



“EVALUATION OF THREE DIFFERENT DOSES OF FENTANYL IN LAPAROSCOPIC SURGERY”

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ABSTRACT

Background and Objectives: Laparoscopic surgical procedures are performed by insufflation of carbondioxide which produces adverse cardiac effects like tachycardia and hypertension.Hence the present study has been conducted to evaluate three different doses of fentanyl in maintaining hemodynamic stability during laparoscopic cholecystectomy.

Methods: The present study was conducted in 90 patients who were randomly allocated into three groups , group A (fentanyl 2 mc/kg) ,group B (fentanyl 3 mcg/kg) and group C (fentanyl 4 mcg/kg) each having 30 patients.Group –A received 2 mcg/kg fentanyl in 10 ml normal saline ,group B patients received fentanyl 3 mcg/kg in 10 ml normal saline and group C patients received fentanyl 4 mcg/kg in 10 ml normal saline 5 minutes before to induction.

The hemodynamic parameters heart rate, systolic bloodpressure,diastolic blood pressure and mean arterial pressures were noted at various time intervals during the surgery.

Results : In group A (2cg /kg) patients fentanyl does not significantly attenuate the haemodynamic parameters like pulse rate and blood pressures (systolic ,diastolic,mean arterial blood pressures) during laryngoscopy ,intubation and laparoscopy.

In group B (3mcg/kg) patients fentanyl not significantly attenuates blood pressures (systolic,diastolic,mean arterial blood pressures) but it significantly attenuates pulse rate during laryngoscopy ,intubation and laparoscopy.

In group C(4 mcg/kg) patients fentanyl significantly attenuates both pulse rate and blood pressures (systolic,diastolic,mean arterial pressures) during laryngoscopy ,intubation and laparoscopy.

KEYWORDS :

INTRODUCTION : Laryngoscopy and intubation in the patients who are in a lighter plane of anaesthesia is associated with significant increase in blood pressure and heart rate⁽¹⁻⁴⁾.These increases in the pulse rate and blood pressure are usually of short duration and well tolerated by healthy patients.

However, in patients with hypertension,myocardial ischemia & cardiovascular disease these changes may lead to further deterioration & complications like myocardial infarction, dysrhythmia (like VPC's,Bigemini, etc), cardiac failure and cerebrovascular catastrophes⁽⁵⁻⁸⁾. These changes occur from reflex sympathetic discharge resulting from pharyngeal and laryngotracheal stimulation with increases in plasma concentration of epinephrine and nor-pinephrine.This increased sympatho adrenal activity resu

These hemodynamic responses are usually not completely attenuated by usual premedication. So many methods have been identified to attenuate these responses including intravenous agents like narcotics^(8,9), vasodilators⁽¹⁰⁾,Beta adrenergic blockers^(11,12),clonidine⁽¹³⁾,calcium channel blockers⁽¹⁴⁾ and lignocaine⁽¹⁵⁾.Fentanyl citrate has been identified as an effective agent in this regard⁽¹⁶⁻²²⁾.

Laparoscopy has been promoted aggressively and has advantages like shorter hospital stay, more rapid return to normal activities,less pain associated with the small, limited incisions and less postoperative ileus compared with the open laparotomy technique^(23,24).

Pneumoperitoneum causes various cardiovascular and respiratory derangements. Laparoscopic surgery which involves insufflation with carbondioxide produces undesirable responses like hypertension, tachycardia and dysrhythmias.The potential problem of hemodynamic response of pneumoperitoneum during laparoscopic surgery does need an optimal preoperative and intraoperative anesthetic care of patients⁽²⁵⁾.

Fentanyl citrate is effective in blunting the pressure response to laryngoscopy and intubation with different potency with different dose titration. Off course it would have some side effects like respiratory depression and chest wall rigidity insusceptible persons. But with doses used in clinical setting to attenuate this pressure response, side effects are minimal.

Several studies have compared fentanyl (2 microrams per kg)with dextotomidine ,clonidine ,lignocaine ,nalbuphine, butorphanol and they have found that fentanyl is inferior to dextotomidine ,clonidine,butorphanol and superior to linocaine,nalbuphine.

So wanted to observe if by increasing the dose of fentanyl ,the attenuation of stress response to intubation and surgery was better or not .so we decided to compare three different doses of fentanyl^(2,3,4) micrograms per kg) in attenuation of stress response to laryngoscopy intubation and pneumoperitoneum and to surgery.

