

“Etomidate as Choice of Inducing Agent During Rapid Sequence Intubation In Polytrauma Patients”

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Abstract

Background: Rapid sequence intubation (RSI) is an approach that has become the standard for airway management in the emergency department. Present study is aimed to assess the efficacy and safety of Etomidate for RSI in the emergency department.

Material & Method: This prospective observational study of 50 patients of polytrauma who received intravenous Etomidate as an inducing agent during rapid sequence intubation over a period of 3 years to evaluate intubating conditions and hemodynamic effects at MGM medical college, Kamothe, Navi Mumbai. All the patients presenting to ED of polytrauma aged more than 15 years were included.

Result: Total of 50 patients fulfilling inclusion criteria were included in present study among them 88% were male patients and 12% were female patients, with mean age 36.40 ± 13.70 yrs. GCS score below 8 is the cut-off for intubation and mechanical ventilation. 36% of our patients presented with a GCS score of 7 and 12 % of them presented with a GCS score of 8. There was significant higher mean difference between the interval of time, indicating the positive hemodynamic effect. ($p < 0.05$)

Conclusion: Etomidate is an excellent choice for inducing a patient during RSI, because of its superior hemodynamic profile, a majority of our patients presented to our ER with hemorrhagic shock where it was critical to maintain the mean arterial pressure simultaneously not elevate the intracranial pressure.

Keywords: Hemodynamic changes, Systolic Blood pressure, Diastolic blood pressure, Trauma, Rapid Sequence Intubation.

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I. Introduction:

Rapid sequence intubation (RSI) is an approach that has become the standard for airway management in the Emergency Department (ED). Administration of an induction agent followed by a rapidly acting neuromuscular blocking agent to produce unconsciousness and paralysis provides optimal intubating conditions while reducing the chances of aspiration in unprepared patients.¹

The most common induction agents currently used in RSI include the Benzodiazepine-like midazolam, and miscellaneous agents such as ketamine and propofol.² Unfortunately, these agents are very frequently associated with hemodynamic effects that are undesirable in many patients requiring intubation in the ED. Etomidate is a sedative-hypnotic chemically unrelated to all other induction agents.³ Etomidate is an attractive agent for RSI due to its rapid onset and recovery, cerebroprotective properties, and minimal adverse cardiovascular and respiratory effects”.⁴

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II. Material & Method:

This prospective observational study of 50 patients of polytrauma who received Etomidate intravenous as an inducing agent during rapid sequence intubation over a period of 3 years to evaluate intubating conditions and hemodynamic effects at MGM medical college, Kamothe, Navi Mumbai. All the patients presenting to ED of polytrauma aged more than 15 years were included. Patients with epilepsy, polytrauma with septicemia and less than 15 years of age were excluded from the study. Etomidate in dose of 0.3mg/kg was used in the study.

The ethics clearance was obtained prior to start of the study and consent from all the participants was obtained at enrolment.

Statistical analysis: all the data was collected in proforma and entered in excel sheet. The analysis of the data was performed using SPSS v21 operating on windows 10. The patient’s data are represented in tables, figures, bar diagram and summarized as frequency, percentage, Mean±SD. The mean difference between the variables at different interval of time was analysed using paired t-test, and a p-value of <0.05 was considered statistically significant.

III. Result:

Total of 50 patients fulfilling inclusion criteria were included in present study among them 88% were male patients and 12% were female patients, with mean age 36.40±13.70yrs. GCS score below 8 is the cut-off for intubation and mechanical ventilation. 36% of our patients presented with a GCS score of 7 and 12 % of them presented with a GCS score of 8.

Table 1: Demographic details of the included participants

		Mean	Standard deviation
Age		36.40	13.70
Weight		63.38	10.0
Pulse rate		116.22	16.22
Respiratory rate		24.50	4.1
SPO2		84.68	6.08
pH		7.21	0.07
pCO2		29.62	9.78
HCO3		16.40	4.96
Lactate		4.32	1.28
		Frequency	Percentage
Gender	Male	44	88
	Female	6	12
GCS score	5	16	32
	6	10	20
	7	18	36
	8	6	12

Table 2: Mean levels of systolic, diastolic blood pressure and mean arterial pressure at various interval of time.

