



**A COMPARATIVE STUDY BETWEEN ESMOLOL AND CLONIDINE IN ATTENUATING HYPERDYNAMIC CARDIOVASCULAR RESPONSES TO LARYNGOSCOPY AND ENDOTRACHEAL INTUBATION IN GENERAL ANAESTHESIA AT SHMSR, GREATER NOIDA**

**Anaesthesiology**

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**ABSTRACT**

**BACKGROUND :** Many new studies are still being carried out with re-evaluation of older ones. With this idea an endeavour will be made to evaluate whether intravenous esmolol or oral clonidine as a premedicant can modify cardiovascular responses to direct laryngoscopy and endotracheal intubation.

**MATERIAL AND METHODS :** Present study was carried out in the Department of Anaesthesiology, Sharda Hospital, School of Medical Sciences and Research, Knowledge Park III, Greater Noida. Sixty patients were chosen for this study. They were of both sexes. Their age ranged from 18-50 years and weight ranged from 40-75 kg.

**RESULTS :** In the esmolol group, both the pulse rate and arterial pressure showed a significant rise just after laryngoscopy and intubation. But two minutes after intubation the rise was statistically insignificant in comparison to control group. Esmolol could check the rise of both pulse rate and blood pressure at two minutes after intubation.

**CONCLUSION :** Although increased sedation with clonidine premedication is an undesired side effect but that usually does not require intense post operative monitoring, as the incidence of respiratory depression following oral clonidine premedication is extremely rare.

**KEYWORDS**

**INTRODUCTION**

During induction of general anaesthesia two important events take place. One is laryngoscopy, the other one being tracheal intubation. During laryngoscopy, blade of laryngoscope presses against the base of tongue and lifts up epiglottis. This incidence gives rise to certain impulses resulting in intense sympathetic stimulation causing hypertension and tachycardia. Compared to endotracheal intubation, laryngoscopy causes more intense stimulation so far as cardiovascular effects are concerned.

The changes usually recorded include a rise of systolic blood pressure [SBP] by about 30-50 mm Hg, diastolic blood pressure [DBP]-about 20-30 mm Hg, resulting in rise in mean arterial pressure [MAP]. Heart rate increases by about 20-40 beats per minute thus raising Rate pressure product [RPP], an index of myocardial oxygen consumption. Various cardiac dysarrhythmias apart from sinus bradycardia and tachycardia do occur in 5-10% of the patients. However, most of these are benign and transient.

Sympathoadrenal stimulation may prove detrimental to the health to a certain group of patients, e.g. those with ischemic heart disease who may suffer acute myocardial infarction. In patients with inotropically compromised heart such an increase in heart rate may lapse them into heart failure. In the case of patients with cerebral aneurysm may result hypertensive haemorrhage in brain. Therefore to prevent these casualties one must try to attenuate the sympathoadrenal stimulation.

This observation led to use of different techniques and drugs to attenuate cardiovascular responses to laryngoscopy and tracheal intubation like deeper plane of anaesthesia, local anaesthetics [applied both locally and intravenously], narcotics, vasodilators, calcium channel antagonists, beta-1 adrenoreceptor blocker, alpha-2 adrenoreceptor agonists, or their combinations with various degrees of success.

But no single method has gained widespread acceptance because each method has its own merits and demerits. Many new studies are still

being carried out with re-evaluation of older ones. With this idea an endeavour will be made to evaluate whether intravenous esmolol or oral clonidine as a premedicant can modify cardiovascular responses to direct laryngoscopy and endotracheal intubation.

**AIMS AND OBJECTIVES**

1. To evaluate whether intravenous esmolol or oral clonidine premedication prior to induction of anaesthesia can attenuate hyperdynamic cardiovascular responses to direct laryngoscopy and endotracheal intubation.
2. The ability of clonidine and esmolol to attenuate cardiovascular responses will be compared with those of a control group of patients.
3. To find out which drug is more preferable for attenuating cardiovascular responses during laryngoscopy and endotracheal intubation.

**MATERIALS AND METHODS**

The present study was carried out in the Department of Anaesthesiology, Sharda Hospital, School of Medical Sciences and Research, Knowledge Park III, Greater Noida. Subjects were selected amongst those who were selected for surgery under general anaesthesia requiring endotracheal intubation.

