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A COMPARATIVE STUDY BETWEEN ETOMIDATE AND PROPOFOL AS AN INDUCTION AGENT DURING INDUCTION, LARYNGOSCOPY AND INTUBATION

Dr. Supriya Agarwal[1], Dr. Vidushi Sharma[2]
[1,2] Assistant Professor, Department of Aneastheiology
K D Medical College, Hospital & Research Center Mathura

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Corresponding author: Dr. Vidushi Sharma
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Abstract
Background: The objective of study was to compare Etomidate and Propofol as induction agents and their effect on Pain on injection, time to loss of consciousness and myoclonic movements.
Methods: The study was carried out on 100 patients of ASA grade I and II between 18-58yrs of age of either sex enrolled for this prospective randomized double blind study, admitted in K D Medical College, Hospital & Research Center, Mathura (U.P) and scheduled for elective surgical procedures under general anaesthesia and endotracheal intubation.
Results: The incidence of pain on injection in propofol group was more as compared to etomidate group (p value <0.05). In propofol group 25(50%) patients while in etomidate group only 2(4%) patients had pain on injection. Etomidate group had significantly more myoclonic movements than propofol group (p value <0.05). In etomidate group 18(36%) patients had myoclonic movements of various severity, while in propofol group no patient had myoclonic movements.
Conclusion: Incidence of apnoea on induction was more in propofol group than etomidate group but comparison was not statistically significant.
Keywords: Apnea, Propofol, Etomidate.

Introduction:

Before the introduction of intravenous anaesthetic inducing agents, the induction of anaesthesia was unpleasant, time consuming and at times stormy. The advent of intravenous anaesthesia has made aneasthetic induction easier, faster, more pleasant and acceptable to the surgical patients.[1]

Induction agents are drugs that, when given intravenously in an appropriate dose, cause a rapid loss of consciousness. This is often described as occurring within "one arm-brain circulation time" that is simply the time taken for the drug to travel from the site of injection (usually the arm) to the brain, where they have their effect. [2]

Propofol is a lipid soluble alkyl phenol derivative, which acts at gaba receptors and blocks neurotransmission. It has a rapid onset of action and fast recovery. It may cause hypotension and respiratory depression.[4]

Etomidate is another induction agent, which is considered to be better than propofol as it provides better haemodynamic stability of the patient during induction as proved in many studies.[5]

There are no good randomized, prospective studies that show a clinically significant adverse outcome from single-dose etomidate. There are, however, retrospective studies that show that etomidate does not increase mortality in septic patients[6-8] in emergency room patients and in congenital heart disease patients. Because of its hemodynamic stability, even in the sickest patients, and no clear evidence of a clinically significant adrenal suppression or other serious side effects, etomidate has been revisited and needs to be evaluated as induction agent.

We designed a randomized double blind prospective study with hypothesis that etomidate will prove to be a better induction agent than propofol.

Material and Method

A prospective randomized double blind study was designed on 100 patients of ASA grade I and II between 18-58yrs of age of either sex, admitted in K D Medical College, Hospital & Research Center, Mathura (U.P) and scheduled for elective surgical procedure under general anaesthesia and endotracheal intubation.

The study protocol was approved by Institutional Ethical Committee and written informed consent was obtained from all patients.

The pre-anaesthetic check-up included a detailed medical and surgical history, and any previous anaesthetic exposure with its outcome. General examination included general condition, built, weight, heart rate, blood pressure, respiratory rate, and presence of cyanosis, anaemia, clubbing, jaundice or edema. A careful thorough systemic examination was done to rule out any cardiovascular, respiratory, gastrointestinal and neurological or any other systemic illness. Airway examination was done including Mallampati grading, mouth opening, thyromental distance, flexion and extension at neck, and dental status of patient.

Routine biochemistry investigation included haemoglobin levels, total leucocyte count, differential leucocyte count,

blood sugar, blood urea, and serum creatinine. ECG and X-Ray chest were done in patients where indicated and in those over 40 years of age along with other relevant investigations.

After taking detailed history and thorough clinical examination, the patients were excluded from the study on the basis of below mentioned criteria:

Patients with systemic hypertension, hepatic, renal, endocrine and cardiac dysfunctions, morbid obesity (body weight more than 20% of the ideal body weight), expected difficult intubation (Mallampati grade III and IV) or difficult direct laryngoscopy (Cormack Lehane III and IV) and patients requiring more than one attempt for intubation were excluded from the study.

Patients with known drug hypersensitivity, those on antihypertensive medication or antidepressant drugs and those who refused to give consent were also excluded.

The total 100 patients were randomly divided into two groups of 50 patients each according to a computer generated random table. Group I (N=50) received inj propofol 1% in the dose of 2mg /kg body weight IV whereas Group II (N=50) was given inj. Etomidate 0.3mg/kg body weight IV as an induction agent.

Group allocation was done by an assistant who was unaware of the study protocol and was not involved in the study.

Statistical Analysis

The data obtained in the study was analysed using Microsoft Excel and SPSS software (version 20) for windows. Variables were expressed as Mean ± SD and the parameters of the two groups were compared using "independent T test". P value <0.05 was regarded as statistically significant, P value <0.001 was taken as highly significant and P value >0.05 was regarded as nonsignificant.

Results

A total of 100 patients participated in the study. No patient was excluded from this study after enrolment from the study.

