemodynamic responses during laryngoscopy and intubation is concerned in laparoscopic surgeries.

REFERENCES

Stowe DF, Bosnjak ZJ, Kampine JP. Comparison of etomidate, ketamine, midazolam, propofol, and thiopental on function and metabolism of isolated hearts. Anesth Analg 1992; 74: 547-58.

Gelissen HP, Epema AH, Henning RH. Inotropic effects of propofol,thiopental, midazolam, etomidate, and ketamine on isolated human atrial muscle. Anesthesiology 1996; 84: 397-403.

Harris E, Murray AM, Anderson JM, Grounds RM, Morgan M. Effects of thiopentone, etomidate and propofol on the haemodynamic response to tracheal intubation. Anaesthesia 2007; 43: 32-6

Sarkar M, Laussen PC, Zurakowski D, et al. Hemodynamic responses to etomidate on induction of anesthesia. Anesth Analg. 2005;101:645---50.

Mayer M, Doenicke A, Nebauer AE, et al. Propofol and Etomidate Lipuro for induction of general anesthesia. Hemodynamics,vascular compatibility, subjective findings and postoperative nausea. Anaesthesist 1996;45:1082---4.

Boysen K, Sanchez R, Krintel JJ, et al. Induction and recovery characteristics of propofol, thiopental and etomidate. Acta Anaesthesiol Scand. 1989;33:689---92.

Grundmann U, Silomon M, Bach F, et al. Recovery profile and side effects of remifentanil-based anaesthesia with desflurane or propofol for laparoscopic cholecystectomy. Acta Anaesthesiol Scand. 2001;45:320--

Blobner M, Felber AR, Gogler S. Carbon-dioxide uptake from the pneumoperitoneum during laparoscopic cholecystectomy. Anesthesiology. 1992;77:A37–40.

Edwards ND, AlfordAM,Dobson PM,Peacock JE.Myocardial ischemia during tracheal intubation and extubation.Br j Anesth 1994;72:537-9

Kaplan JD,Schuster DP.Physiological consequences of tracheal intubation.

Grounds RM,Twigley AJ,Carli F,whitman ,Morgan M. The haemodynamic effects of thiopentone and propofol. Anesthesia 1985;40:735-40

Todd MM, Drummond JC,Hoi sang u. the haemodynamic consequences of high dose thiopental anesthesia.

Larsen R Rathgeber J, Bagdann A. Effects of propofol on cardiovascular dynamics and coronary blood flow in geriatric patients. A comparison with etomidate. Anesthesia 1988;43:25-31

Colvin MP, Savage TM, newland PE, Weaver EJM, Waters AF, BrookeJM, Inniss R. Cardiorespiratory changes following induction of anaesthesia with
etomidate in pateints with cardiac disease.

Criado A, Maseda J,Navarro A, et al: Induction of anaesthesia with etomidate; Hemodynamic study of 36 patients.Br J Anaesth 1980;52:803-806

Dennis SG, Wotton PR,Boswood A, Flaherty D: Comparison of the effects of thiopentone and propofol on electrocardiogram .Br J Anaesth 2002;89:492-498

Ebert T,Muzi M, Goff D: Symapathetic response to induction of anaesthesia in humans with propofol or etomidate. Anaesthesiology 1992;77:A337.

Continuing Education in Anaesthesia, Critical care and Pain; Laparoscopic Abdominal Surgery,byMendy Perrin, Antony Fletcher, Volume 4 number 4 2004, page: 107-110

Forbes A.M. and Dally F.G.:Acute hypertension during inductionof anaesthesia and endotracheal intubation in normotensivepatient.British Journal of Anaesthesia,1970;42:618-624

Pyrs. Roberts et al: Studies of anaesthesia in relationtohypertension-hemodynamic consequences of induction and endotracheal intubation British Journal of Anaesthesia,1971;43:531-545

Eger EI 2nd, Gong D, Koblin DD, Bowland T, Ionescu P, Laster MJ, et al. The effect of anesthetic duration on kinetic and recovery characteristics of desflurane versus sevoflurane, and on the kinetic characteristics of compound A, in volunteers. Anesth Analg 1998;86:414-21.

Juvin P1, Servin F, Giraud O, Desmonts JM.Emergence of elderly patients from prolonged Desflurane, isoflurane, or propofol anesthesia.AnesthAnalg. 1997;85:647-51.

Heavner, A. D. Kaye B, K. Lin and T. King. Recovery of elderly patients from two or more hours of Desflurane or Sevoflurane anaesthesia. Br. J. Anaesth. 2003;91:502-506.

King BD, Harris LC, Greifenstein FE, Elder JD and DrippsRD:Reflex circulatory responses to direct laryngoscopy and tracheal intubation performed during general anesthesia. Anesthesiology1951; 12:556-66.

Scheinin B, Lindgren L, Randell T – Dexmedetomidine attenuates sympathoadrenal responses to tracheal intubation and reduces the need for Thiopentone and preoperative Fentanyl, BJA 1992; 68: 126-31

Mustola ST, Bear GA, Metsa Ketala T, Laippala: Hemodynamic responses
during total intravenous anaesthesia for laryngoscopy. Thiopentone compared with propofol . Anaesthesia ;50(2) :108-13,1995.

Morel J, Salard M, Castalein c,et al. Hemodynamic consequences of etomidate administration in elective cardiac surgery: a randomised double blinded study. Br J Anaesth 2011;107:503-9.

Valoten M, et al. Comparison between propofol amd thiopentone for induction of anaesthesia in children. Anaesthesia 1998; 132;304

Coley S,et al. Haemodynamic changes after induction of anaesthesia and tracheal intubation following propofol or thiopentone in patients of ASA grade 1 and 2. Br. J Anaesthesia 1989.

Splinter WM, et al. Haemodynamic response to laryngoscopy and tracheal intubation in geriatric patients: effects of fentanyl, lidocaine and thiopentone. Can J Anaesth 1989.

WO Eames, AG Rooks et al. The journal of the American Society of Anaesthesiologists 84 (6), 1307-1311,1996. Comparison of the effects of etomidate, propofol, thiopentone on respiratory resistance after tracheal intubation.

Brussel T, Theissen JL, et al. 1983. Haemodynamic and cardiodynamic effects of propofol and etomidate; Negative ionotropic effects of propofol. Anaesth Analog.62:35-40.

Wourters PF, et al. Cardiodynamic effects of propofol in comparison with thiopentone; Assessment of transesophageal echcocardiographic approach. Anaesth Analog 1992;72:28-35.

Whitman JG, et al. Haemodynamic effects of midazolam and thiopentone during induction of anaesthesia for coronary artery surgery. Br.J Anaesth. 1982; 54;831

Mousami Das Et Al.Comparitive Study On Hemodynamic Responses During Intubation Using Etomidate Propofol and Thiopentone In Laparoscopic Cholecystectomy surgeries. Vol 5 No 4 (2015): Innovative Journal of Medical and Health Science.

MJ Brossy Et Al.Hemodynamic and catecholamine changes after induction of anaesthesia with either thiopentone or propofol with suxamethonium. *BJA: British Journal of Anaesthesia*, Volume 72, Issue 5, May 1994, Pages 596–598

Mehmet Levent Uygur Et Al.Comparison of the hemodynamic effects of three different methods at the Induction Of Anesthesia. Turk J Anaesthesiol Reanim. 2014 Dec; 42(6): 308–312.

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