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A COMPARATIVE STUDY OF EFFECT OF ETOMIDATE AND PROPOFOL ON HEMODYNAMICS AND AGENT SPECIFIC ADVERSE EFFECTS IN SHORT SURGICAL PROCEDURES.

Anaesthesiology

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ABSTRACT

Background: Concern for induction of anaesthesia in patients posted for short surgical procedures are hemodynamic stability, safe and rapid induction and smooth reversal with minimal adverse effects. This study was designed to compare etomidate and propofol for their effect on hemodynamics and various adverse effects.

Method Eighty ASA I & II patients, 20- 60 years of age posted for short surgical procedures of 15- 20 minutes duration like incision and drainage, breast abscess, closed reduction, K-wire fixation, cystoscopy DJ stent removal, D&C etc were divided in two groups of 40 each receiving Inj. Etomidate (0.3mg/kg body weight) and Inj. Propofol (2 mg/kg body weight). After premedication patients were maintained on N2O:O2. Induction time and vital parameters ie heart rate, Mean arterial pressure were recorded at 1,3,5,10 and 15 minutes. Adverse effects ie pain on injection, myoclonus, allergic reactions and post operative nausea and vomiting were carefully watched.

Results: Demographic variables were comparable in both the groups. Patients in etomidate group showed early induction with little change in heart rate and Mean arterial pressure compared to propofol from baseline values. Pain on injection was more in propofol group while myoclonus and post operative nausea and vomiting was higher in etomidate group.

Conclusion This study concludes that etomidate is a better induction agent than propofol due to its induction period, hemodynamics stability and less pain on injection.

KEYWORDS

Etomidate, propofol, Short surgical procedures, induction, hemodynamics

Introduction

Various intravenous induction agents like Thiopentone, Midazolon, propofol, ketamine and etomidate have been routinely used for general anaesthesia. Intravenous induction agents are drugs which when given in appropriate dose result in rapid loss of consciousness and are used to induce general anaesthesia as a sole drug for short procedures , for maintenance and to provide conscious sedation. Most important concern about these agents is hemodynamic stability and rapid induction and recovery.

Propofol , 2.6 disoproppyl phenol is a short acting drug and has been the most commonly used induction agent since long due to its characteristic property of rapid and smooth induction and recovery. It acts by various mechanisms like potentiation of GABA receptors and blocking sodium channels and cause vasodilatation resulting in transient fall in blood pressure.[1, 2]

Etomidate, a carboxylated imidazole is also a short acting drug and is known to be cardiovascular safe as it lacks effect on sympathetic nervous system and histamine release resulting in increased coronary perfusion and less drop in blood pressure.[3,4]

This study was an attempt to evaluate the effects of propofol and etomidate by comparing parameters such as change in heart rate and blood pressure in short surgical procedures as primary outcome and to study the time of induction and any side effects like pain on infection myoclonic movements, allergic reactions and post operative nausea and vomiting as secondary outcomes.

Method

The study was conducted in Department of Anaesthesia, SMS Medical College, Jaipur on 80 patients of American Society of Anaesthisiology (ASA) grade I& II between 20 to 60 years of either sex weighing 30-80 kg posted for short surgical procedures of 15- 20 minutes duration like incision and drainage, breast abscess, closed reduction, K-wire fixation, cystoscopy DJ stent removal, D&C etc.

After taking approval from institutional ethical committee written informed consent was taken from all the patients for participating in the study. Patient with history of known allergy to study drugs, seizures, on steroids medication and who were hypotensive were excluded from the study.

This prospective interventional comparative study comprised of two groups and sample size was calculated at $_{a}$ level 0.05 and $_{B}$ 0.2 with study power of 80% . Sample size thus obtained was 40 patients in each group.

Patients were randomly divided by using chit in box method in two groups.