	SBP		DBP		MAP	
	Mean	SD	Mean	SD	Mean	SD
0 min	104.48	18.49	70.6	11.32	82.04	13.19
5 min	98.8	16.2	69.52	10.18	79.08	11.58
10 min	105.47	16.31	72.2	9.97	82.27	10.6
15 min	109.88	14.87	73.63	11.5	85.35	11.77
20 min	113	12.02	76.54	9.45	88.5	9.23

The systolic, diastolic and the mean arterial pressure measured at time of presentation, followed by 5, 10, 15, 20 minutes respectively after the induction dose of Etomidate (0.3mg/kg) prior to intubation. The table clearly shows that initially there was an initial drop in systolic blood pressure by approximately 6 mmHg during the first 5 minutes, which gradually improved by 7 mmHg in the next 5 minutes to come, and gradually increased by 5 and 4 mmHg by 15 and 20 minutes respectively.

Table 3: Comparison of mean difference between the interval of time.

Mean difference	Mean	SD	Z score	p-value
SBP 5 – SBP 10	-6.28	5.88	-4.96	0.001**
DBP 5 – DBP 10	-2.48	5.36	-3.57	0.001**
MAP 5 – MAP 10	-2.91	5.84	-3.919	0.001**
SBP 5 – SBP 15	-10.69	9.02	-5.323	0.001**

DBP 5 – DBP 15	-3.91	8.61	-4.06	0.001**
MAP 5 – MAP 15	-6.00	8.38	-5.213	0.001**
SBP 5 – SBP 20	-13.75	7.53	-5.74	0.001**
DBP 5 – DBP 20	-6.833	7.63	-4.84	0.001**
MAP 5 – MAP 20	-9.12	7.20	-5.78	0.001**
SBP 10 – SBP 15	-4.40	7.21	-4.03	0.001**
DBP 10 – DBP 15	-1.42	7.43	-2.54	0.001**
MAP 10 – MAP 15	-3.08	7.18	-4.31	0.001**
SBP 10 – SBP 20	-7.20	7.42	-4.788	0.001**
DBP 10 – DBP 20	-4.29	7.18	-3.63	0.001**
MAP 10 – MAP 20	-6.10	6.95	-4.941	0.001**
SBP 15 – SBP 20	-2.088	3.68	-3.38	0.001**
DBP 15 – DBP 20	-2.00	4.63	-2.72	0.001**
MAP 15 – MAP 20	-2.20	4.12	-3.29	0.001**

There was significant higher mean difference between the interval of time, indicating the positive hemodynamic effect.(p<0.05)

IV. Discussion:

Of 50 patients of polytrauma who presented to our ED who got intubated, received Etomidate intravenously as an inducing agent during rapid sequence intubation. Of the 50 patients who presented, 44 were males and 6 were females. We had intubated all patients with a GCS score below 8. Also, patients in whom it was difficult to maintain the airway and in patients in whom a failure to maintain oxygenation and ventilation. An anticipated likelihood of deterioration of the patient's condition followed by failure to maintain or protect the airway. 36% of our patients presented with a GCS score of 7 and 12 % of them presented with a GCS score of 8. Majority of patients presented to us were in grade 2 or grade 3 shock, so had abnormal vital parameters like tachycardia, tachypnea, hypotension, and low saturation. ABG was done using i-STAT of our patients presenting to the ED, the initial parameters showed metabolic acidosis, which eventually resolved on fluid resuscitation. An increase in the lactates was seen which eventually resolved on fluid resuscitation. Thus lactates also added as a useful marker to guide the resuscitation.

