



## “A COMPARATIVE STUDY OF EFFECT OF DEXMEDETOMIDINE AND FENTANYL ON HAEMODYNAMICS IN GENERAL ANAESTHESIA”

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### ABSTRACT

**BACKGROUND:** In general anaesthesia, endotracheal intubation and time of extubation are most critical events which provoke transient but marked sympatho-adrenal response. Dexmedetomidine, a specific alpha 2 agonist and Fentanyl, a synthetic opioid agonist are administered as an adjuvant to inhaled anaesthetic to blunt circulatory responses to direct laryngoscopy for intubation of trachea or during surgical stimulation.

**OBJECTIVE OF THE STUDY:** This study was conducted to compare the efficacy of Dexmedetomidine and Fentanyl in terms of haemodynamic changes during elective surgeries and in postoperative period and to evaluate whether Dexmedetomidine is more effective than Fentanyl with regard to the above criteria.

**METHODS:** Sixty patients of aged 25-65 years with ASA I and II were randomized to two groups. Thirty patients received Dexmedetomidine loading dose of 1 µg/kg over ten minutes before induction followed by infusion at the rate of 0.25 µg/kg/hr throughout the surgery. Similarly, the remaining thirty patients received Fentanyl loading dose of 2 µg/kg over ten minutes followed by infusion at the rate of 0.5 µg/kg/hr. Patients were induced with propofol 2mg/kg and atracurium 0.5mg/kg following which patients were intubated and maintained general anaesthesia with isoflurane, oxygen, nitrous oxide and IPPV. Heart rate, systolic blood pressure, diastolic blood pressure, mean arterial pressures were noted at baseline, after loading dose of respected drugs, after induction, at intubation and throughout the surgery, which continued in PACU upto 24 hours.

**RESULTS:** Both Fentanyl and Dexmedetomidine attenuated the rise in heart rate, systolic, diastolic and mean arterial pressures, with Dexmedetomidine being statistically significant (p<0.001)

**Conclusion:** Dexmedetomidine proved to have better haemodynamic stability and more effective in attenuating haemodynamic response following intraoperative infusion when compared to Fentanyl.

**KEYWORDS :** Dexmedetomidine; Fentanyl; Endotracheal intubation; Extubation; Haemodynamics.

### INTRODUCTION :

In general anaesthesia, endotracheal intubation and time of extubation are most critical events which provoke transient but marked sympatho-adrenal response such as hypertension and tachycardia.

Dexmedetomidine, is the dextro isomer and pharmacologically active component of medetomidine, specific alpha 2 agonist which reduces the pressor response mediated by sympathetic nervous system during general anaesthesia. It also has anxiolytic, anaesthetic, hypnotic and analgesic properties. [1]

Fentanyl is a phenylpiperidine derivative synthetic opioid agonist. It is structurally related to meperidine. Fentanyl is administered clinically in a wide range of doses and fentanyl, 2 to 20 microgram/kg IV is administered as an adjuvant to inhaled anaesthetic to blunt circulatory responses to direct laryngoscopy for intubation of trachea or during surgical stimulation [1]

### MATERIALS AND METHODS :

#### Source of data collection:

The study group included patients undergoing elective surgeries under general anaesthesia at KVG medical college and hospital from January 2019 to April 2020 after approval from institutional ethics committee

- Method of collection of data

**Study design:** Randomized controlled trial.

#### INCLUSION CRITERIA:

1. Age – 25 to 65 years.
2. Gender - both male and female
3. American Society of Anesthesiologist Grade I & II.
4. Patients undergoing surgeries under general anaesthesia including laparoscopic surgeries.

#### EXCLUSION CRITERIA:

1. Patients with disorder of cardiovascular, hepatic, renal or neuromuscular systems.
2. Patients with uncontrolled systemic diseases such as diabetes mellitus, hypertension, chronic obstructive lung disease.
3. Patients on calcium channel blockers, beta blockers, chronic use

of opioids.

4. Patients with BMI > 35.
5. Patients receiving drugs known to interact with study drugs.

**Sample Size :** A total of 60 patients with 30 in each group.

$$\text{Formula used : } n = \frac{z^2 \sigma^2 (\epsilon_1 - \alpha + z_1 - \beta)^2}{(F_1 - F_2)^2}$$

### METHODOLOGY

After approval from institutional ethics committee, a randomized controlled study was conducted on 60 patients. Preanaesthetic evaluation was done and written informed consent was taken from all the patients.

