



BOLUS ADMINISTRATION OF ESMOLOL VERSUS FENTANYL FOR PRESSOR RESPONSE ATTENUATION DURING LARYNGOSCOPY & ENDOTRACHEAL INTUBATION—A COMPARATIVE STUDY

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ABSTRACT

Background: Laryngoscopy and intubation is almost always associated with hemodynamic changes due to sympathetic discharge caused by epipharyngeal & laryngopharyngeal stimulation which has increase in endogenous catecholamines.

There is increase in heart rate, BP, cardiac arrhythmias.

Aim and objective: Study is planned to compare clinical evaluation of single bolus dose of esmolol and fentanyl in attenuating cvs response to laryngotracheal stimulation in healthy normotensive patients in order to reduce life threatening complications during induction of anesthesia.

Methods: 60 adult ASA grade I and ASA grade II patients & Mallampati grade I of both sexes and age ranging from 20-60 years were included in the study who underwent elective gynaecological and other general surgeries.

Patients were divided into 2 groups Group I consists of 30 patients, where esmolol 1.5 mg/kg I.V bolus dose and group II consists of 30 patients where fentanyl 2 mcg/kg body I.V bolus dose was given. Study drug was injected 3 min before intubation. Heart rate, systemic arterial pressure and ECG were recorded as baseline and after administration of study drug at intubation and thereafter.

Results: Reading of heart rate, BP were compared with baseline and among each group. The rise in HR was minimal in esmolol group and was highly significant.

Conclusion: Esmolol 1.5 mg/kg as a bolus dose proved to be effective in attenuating rise in HR following laryngoscopy and intubation while the rise in BP was suppressed but not abolished by bolus dose of esmolol

KEYWORDS : Esmolol, fentanyl, laryngoscopy, endotracheal intubation, pressure response.

Introduction:

Ivan w Magill, father of endotracheal intubation and advent of balanced anesthesia by John Lundy the use of controlled ventilation has become universal 1946, T Cecil Gray & John Halton popularize use of curare with controlled ventilation.

Endotracheal intubation is the translaryngeal placement of endotracheal tube into trachea laryngoscopy & intubation almost associated with hemodynamic changes like increase in heart rate, systolic BP, pulmonary artery pressure and cardiac arrhythmias due to sympathetic stimulation which is dangerous in patients with heart disease, valvular heart disease, hypertension, CVA, aortic aneurysm, pheochromocytoma etc. These changes are the maximum at 1 min after intubation and last for 5-10 min. Esmolol is an ultra short acting beta blocker. It has predominant effect on beta receptors and possesses no significant membrane stabilizing activity. It has rapid onset and a short duration of action.

Fentanyl is a phenyl piperidine of a 4- amino piperidine series, structurally related to, but not derived from pethidine. The aim of this study is to do a comparative study of esmolol and fentanyl in attenuating the pressure response during laryngoscopy and intubation.

Methods:

A study of esmolol vs fentanyl in attenuation of CVS response during laryngoscopy & intubation was compared in 60 adult patients of ASA grade I & grade II, Mallampati grade I undergoing surgery under general anesthesia were selected and informed consent was taken for all cases. Patients were of both sexes and age ranging from 20-60 years patients underwent gynecological procedures like vaginal hysterectomy, total abdominal hysterectomy, diagnostic laparoscopy, laparotomy & other general surgeries.

Exclusion criteria:

- 1) History of respiratory problems
- 2) History of heart block (AV conduction block) greater than first degree congestive heart failure, cardiac arrhythmias
- 3) History of angina CAD, DM, HTN and major medical problem.
- 4) Base line HR < 60/min
- 5) Base line systolic BP < 100 mm Hg
- 6) Treatment with beta blocker/ Ca²⁺ channel blocker.
- 7) Hepatic/renal problems
- 8) Patients with full stomach.
- 9) Patients posted for emergency surgery.
- 10) Patients with difficult airway.

11) Patients refusal.

All the patients were premedicated with intra muscular injection glycopyrrolate 0.2 mg and midazolam 2mg Im, im tramadol 1 mg/kg given 45 min prior to surgery.

Intravenous cannulation with 18 G cannula, was inserted and a drip was started with RL solution.

Pulse oximeter, non invasive BP, ECG was connected and recorded before as well as after premedication and continuously after intubation at 1,2,3,4,5,6,7,8,9,10 minutes.

All the patients were divided into two groups of 30 each and were preoxygenated for 3 minutes with 100 % oxygen and induction was achieved with I.V thiopentone 2.5 % in dose of 5mg/kg

After induction Group I was followed with injection esmolol 1.5 mg/kg and Group II was followed with injection fentanyl 2mcg/kg.

This was followed by injection suxamethonium 1.5 mg/kg after 60 sec laryngoscopy was performed and was intubated. Patients were then connected to and ventilated with closed circuit with a circle absorber for controlled ventilation anesthesia. Anesthesia was maintained with N₂O (67%) and oxygen (33%) and non depolarising muscle relaxant vecuronium was used in a dose of 0.08 mg/kg. HR & BP were noted immediately after intubation then measurements were repeated every minute for 10 minutes after intubation.

Discussion:

Laryngoscopy & endotracheal intubation frequently induce a cardiovascular stress response characterized by hypertension and tachycardia. This result in increase in myocardial O₂ demand leading to ischemia and acute heart failure in susceptible individuals. In an attempt to blunt these adverse responses, different techniques were used.