Group E (n= 40) received Inj. Etomidate (0.3mg/kg body weight)
Group P (n= 40) received Inj. Propofol (2 mg/kg body weight)

Preanaesthetic checkup was done on the day before surgery and on arrival in operation theater. PAC, fasting status and consent was checked and intravenous access with 18 G cannula was secured. Inj. Ringer lactate 10 ml/kg /hr was started and monitors (NIBP, SPO2, ECG and BIS) were attached and injection Midazolam 0.02mg/kg and Inj. Fentanyl 2mg/kg was given. Patients were oxygenated with 100% O2 for three minutes and then Inj. Etomidate 0.3mg/kg was given to Group E and Inj. Propofol 2 mg/kg was given to patients in Group P.

Loss of consciousness was accessed by checking loss of eye lash reflex. Pain on injection and myoclonic movements were recorded if any. Anaesthesia was maintained with N2O:O2 at 60:40 by using bains circuit. Intraoperative induction agent was repeated in bolus to keep bispectoral index score below 60. Intraoperative SPO2 ,HR, SBP, DBP and MAP were measured at 1st,3rd, 5th, 10th and 15th minute. Drugs and N2O were stopped after completion of surgery. Thereafter 100% oxygen was continued for next 5 minutes or longer if required. Proper suction was done and patient was observed until regaining of consciousness. Post operative nausea and vomiting, any allergic reaction were observed. Pain on injection were measured using 4 grade scale 0=no pain, 1= verbal complaint of pain, 2 = withdrawl of arm and 3 both verbal complaints and withdrawl of arm. The incidence and degree of myoclonic movements was recorded follows 0= no myoclonic movements, 1= minor myoclonic movements, 2= moderate

myoclonic movements, 3= major myoclonic movements.

Patients were shifted to recovery room once they started obeying verbal commands and were fully conscious.

Statistical analysis

Data are presented as mean and standard deviation. Patient characteristic data were analyzed with one way ANOVA for continuous variables and chi square test for categorical variables. P values < 0.05was considered significant.

Results

A total of 80 patients were assessed after randomly dividing them in two groups. Both groups were comparable in age, sex, weight and ASA grades with no significant difference (p>0.05) Table-1. Preoperative baseline vitals (HR, SBP,DBP MAP) were comparable in both the groups with no significant difference(p>0.05)

Table 1: Demographic characteristic of patients

Variable	Group E	Group P
Age	30.9±8.3	32.3±10.2
Weight	64.5±9.2	60.8±8.6
Sex (Male:female)	24:16	27:13
ASA Grade 1/11	30/12	28/12

Table 2- Comparison of Induction Time in study groups

Group	Mean	Standard deviation
Group E	19.4	2.6
Group P	20.2	2.4

The induction time of two groups was recorded and results showed slightly less induction time in Group E in comparison to Group P but the result showed no statistical difference.

Table 3 – Comparison of Heart rate in study groups

Time	Group E	Group P		P value
Base line	89.2±9.9	86.6±11.1	→	0.2695
1 minute	91.0±13.3	81.7±11.7	→	0.0015
3 minute	89.2±9.8	69.0±9.3	→	0.000
5 minute	89.4±9.5	69.5±8.3	→	0.000
10 minute	86.4±11.4	73.9±9.0	→	0.000
15 minute	89.3±11.3	78.6±10.1	→	0.000

The heart rate in Group E remained more stable in comparison to readings in Group P and statistically significant difference was observed between the two groups as 1,3,5,10 & 15 minutes.

Table 4- Comparison of Mean Arterial Pressure in study groups

Time	Group E	Group P		
Base line	103.1±7.4	100.1±7.3	→	0.0803
1 minute	99.2±7.6	96.6±7.5	→	0.1233
3 minute	99.7±5.1	82.8±7.7	→	0.000
5 minute	101.8±5.2	80.7±5.5	→	0.000
10 minute	90.8±6.6	85.2±5.8	→	0.000
15 minute	94.1±6.4	91.7±6.4	→	0.0947

Following induction fall in MAP was found in both the groups at 1 minute. The MAP remained more stable in Group E in comparison to the readings in Group P. The MAP readings in both the groups were statistically significant at 3,5,and 10 minutes and at 15 minutes rise of MAP was observed in both the groups.