On the day of the surgery, routine monitors such as ECG, Pulse oximetry (spo2) and non-invasive BP were attached. Patients were randomly allocated to 2 groups, Group D and Group F.

Group D - patients received a loading dose of IV Dexmedetomidine 1 microgram/kg over 10 minutes before induction of anaesthesia and 0.25 microgram/kg/hr during operative period.

Group F - patients received a loading dose of IV Fentanyl 2 microgram/kg over 10 minutes before induction of anaesthesia and 0.5 microgram/kg/hr by continuous infusion during operative period.

During the period of loading dose of the study drug, haemodynamic parameters at 0, 5 and 10 minutes were noted and supplemental oxygen was provided.

After the loading dose of study drug, induction of anaesthesia in both the groups was conducted by injection propofol 2mg/kg IV, neuromuscular blocking agent, inj. atracurium 0.5mg/kg IV was given following which endotracheal intubation was done using an appropriate size cuffed endotracheal tube and general anaesthesia was maintained by inhalational anaesthetic agent - isoflurane, oxygen and nitrous oxide and ventilation was controlled by maintaining normocapnia.

Haemodynamic parameters such as heart rate (HR), Systolic blood

pressure(SBP), diastolic blood pressure(DBP) and mean arterial pressure(MAP) was noted during induction and at the time of intubation and thereafter every 5 minutes upto 30mins and thereafter every 10minute till extubation.

Additional doses of inj.Atracurium 0.1mg/kg was given as per requirement.

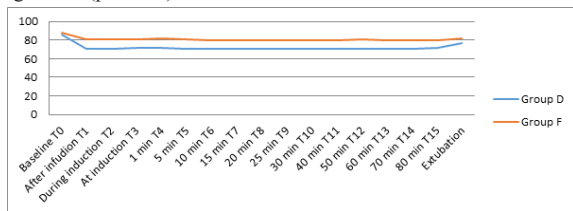
After surgery ,dexmedetomidine/fentanyl infusion was stopped along with isoflurane and nitrous oxide.Patients were completely reversed using mixture of neostigmine 0.05mg/kg and glycopyrolate 0.01mg/kg and extubation was done once extubation criteria was met. After extubation, all the patients were shifted to PACU. In PACU, MAP and HR was assessed on arrival and at 1,6,12 and 24hrs.

**RESULTS :**

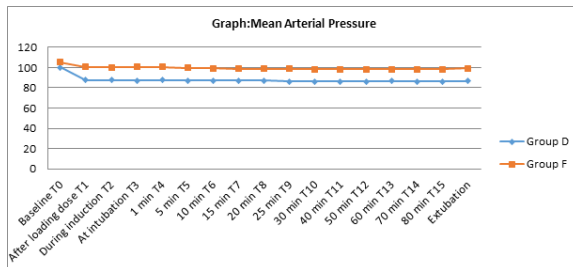
MS excel and SPSS version 2.0 were used to analyse data and t test was used to find a significant statistical difference between the two groups. p-value <0.05 was considered statistically significant. There was statistically significant decrease in the heart rate in Group D compared to Group F throughout the surgery. At extubation, heart rate in the group D was 76.70 ± 7.85 and in group F was 87.53 ± 9.583, where the rise in the heart rate was significantly lower in the group D when compared to group F (p=0.042).

Mean arterial pressure in the group D was lower compared to group F , which was statistically significant with p<0.001. At extubation, mean arterial pressure in group D was 86.900 ±9.33 and 99.300 ± 4.720 in group F, which was significantly lower in the group D (p<0.001)

Ramsay sedation score was more in group D with a score of 3.366 ± 0.4901 and 2.433 ± 0.5040 in group F , which was statistically significant(p<0.001)



**Figure 1: Changes In The Heart Rate.**



**Figure 2: Changes In The Mean Arterial Pressure**

**Table 1: Ramsay Sedation Score Between The Two Groups**

	Group D Mean ± S.D	Group F Mean ± S.D	P Value
Ramsay Sedation score	3.366 ± 0.4901	2.433 ± 0.5040	<0.001