Sixty patients were chosen for this study. They were of both sexes. Their age ranged from 18-50 years and weight ranged from 40-75 kg. The patients were carefully selected according to the American Society of Anaesthesiologists classification and were in the grade of I and II. The patients were selected from General surgical, Gynaecological and Orthopaedics wards of Sharda Hospitals, Greater Noida.

During preoperative visit the patients were explained thoroughly under the following headings.

**A. HISTORY TAKING:**

A detailed history was taken including the history of the present and past illness, personal history, family history, past history of any

operation and anaesthesia. History of drug intake and drug allergy.

#### **B. CLINICAL EXAMINATION:**

- a. Height, Weight, Nutrition, Pulse, Blood Pressure, Temperature, Anaemia, Jaundice, Cyanosis, Clubbing and Oedema.
- b. A careful clinical examination of cardiovascular, respiratory, nervous, gastrointestinal and genitourinary system.
- c. Pre operative investigation:
  1. Routine examination of Blood- Total and differential count of white blood cell, Erythrocyte Sedimentation Rate, Haemo globin%  
Urine-Macrosopic and microscopic examination.  
Stool- Macrosopic and microscopic examination.
  2. Blood Sugar-Fasting and post prandial, Urea and Creatinine.
  3. Serum Electrolytes- $\text{Na}^+$ ,  $\text{K}^+$  and  $\text{Cl}^-$
  4. Chest X ray [PA view]
  5. 12 lead ECG
  6. Echocardiography and Doppler study.

None of the patients included in this study have any history of respiratory, cardiovascular, hepatic, renal, endocrinal and metabolic disorders. Their nutritional status was found to be good.

The patients had no history of receiving psychotropic, hypotonic, antihypertensive, antiarrhythmic, diuretic, antidiabetic and steroid therapy.

All patients waiting for surgery were examined thoroughly in the ward two days before the expected day of operation. This opportunity was also utilised to establish a pleasant rapport with the patient and allaying his/her anxiety.

Altered anatomy of the mouth and neck, particularly dental structure that might pose a problem to smooth and quick intubation-patients having such anticipated intubation problems were excluded from the study.

All the patients received tablet lorazepam 2 mg at bedtime on the night before operation. In the ward, on the morning of operation, about two hours before induction of anaesthesia pulse rate, systolic and diastolic blood pressure was measured and tablet lorazepam [2 mg] was given orally.

All the patients received injection glycopyrrolate [0.2 mg], intramuscularly ½ hour before the operation.

Then the subjects were brought to the operation theatre and they were rested on operation table for five minutes in a calm and quiet atmosphere to get them accustomed with the new surroundings and environment. All the essential monitors-pulse oxymeter, non invasive blood pressure monitor, ECG, Capnometer and in some selected patients central venous line was inserted to monitor CVP with the help of water manometer.

The subjects were monitored for pulse rate [PR as beats per minute; bpm] by palpation of the radial artery and for systolic and diastolic pressures [SBP and DBP respectively in mm of Hg] with the help of a non-invasive automated blood pressure monitor.

After final checking of the subjects, dependable intravenous channel was instituted.

Pulse and blood pressure were recorded which acted as a preoperative basal value [Before study drug administration].

Altogether 60 subjects were studied. They were randomly allocated in three groups, each containing 20 subjects.

#### **THE GROUPS ARE:**

Group E: Received intravenous Esmolol 2mg/kg, 2 minutes before induction of anaesthesia. All of them have received 5 ml rose syrup orally 90 minutes before the induction.

Group C: Received oral clonidine tablet, 4µg/kg, dissolved in 5 ml rose syrup, 90 minutes before induction of anaesthesia. They have also received 10 ml normal saline intravenously 2 minutes before the induction.

Group P: Received none of the two drugs under the study. They have

taken 5 ml rose syrup 90 minutes before the induction, orally and 10 ml normal saline 2 minutes before induction, intravenously.

In all the three groups, pulse rate and blood pressure were recorded before study drug administration, which has been denoted as premedication value [Basal Value].

The patients were preoxygenated with 100% oxygen for 5 minutes from a Boyle's machine via a face mask and Mapleson A system. Anaesthesia was induced 2 minutes after intravenous esmolol and 90 minutes after oral clonidine.

Anaesthesia was induced with intravenous thiopentone [4 mg/kg] followed by suxamethonium [1.5 mg/kg] with proper care and monitoring.

After full relaxation, laryngoscopy was done to expose glottis properly and intubation was carried out in a single attempt. The cuff of endotracheal tube was inflated and pulse and blood pressure were recorded, which was denoted as "0" time [just after laryngoscopy and endotracheal intubation].