In the present study, three different doses of fentanyl was compared in laparoscopic surgery to observe hemodynamic changes intraoperat ively and to observe post operative complications.

MATERIAL AND METHODS

Source of data: The randomized prospective study “Evaluation of three different doses of fentanyl in laparoscopic surgery ” was undertaken at Government General Hospital, Kurnool medical college, Kurnool. The institutional ethical committee approved the study and written informed consent was obtained from all the patients before being included in the study.

Selection Criteria

Inclusion :

1. ASA Grade I and II.
2. Age between 18 to 60 years

Exclusion :

1. Morbid obesity.
2. Patients with cardiac dysfunction.
3. Hypertensive patients.
4. Patients with Renal dysfunction.
5. Patients with liver dysfunction.
6. Patients with severe endocrine disorders.
- 7.Pregnant and lactating patients.
- 8.Patients with known hyper sensitivity to fentanyl.

The patients were randomly allocated in a double blind fashion and using a sealed envelop technique in to three groups as below:

- 1.GROUP A(n=30) - Received 2 micrograms per kg of FENTANYL

in 10ml of 0.9% normal saline 5min before induction
 2.GROUP B (n=30) – Received 3micrograms per kg of FENTANYL in 10 ml of 0.9% normal saline 5min before induction.

3.GROUP C(n=30)--Received 4 micrograms per kg of FENTANYL in 10 ml of 0.9% normal saline 5 min before induction

A thorough pre anaesthetic evaluation was performed by taking history and clinical examination . In all patients age, weight, Systolic blood pressure, Diastolic blood pressure and Heart rate were recorded.All patients were investigated thoroughly to rule out cardiac,renal,hepatic and endocrine problems

On arrival in the operation theatre, monitors were attached and baseline parameters such as heart rate, systemic arterial pressure and oxygen saturation were noted down as pre operative parameters. Intravenous lines were secured, one 20 Gauge cannula in the right hand for fluids and another 18 gauge cannula in left hand for Intravenous fluids and drug administration. 500 ml of crystalloids (Ringer Lactate) was started.

Patients were premedicated with ondansetron 0.08mg/kg, Glycopyrrolate 0.2 mg,midazolam 0.02 milligrams per kg and Group --A ,received 2 micrograms per kg FENTANYL in 10 ml of 0.9%normal saline 5min before Induction of anaesthesia where as Group - B received 3 micrograms per kg FENTANYL in 10ml of 0.9% normal saline 5min before induction of anaesthesia and Group--C received 4 micrograms per kg FENTANYL in 10 ml of 0.9% normal saline 5 min before induction of anaesthesia.

Patients were induced with Thiopentone 5mg/kg till loss of eye lash reflex.Endotracheal intubation was facilitated by succinylcholine 2mg/kg. Anaesthesia was maintained with 33% oxygen in nitrous oxide, and vecuronium bromide 0.1mg/kg. Intermittent positive pressure ventilation was continued by mechanical ventilator to maintain end tidal carbon dioxide between 35-40 mm Hg.

Pneumoperitoneum was created by insufflation of carbon dioxide at the rate of 2 litres /min. Intra abdominal pressure was maintained at 14mmHg throughout the surgical procedure. Throughout the procedure, any rise in mean arterial pressure more than 20% from the baseline was treated with nitroglycerine infusion ..

Systemic arterial pressure including the systolic, diastolic and mean arterial pressure, heart rate, Saturation, Endtidal carbon dioxide and electrocardiography were recorded at the following points of time:

- 1)Preoperative
- 2)just before induction
- 3)during intubation
- 4)1 minute after intubation.
- 5)3 minutes after intubation
- 6)5minutes after intubation
- 7)before Pneumoperitoneum
- 8) 1minute after Pneumoperitoneum
- 9) 3 minutes after Pneumoperitoneum
- 10) 5 minutes after Pneumoperitoneum
- 11)15 minutes after Pneumoperitoneum,
- 12)30 minutes after pneumoperitoneum,
- 13)45 minutes after pneumoperitoneum
- 14)60 minutes after pneumoperitoneum
- 15)end of Pneumoperitoneum
- 16)1 minute after end of EXTUBATION

At the end of surgery patients were reversed with Glycopyrrolate 0.01 mg/kg and Neostigmine 0.05mg/kg . Extubation was performed and patients were transferred to recovery room.

POST OPERATIVE PERIOD

patients were monitored post operatively upto 24 hrs for any adverse effects like brady cardia,nausea ,vomiting ,sedation and respiratory depression and any other side effects .