**Table 2 : Ramsay Sedation Score.**

LEVEL OF ACTIVITY	POINTS
Patient anxious, agitated or restless	1
Patient cooperative, orientated and tranquil	2
Patient responding only to verbal commands	3
Patient with brisk response to light glabella tap or loud auditory stimulus	4
Patient with sluggish response to light glabella tap or loud auditory stimulus	5
Patient with no response to light glabella tap or loud auditory stimulus	6

**Table 3: Comparison Of Etco<sub>2</sub> Between The Two Groups**

	Group D Mean ± S.D	Group F Mean ± S.D	P Value
ETCO <sub>2</sub>	31.53 ± 0.973	34.466 ± 0.819	<0.001

**DISCUSSION :**

A study conducted by sakshi goyal et al<sup>2</sup> on 60 female patients undergoing surgeries for breast carcinoma under general anaesthesia to compare the efficacy of IV dexmedetomidine and IV fentanyl on haemodynamic parameter, recovery profile and postoperative analgesia and they conclude that dexmedetomidine can be used as a suitable alternative to fentanyl due to better haemodynamic stability and better recovery profile A study conducted by Eldin Abdel Hamid MH<sup>3</sup> on sixty patients undergoing arthroscopic shoulder surgery under general anaesthesia to evaluate the efficacy of iv dexmedetomidine infusion and iv fentanyl infusion on haemodynamics and concluded that iv infusion of dexmedetomidine provides better hypotensive anaesthesia by lowering MAP and HR which leads to better surgical field than iv fentanyl infusion.

A simple descriptive study conducted by Rao SH et al<sup>4</sup> to describe the effect of dexmedetomidine on haemodynamic stability in the intraoperative period, as well as on the pressor response to intubation and extubation and the requirement of inhalation anaesthetics and recovery on 81 ASA I and II patients. They concluded that Dexmedetomidine provided a stable haemodynamic profile in the perioperative period and a blunted pressor response to intubation and extubation. There was a minimal requirement for analgesics and inhalational agents with its use.

Feld et al<sup>5</sup> conducted a randomized study on twenty bariatric patients with BMI of 54 to 61kg/m2 posted for open gastric bypass surgery under general anaesthesia. They came to a conclusion that when dexmedetomidine was used as a substitute for fentanyl, MAP and HR were lower and postoperative analgesia was better in dexmedetomidine group when compared with fentanyl group.

A study conducted by Tanskanen et al<sup>6</sup> on 54 patients posted for elective surgeries of supratentorial brain tumour under general anaesthesia . The dexmedetomidine group received continuous infusion of dexmedetomidine with plasma target concentration of 0.2 or 0.4 ng/ml from 20 minutes before anaesthesia until the start of skin closure. They gave a conclusion that dexmedetomidine increases perioperative haemodynamic stability when compared with fentanyl.

A study conducted by Turgut et al<sup>7</sup> including 50 ASA I and II patients undergoing lumbar laminectomy. They observed that MAP values were significantly higher in fentanyl group compared to dexmedetomidine group and concluded that propofol-dexmedetomidine provides stable perioperative haemodynamic responses.

**CONCLUSION:**

From the present study it can be concluded that, In Dexmedetomidine group, patients received Dexmedetomidine at 1 µg/kg as loading dose over 10minutes before induction of anaesthesia followed by infusion at the rate of 0.25 µg/kg/hr throughout the surgery. It showed significant decrease in the heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP) and mean arterial pressure (MAP) throughout the study period.

In Fentanyl group, patients received Fentanyl at 2 µg/kg as loading dose followed by infusion at the rate of 0.5 µg/kg/hr throughout the surgery. Though, decrease in HR,SBP,DBP and MAP was not more than those as recorded in Dexmedetomidine group.

Side effects like bradycardia, hypotension, nausea, vomiting and dryness of mouth were not observed in both the groups and recovery was satisfactory.

Hence both Dexmedetomidine and Fentanyl in the above mentioned dose can be used safely to attenuate the haemodynamic response without significant side effects, whereas Dexmedetomidine proved to have better haemodynamic stability and more effective in attenuating haemodynamic response following intraoperative infusion when compared to Fentanyl.

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