King et al (1951) used ether. WF Coffet al (1960) tried a combination of topical anesthesia of larynx together with superior laryngeal nerve block to attenuate the stress response to intubation I Curran et al (1980) tried droperidol, A J Cole C Jordan (1980) studied the effect of B blocker using metoprolol & propranolol respectively

Christopher et al. used esmolol 1-2mcg/kg and concluded that the increase in HR and BP associated with laryngoscopy and endotracheal

intubation were significantly lower in comparison to the control group

Sahabat et al. used esmolol 1mg/kg and concluded that esmolol partially attenuated the hemodynamic response but did not abolish it completely. Esmolol in bolus doses 100 mg and 200 mg attenuated tachycardia and HTN after tracheal intubation

Narcotics may block afferent nerve impulses resulting from stimulation of the pharynx and larynx during intubation

Fentanyl has also been used in different doses varying from 2 to 15 mcg/kg to blunt hemodynamic response to laryngoscopy and endotracheal intubation. Low doses of fentanyl 2mcg/kg were used in our study and efficacy was compared with esmolol group

Yushi et al. In his study concluded that 2mcg/kg fentanyl suppresses the hemodynamic response to endotracheal intubation more than the response to laryngoscopy

It was shown that supplementation of anaesthetic induction with fentanyl 2mcg/kg significantly attenuated the increase in HR, arterial pressure after laryngoscopy and intubation and fentanyl 6mcg/kg completely abolished pressure responses.

Low doses of fentanyl were employed because a large dose lead to muscular rigidity, bradycardia, nausea and vomiting. Large doses may also cause postoperative respiratory depression; especially in surgery with short duration of less than 1 hour.

Mc clain et al. reported apnoeic episodes in four out of seven patients who received 3.2-6.5mcg/kg fenanyl.

Esmolol group is superior to fentanyl group for attenuation of hemodynamic response to laryngoscopy and endotracheal intubation therefore we can conclude that patients with HTN, ischemic heart disease and brain tumor will be benefited by giving intravenous esmolol preoperatively before laryngoscopy and endotracheal intubation.

Results:

From the study conducted the hemodynamic observations were monitored at

- 1) Pre induction
- 2) After induction
- 3) Laryngoscopy & intubation
- 4) 1 minute after intubation
- 5) 2 minutes after intubation
- 6) 3 minutes after intubation
- 7) 4 minutes after intubation
- 8) 5 minutes after intubation
- 9) 6 minutes after intubation

60 normotensive, healthy adult (ASA grade I & II) patients undergoing elective non cardiac surgery were studied.

They were randomly divided into two groups comprising of 30 patients each.

The demographical data was compared among the two groups.

No statistically significant difference between the groups was observed with respect to age, gender or weight.

Heart rate, systolic and diastolic blood pressures were recorded before induction at the time of laryngoscopy and intubation and at 1 min interval for 6 min thereafter. There is no statistical significance difference in mean heart rate, mean systolic, diastolic across 2 groups pre operatively.

Table 1 : The mean HR, mean systolic and mean diastolic blood pressure after induction.

After induction	Esmolol group	Fentanyl group	P value	Significance
Heart rate	79.73+or-7.73	88.53+or-4.32	<0.05	Significant
Systolic BP	117.86+or-11	118.4+or-10.76	>0.05	Non significant

Diastolic BP	76.9+or-5.02	76.66+or-6.13	>0.05	Non significant
MAP	90.55+or-7.01	90.57+or-7.67	>0.05	Non significant

There is statistical significance difference in the mean HR among 2 groups. There is no statistical significance difference in mean systolic & diastolic among 2 groups.

Table 2: HR, Systolic BP, diastolic BP, and MAP at laryngoscopy and endotracheal intubation

After induction	Esmolol group	Fentanyl group	P value	Significance
Heart rate	91.43+or-10.15	91.43+or-10.15	<0.05	Significant
Systolic BP	134.56+or-8.04	134.56+or-8.04	<0.05	Significant
Diastolic BP	88.86+or-6.46	88.86+or-6.46	<0.05	Significant
MAP	110.28+or-11.38	104.09+or-6.98	<0.05	Significant

There is high statistically significant difference in mean HR across the 2 groups (p<0.001)

The mean HR, BP, MAP of the esmolol group are the least.

The differences with the fentanyl group are statistically significant.

The mean HR, Systolic BP, diastolic BP, and MAP at 1 minute, 2 minute, 3 minute, 4 minute, 5 minute following intubation are having statistically significance among 2 groups (p <0.01). the BP & MAP are the lowest in the esmolol group than fentanyl.

There is no statistical significant difference in mean HR, Systolic BP, diastolic BP among patients in esmolol and fentanyl groups.

Conclusion:

Bolus injection of both esmolol (1.5 mg/kg) and fentanyl (2mcg/kg) before intubation are effective in attenuating the hemodynamic responses to laryngoscopy and endotracheal intubation like HR, BP.

But only esmolol provided consistent and reliable protection against increase in both heart rate and systolic blood pressure accompanying laryngoscopy & endotracheal intubation.

No evidence of any myocardial insult or any side effects were noted with esmolol and fentanyl.

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