OBSERVATION AND RESULTS

The present study was done in Department Of Anaesthesiology, Government General Hospital, Kurnool between april 2014 to 2015

august.The patients were divided into three groups.

- Group A - patients received fentanyl 2 mcg/kg
- Group B- patients received fentanyl 3mcg/kg
- Group C patients received fentanyl 4 mcg/kg

The following observations and results were noted. All quantitative results are obtained by ANOVA TEST. Qualitative results like sex distribution are obtained by CHISQUARE TEST.

DISCUSSION

The present study was prospective randomised trial done to evaluate the effects of three different doses of fentanyl on Hemodynamic Response due to Anaesthesia and laparoscopic surgical procedures .

Two important issues that are noted in this study are Pharmacological actions of fentanyl and physiological responses to surgery ,anaesthesia and Laparoscopy.

Laparoscopic procedures involves peritoneal insufflations with Carbon dioxide and creates pneumoperitoneum. This induces intraoperative ventilatory and hemodynamic changes that complicates anaesthetic management for laparoscopy.

The hemodynamic variability due to laparoscopy is due to release of humoral factors and potential mediators are catecholamines , prostaglandins and vasopressin. Elderly patients have some physiological cardiac and circulatory alterations that results in a decrease in myocardial performance.Cardiac output was particularly dependent on venous return and any reduction in blood volume and in preload could result in compromised myocardial function. Laparoscopy produces mainly alterations in cardiac output because of decreased preload and increased afterload.

Laryngoscopy and intubation in the lightly anaesthetised patient is associated with significant increase in HR and BP for short duration, which was well tolerated by healthy patients but not in patient with cardiovascular disease. These changes occur from reflex sympathetic discharge resulting from pharyngeal and laryngeal stimulation with increase in plasma concentration of epinephrine and norepinephrine. This reaction is not prevented by regular pre medication⁽¹⁾.

Surgical stimulation and postoperative stress evoke a general sympathetic stimulation evinced by increased levels of epinephrine and norepinephrine, increased blood pressure and heart rate, a state of hypercoagulopathy, and thermal instability. All these are associated with an increased myocardial oxygen demand and an increased incidence of postoperative complications. The hyperdynamic changes predispose the myocardium to ischemia, especially in patients with coronary artery disease and a decreased reserve for coronary blood flow. Perioperative ischemia is associated with a 9-fold increase in the risk of having postoperative cardiac death, nonfatal myocardial infarction (MI), or unstable angina while in the hospital The long-term risk for adverse cardiac events increases 2-fold in patients who have perioperative ischemia alone and 14-fold to 20-fold in patients who have perioperative MI or unstable angina. Fentanyl blunt hemodynamic variability during surgery and recovery, may exert anti-ischemic effects in the perioperative setting, and may also be effective in reducing these high rates of early postoperative ischemic event.

Fentanyl has analgesic activity ,short duration of action,rapid onset,no histamine release,cardio stability and less post operative side effects.Thus , fentanyl is used for attenuation of stress response during laryngoscopy ,intubation and pneumoperitoneum.

DOSING OF DRUG:

Fentanyl, 2 to 20 µg/kg IV, may be administered as an adjuvant to inhaled anesthetics in an attempt to blunt circulatory responses to (a) direct laryngoscopy for intubation of the trachea, or (b) sudden changes in the level of surgical stimulation. High doses up to 20 µg/kg IV are used for prolonged cardiac surgeries and is associated with delayed recovery.. So we compared lower doses of fentanyl 2,3,4 micrograms per kg in this study.

TIMING OF INJECTION OF DRUG:

Timing of the intravenous injection of fentanyl to prevent or treat such responses should consider the effect-site equilibration time, which for

fentanyl is prolonged when compared with alfentanil and remifentanyl. Effect site equilibration time for fentanyl is 6.4 minutes. In this study fentanyl drug is given slowly over 1 minute and before 5 minutes to induction

In this clinical study, all the three groups were similar with regard to demographic data, operative procedures & duration. Patients with significant co-morbidities, allergic to study drug, airway abnormalities, nasal intubation, and surgeries requiring head and neck manipulations and throat packing were excluded because of greater impact on stress response.

Then all three groups of fentanyl A, B, C are compared in the following haemodynamic parameters.