Table-5 Comparison of Adverse outcomes in study groups

Adverse outcomes	Group E	Group P
Pain on injection	1	4
Myoclonic movements	2	0
Allergic reactions	0	0
Postoperative nausea and vomiting	4	0

Discussion

Etomidate and propofol are short acting intravenous anaesthetic agents used for induction and general anaesthesia. Etomidate was induced in 1972 but earlier preparations were associated with severe adverse effects but in new formulations in which water insoluble active ingredient Etomidate is dissolved in an emulsion containing medium and long chain triglycerides which acts as a drug vehicle. In this new formulation some of the adverse effects like thrombosis and thrombophlebitis have been eliminated while others like myoclonic movements have been substantially reduced. [5] Patient comfort, safety and low complication rates are the essentials of short surgical procedures.

Induction time or loss of consciousness was studied by observing loss of eyelash reflex and it was noted that the loss of consciousness was faster in Group E with mean value of 19.4 ± 2.6 in comparison to 20.2 ± 2.4 in Group P but the difference was statistically insignificant. Our results were similar to study conducted by Shah et al[6] which observed induction time of 20 seconds using etomidate 0.03mg/kg. Moreover our findings are in agreement with the results of study conducted by J. Schaeuble et al [7] which compared time of loss of consciousness between etomidate and propofol for fibreoptic intubation and they found it faster with etomidate.

Baseline heart rate were comparable in both the groups with no statistical significant difference (p> 0.05). In Group E the changes in heart rate were minmal throughout the study period which means Group E showed more stability in pulse rate in comparison to Group P. Statistically significant difference was observed between the two groups throughout the study period. Our results are in agreement with the results of study conducted by Fatma S et al [8] Fall in blood pressure after induction was observed in both the groups. It could be due to both removal of anxiety of surgery and anaesthesia and effect of drug on cardiovascular system. Although at one minute the change in MAP was insignificant but later on there was significant difference noted in both the groups at 3rd , 5th , and 10th minutes, which showed more drop in blood pressure in Group P. At 15 minutes again the changes in BP were insignificant which could be attributed to sympathetic stimulation and weaning effect of drugs at the time of completion of surgery. Our results are in agreement with the results of study conducted by Fatma S et al 8 and James R Miner et al [9]

Pain on injection was observed in 4 patients in Group E and in 12 patients in Group P and the results were similar to study conducted by Fatima et al who observed significantly lower pain with propofol etomidate admixture and etomidate in comparision with propofol.[8]

Myoclonus is a brief rapid shock like jerking movement consisting of single or repetitive discharge. It has to be distinguished with fasciculation and seizures. Fasciculation are a visible or palpable twitch within a muscle due to spontaneous discharge of a motor unit which are innervated by a single nerve fiber, while a seizure is a physical finding or change in behavior that occurs after an episode of abnormal electrical activities in brain.

Two patients in Group E showed myoclonus while none of patient showed myoclonus in Group P .Our results are in agreement with the study conducted by James R etal[9] which showed myoclonus in 20% of cases with etomidate in comparision to 1.8% with propofol.

There were no allergic reactions noticed in both the groups and 4 patients in Group E showed postoperative nausea and vomiting in comparison to nil in Group P which is in agreement to the known antiemetic property of prpofol. Our results are in agreement with the study conducted by St Piera M etal10 which showed more incidence of nausea and vomiting with etomidate in comparison with propofol and study of James R Miner et al9 which noted myoclonus in 20% of cases in etomidate group in comparison to 1.8% in propofol group.

Conclusion

From this study it can be concluded that etomidate is a better induction agent because of its hemodynamic stability over propofol. Moreover the time taken for induction with etomidate is slightly shorter then propofol and it is associated with less incidence of pain on injection. Drawback found with etomidate was incidence of myoclonus and postoperative nausea and vomiting.

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