Blood pressures, pulse rate, SpO<sub>2</sub> were taken 1, 2, 5 and 10 minutes after laryngoscopy and intubation [the zero time].

Maintenance of anaesthesia was carried out with N<sub>2</sub>O 67% and O<sub>2</sub> 33%. Injection Vecuronium 0.08-mg/kg-body weight and injection fentanyl [1 µg/kg] were given intravenously as muscle relaxant and analgesic respectively.

At the end of surgery, the subjects were reversed from the residual effect of non-depolarising effects of muscle relaxants as necessary. During the whole period, the subjects were carefully observed for any untoward effects and especially for those which might be due to esmolol and clonidine.

Mean arterial pressure [MAP] and rate pressure product [RPP] were also taken from the study.

Results obtained in the study are presented in a tabulated manner [mean +/- SD] in the following section. Statistical analysis was done by Student's t test, where sample mean is used to estimate the population mean and the corresponding p value was obtained [p<0.05 was considered as significant and p<0.01 was considered as highly significant whereas, p>0.05 was considered as statistically insignificant]. Demographic data are expressed in tabular manner and also with bar diagram and pie chart. Changes of different variables [e.g. systolic blood pressure, diastolic blood pressure, pulse rate etc.] with time are displayed in graphical format.

#### **UNTOWARD EFFECTS:**

On one occasion, there was a sudden drop of blood pressure to less than 78/56 mm of Hg necessitating attention and was managed accordingly. This case was excluded from the study.

On two occasions, intubation could not be performed on single attempt and prolonged laryngoscopy was needed in one and the other required the insertion of Laryngeal Mask Airway-so they were also excluded from the study.

Administration of Esmolol in one patient resulted prolonged and protracted bradycardia [less than 52 bpm for 15 minutes]-this case was also excluded from the study.

#### **RESULTS**

Laryngoscopy and intubation of trachea often evokes cardiovascular responses characterised by an increase of arterial pressure and heart rate and disturbance of cardiac rhythm. Usually these transient changes have no deleterious effects in healthy patients, but with patients with altered tone in cardiovascular system, these changes may provoke life threatening consequences. The present study compares the efficacy of oral clonidine and intravenous esmolol for attenuation of cardiovascular responses to laryngoscopy and endotracheal intubation.

Sixty adult patients from both the sexes were randomly allocated into three groups. Group P served as control. Group C and Group E were pre-treated with oral clonidine and intravenous esmolol respectively.

Lorazepam tablet was given to all the patients as premedication. After inducing the patients with thiopental and succinylcholine following oxygenation, the act of laryngoscopy and intubation were performed in a smoothest possible manner and as quickly as possible. The anaesthesia was maintained with nitrous oxide, oxygen and Vecuronium. The blood pressure and pulse rate were noted before study drug administration, just before laryngoscopy and intubation, 1,2,5 and 10 minutes after intubation in all the three groups of patients. The results obtained were then studied and analysed with statistical reference they were compared.

Analysing the different data obtained from this study it was found that both oral clonidine and intravenous esmolol were effective in attenuating the cardiovascular stress response associated with laryngoscopy and intubation.

In the esmolol group, both the pulse rate and arterial pressure showed a significant rise just after laryngoscopy and intubation. But two minutes after intubation the rise was statistically insignificant in comparison to control group. Esmolol could check the rise of both pulse rate and blood pressure at two minutes after intubation.

Orally administered clonidine showed significant attenuation of systolic, diastolic and mean arterial pressure. But it could not attenuate pulse rate in a effective way. Moreover most of the patients remain sedated after reversal of neuromuscular blockage, more so when duration of surgery is less than one hour.

### CONCLUSION

1. Intravenous esmolol is the better attenuator amongst the two drugs studied over here to attenuate the cardiovascular responses to laryngoscopy and intubation.
2. Therefore IV Esmolol could be regarded as drug of choice among the two drugs studied here particularly so when emergency anaesthesia is to be provided in patients of unstable cardiovascular status.
3. However oral clonidine can be used in cases of elective surgery, when anaesthesia is administered single handed and good perioperative monitoring facilities are unavailable.

Although increased sedation with clonidine premedication is a undesired side effect but that usually does not require intense post operative monitoring, as the incidence of respiratory depression following oral clonidine premedication is extremely rare.

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