HEART RATE:

Heart rate preoperatively (basal heart rate) similar in all groups A, B, C and there is no significance among three groups. Heart rate in group A fentanyl 2 µg/kg heart rate is increased in response to laryngoscopy, intubation and pneumoperitoneum by CO₂ inflation and remains above basal heart rate through out study. In group B fentanyl 3 µg/kg heart rate is increased in response to laryngoscopy, intubation but it attenuates the stress response of pneumoperitoneum of CO₂ inflation. and 3 minute after intubation on wards in group B heart rate is below basal heart rate. coming to group C fentanyl 4 µg/kg heart rate is not risen in response to laryngoscopy, intubation and pneumoperitoneum by CO₂ inflation. and through out study heart rate in group C is below basal heart rate.

SYSTOLIC BLOOD PRESSURE:

Systolic blood pressure preoperatively (basal systolic blood pressure) similar in all groups A, B, C and there is no significance among the three groups.

SBP in group A fentanyl 2 µg/kg SBP is increased in response to laryngoscopy, intubation and pneumoperitoneum by CO₂ inflation and remains above basal SBP through out study. in group B fentanyl 3 µg/kg SBP is increased in response to laryngoscopy, intubation but it is significantly not attenuates the stress response of pneumoperitoneum of CO₂ inflation. and so 5 minute after intubation on wards in in group B SBP is above basal value. coming to group C fentanyl 4 µg/kg SBP is not risen in response to laryngoscopy, intubation and pneumoperitoneum by CO₂ inflation. and through out study SBP in group C is below basal SBP.

In group C there is significant attenuation of SBP compared to groups A and B. And at the same time in group B there is no significant attenuation of SBP but compares to group A there is more attenuation of SBP in group B.

DIASTOLIC BLOOD PRESSURE:

Diastolic blood pressure [DBP] preoperatively (basal diastolic blood pressure) similar in all groups A, B, C and there is no significance among the three groups.

DBP in group A fentanyl 2 µg/kg DBP is increased in response to laryngoscopy, intubation and pneumoperitoneum by CO₂ inflation and remains above basal DBP through out study. in group B fentanyl 3 µg/kg DBP is increased in response to laryngoscopy, intubation but it is significantly not attenuates the stress response of pneumoperitoneum of CO₂ inflation. and so 5 minute after intubation on wards in in group B DBP is above basal value. coming to group C fentanyl 4 µg/kg DBP is not risen in response to laryngoscopy, intubation and pneumoperitoneum by CO₂ inflation. and through out study DBP in group C is below basal DBP.

In group C there is significant attenuation of DBP compared to groups A and B. And at the same time in group B there is no significant attenuation of DBP but compares to group A there is more attenuation of DBP in group B.

MEAN ARTERIAL PRESSURE (MAP):

Mean arterial blood pressure [MAP] preoperatively (basal MAP) similar in all groups A, B, C and there is no significance among the three groups.

MAP in group A fentanyl 2 µg/kg MAP is increased in response to laryngoscopy, intubation and pneumoperitoneum by CO₂ inflation and remains above basal MAP through out study. in group B fentanyl 3 µg/kg MAP is increased in response to laryngoscopy, intubation but it is significantly not attenuates the stress response of pneumoperitoneum of CO₂ inflation. and so 5 minute after intubation on wards in in group B MAP is above basal value. coming to group C fentanyl 4 µg/kg MAP is not risen in response to laryngoscopy, intubation and pneumoperitoneum by CO₂ inflation. and through out study MAP in group C is below basal MAP.

in group C there is significant attenuation of MAP compared to groups A and B. And at the same time in group B there is no significant attenuation of MAP but compares to group A there is more attenuation of MAP in group B.

No evidence of any myocardial depression was seen in any of the patients in any group in our study except two patient showing bradycardia in group C.

None of our patients demonstrate the side effects post operatively.

CONCLUSION:

- 1) Fentanyl given 5 minutes before induction produces most attenuation of haemodynamic effect of stress response.
- 2) It will cause minimal changes in heart rate, systolic blood pressure, diastolic blood pressure, mean arterial blood pressure during first 10 minutes after intubation.
- 3) Fentanyl 2mcg/kg IV not significantly attenuates stress response in view of haemodynamic parameters
- 4) Fentanyl 3 mcg/kg IV significantly attenuates blood heart rate and not significantly attenuates blood pressures.
- 5) Fentanyl 4 mcg/kg IV significantly attenuates both heart rate and blood pressures during laryngoscopy, intubation and laparoscopy.
- 6) So we concluded that among three different doses of fentanyl 2mcg/kg, 3mcg/kg, 4 mcg/kg IV, Fentanyl 4 mcg/kg IV is more effective in attenuating stress response during laryngoscopy, intubation and laparoscopy.

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