Table 1: Distribution of patients according to sex

GROUPS	FEMALE	MALE	P value
GROUP I (PROPOFOL)	30 (60%)	20 (40%)	0.967
GROUP II (ETOMIDATE)	27 (54%)	23 (46%)	

Table 2: Distribution of patients according to age

Age Groups	GROUP I (PROPOFOL)	GROUP II (ETOMIDATE)
18-28	7 (14%)	11 (22%)
29-38	29 (58%)	23 (46%)
39-48	10 (20%)	10 (20%)
49-58	4 (8%)	6 (12%)

Table 3: Incidence & grading of pain on injection

GROUP	PAIN ON INJECTION			P VALUE
	Grade 0	Grade 1	Grade 2	
GROUP I (PROPOFOL)	25 (50%)	16 (32%)	9 (18%)	0.002
GROUP II (ETOMIDATE)	48 (96%)	2 (4%)	0 (0%)	

0=no pain, 1=verbal complaint of pain, 2=withdrawal of arm

In group I nine (18%) patients had grade 2 pain and sixteen (32%) patients had grade 1 pain on injection while twenty-five (50%) patients had no pain (0). In group II only two (4%) patients had grade 1 pain. On comparison in both groups it is observed that group I had higher incidence and more severe pain on injection as compared to group II and the difference was statistically significant (P value=0.002).

Table 4: Mean duration of time to loss of consciousness

	GROUP I (PROPOFOL) Mean±S.D.	GROUP II (ETOMIDATE) Mean±S.D.	P VALUE
Time to loss of consciousness in sec (mean±S.D.)	14.14±5.95	16.70±6.41	0.061

Mean duration of time to loss of consciousness on induction was 14.14 and 16.70 seconds in group I and group II patients respectively. The difference between groups was not statistically significant (P value=0.061),

Table 5: Incidence of myoclonic movements in both groups

Myoclonic movements	GROUP I (PROPOFOL)	GROUP II (ETOMIDATE)	P Value
Grade 0	50 (100%)	32 (64%)	**0.000**
Grade 1	0 (0%)	10 (20%)	
Grade 2	0 (0%)	7 (14%)	
Grade 3	0 (0%)	1 (2%)	

0= no myoclonic movements, 1= minor myoclonic movements, 2= moderate myoclonic movements, 3= major myoclonic movements

In group II only one patient (2%) had grade 3 movements, seven (14%) patients had grade 2 movements, ten (20%) patients had grade 1 movements and thirty two (64%) patients had no myoclonic movements.

In group I no patient had myoclonic movements while in group II 18(36%) patients had myoclonic movementsof various severity. The difference is statistically significant (P value=0.000).

Discussion

Induction of anaesthesia is known to be associated with hemodynamic variations of mild to moderate degree depending upon many factors. Patients with already compromised hemodynamics may exhibit even severe and life threatning complications like severe hypotension or hypertensive crisis or cardiac arrhythmias[1]. The search is still on to find out ideal induction agent that causes minimal

hemodynamic changes beside other desirable features. Etomidate, a forgotten induction agent has been revisited due to desirable pharmacological effects.

Pain on injection is more in propofol than etomidate group and comparison shows statistically significant difference (P value=0.002). In propofol group 50% of patients have pain while in etomidate group 4% of patients had pain on injection. A study by Nyman et al[8] also showed lower incidence of pain on injection in the etomidate-lipuro group as compared with the propofol–lidocaine group (5.0% vs 47.5%, P<0.001). Saricaoglu et al[7] also found the incidence of injection pain was less in etomidate group (63.2%) than in propofol group (83.8%). Mayer et al[6] also registered significantly more pain & burning after injection in the propofol group than etomidate group. K Boysen et al[4] also observed more pain on injection with propofol than etomidate. Etomidate formulated in a medium chain lipid emulsion causes significant less discomfort to the patients than propofol, which is solved in a long chain formulation[8]. Propofol belongs to the group of phenols that irritate the skin, mucous membranes, and venous intima.[72] By an indirect action on the endothelium, it activates the kallikrein-kinin system and releases bradykinin, thereby producing venous dilation and hyperpermeability, increasing the contact between the aqueous phase of propofol and the free nerve endings, resulting in pain.[9]

Incidence of apnea was 76% in propofol group and 66% in etomidate group with no statistically significant difference (P value=0.271). K boysen et al[4] also found no statistically significant differences between the two groups (propofol & etomidate) as regards to apnea following induction.

Mean duration for loss of consciousness is more in etomidate group as compared to propofol group but comparison shows no statistically significant difference (P value=0.05). The findings are in accordance with study conducted by Schaeuble J et al.[10]

The incidence of myoclonic movements was higher in etomidate group with statistically significant difference (P value=0.000). In propofol group no patient had myoclonic movements while in etomidate group 36% patients had myoclonic movements. Our findings are in consistence with a study by Saricaoglu et al[7] the incidence of myoclonus was highest in etomidate group(76.3%) whereas myoclonus was not observed in propofol group. In a study conducted by James miner et al[11] myoclonus was noted in 20.0% patients in the etomidate group and 1.8% in the propofol group. Our results are similar to study by Mayer et al[6] where myocloni predominated in etomidate group than propofol group. According to Nyman et al[15] use of etomidate was associated with a significantly higher incidence of myoclonic activity compared with propofol–lidocaine (85.0% vs 15%, P<0.001). K Boysen et al[4] also found more myoclonic movements in etomidate group (P<0.01). The specific mechanisms underlying myoclonus by etomidate are not yet fully understood. The myoclonic movement is believed to result from activity either in the brainstem or in deep cerebral structures.[1,]

Conclusion

Incidence of apnoea on induction was more in propofol group than etomidate group but comparison was not statistically significant.

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