A prospective observational study was conducted by Peter J. Zed et al. of all patients who received Etomidate for induction of RSI over a 42-month period in a large tertiary care teaching hospital. Hemodynamic effects were evaluated before, after, and every five minutes for 15 minutes following administration of Etomidate The Mean (SD) baseline systolic blood pressure (SBP), diastolic blood pressure (DBP), and heart rate were found to be 132.7 (35.4)mmHg, 69.5 (21.2)mmHg, and 96.1 (26.2) bpm, respectively.⁵ Overall, there was a clinically insignificant elevation in SBP (p <0.0001), DBP (p = 0.0002), and heart rate (p < 0.0001) immediately post-intubation. Elevations in SBP persisted at five minutes (p = 0.0230) and ten minutes (p = 0.0254) post-intubation. Diastolic blood pressure and heart rate returned to baseline at five minutes after intubation and remained stable throughout the 15-minute post-intubation assessment period. In the subgroup of 80 patients with a preintubation SBP < 100 mm Hg, there was a 12.1–mm Hg elevation in SBP (p < 0.0001) and a 7.3–mm Hg elevation in DBP (p = 0.0001) immediately post-intubation. This elevation persisted throughout the 15-minute post-intubation assessment period”.⁶

The study concluded that following administration of Etomidate, hemodynamic stability appears to be present, even in patients with low pre-RSI blood pressure. In our study, the systolic, diastolic and the mean arterial pressure were measured at the time of presentation, followed by 5, 10, 15, 20 minutes respectively after the induction dose of Etomidate (0.3mg/kg) prior to intubation. There was an initial drop in systolic blood pressure by approximately 6 mmHg during the first 5 minutes which gradually improved by 7 mmHg in the next 5 minutes, and gradually increased by 5 and 4 mmHg by 15 and 20 minutes respectively. The observed increase in the average systolic blood pressure, when compared from “0” minutes to “20” minutes, is significant as the p-value is less than 0.05. The observed increase in the average diastolic blood pressure when compared from “0” minutes to “20” minutes is significant as the p values is less than 0.05. The observed increase in the average mean arterial blood pressure when compared from “0” minutes to “20” minutes is significant as the p-value is less than 0.05.

In a study conducted by Y F Choi et al., to assess the hemodynamic effect of low dose midazolam and Etomidate. The study concluded that midazolam, even in low dose, was more likely than etomidate to cause significant hypotension when used as an induction agent for rapid sequence intubation. Etomidate is a better alternative.⁷

Graham et al. (personal communication) reported that 89% of patients undergoing ED RSI in Scotland had “physiological compromise” before intubation. Etomidate was used as the induction agent in 33% of this group. There were 328 patients with head injuries and etomidate was used in 26.2%. There were 70 patients who were hypotensive (systolic blood pressure, 90 mm Hg) before RSI. Etomidate was used in 66% of this group of

patients. Overall, the first attempt success rate was significantly higher in the patients who received etomidate (89.3% compared with 80.3%, $p=0.001$)⁸. Schenarts *et al.* “performed a prospective, randomized, placebo-controlled trial to assess whether etomidate use for RSI in the ED was associated with adrenocortical dysfunction. The primary outcome measure was adrenocortical function as measured by the cosyntropin stimulation test (CST) 4, 12, and 24 hours after induction agent. At four hours there was a significant difference between groups regarding CST results (normal response in 100% of control patients and 30% of Etomidate patients, $p=0.004$). The cortisol values before and after ACTH for all Etomidate patients remained within or above the normal cortisol reference range (10–25 mg/100 ml). At 12 and 24 hours, there were no significant differences between the groups”⁹.

The studies suggested that the adrenal insufficiency of sepsis should be treated with administration of stress doses of corticosteroids. “Etomidate may cause brief myoclonus, but this is of no clinical significance. Etomidate by continuous infusion has been reported to cause suppression of endogenous cortisol production. Recently, controversy has emerged regarding the role of etomidate for intubation of patients with septic shock”¹⁰. In our studies, we have not included the patients presenting with septic shock for intubating with Etomidate.

V. Conclusion:

Etomidate is an excellent choice for inducing a patient during RSI, because of its superior hemodynamic profile, a majority of our patients presented to our ER with hemorrhagic shock where it was critical to maintaining the mean arterial pressure simultaneously not elevate the intracranial pressure. Etomidate is an excellent inducing agent for patients with elevated ICP, even in cases of hemodynamic instability because etomidate is able to decrease ICP, cerebral blood flow, cerebral metabolic rate without adversely affecting the mean arterial pressure and the cerebral perfusion pressure.

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