Original Article

DOI: 10.7860/JCDR/2017/27020.10578

Anaesthesia Section

# Comparative Study of the Effect of Dexmedetomidine Vs. Fentanyl on Haemodynamic Response in Patients Undergoing Elective Laparoscopic Surgery

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## ABSTRACT

**Introduction:** Dexmedetomidine and fentanyl, both have sedative and analgesic effects. They are often used as adjunct during anaesthesia to attenuate pressor response during tracheal intubation. Limited study has been done comparing the effect of both drugs on haemodynamic response in patients undergoing laparoscopic surgery.

**Aim:** The study was designed to compare the effect of dexmedetomidine Vs fentanyl on haemodynamic response to tracheal intubation, following pneumoperitoneum and intraoperative period in patients undergoing laparoscopic surgery.

**Materials and Methods:** Sixty patients of age group 18-60 years of either sex, classified as American Society of Anaesthesiologist (ASA) Grade I and II undergoing elective laparoscopy surgery were randomly allocated to one of the two groups (Group-D) and (Group F) of 30 each. Group D received dexmedetomidine and Group F received fentanyl. Patients received intravenous 0.5 µg/kg of the study drug as loading dose over 10 minutes prior to intubation followed by 0.2-0.7 µg/kg/hr as infusion till surgery was over. In operating room parameters like Heart Rate (HR), Respiratory Rate (RR), Systolic Blood Pressure (SBP), Mean Arterial Pressure (MAP), $SpO_2$, $EtCO_2$ were recorded 10 minutes after infusion of drug i.e., dexmedetomidine or fentanyl. The said parameters were again recorded after injection of induction drugs, after intubation, five minutes after intubation, just after pneumoperitoneum, and 5,10,15,30,45 and 60 minutes after pneumoperitoneum, five minutes after release of pneumoperitoneum, five and 10 minutes after extubation.

**Results:** Dexmedetomidine significantly attenuates stress response at intubation with lesser increase in HR (5% Vs 18%), SBP (9% Vs 19%) and DBP (3% Vs 15%), MAP (2% Vs 15%) as compared to fentanyl ($p<0.05$). Throughout intraoperative period of pneumoperitoneum Group D showed significant fall in HR, SBP, DBP, MAP from baseline value at all points of time intervals whereas it remained constantly high above baseline value in Group F (p-value <0.05).

**Conclusion:** Dexmedetomidine when compared to fentanyl causes greater attenuation of stress response to tracheal intubation, following pneumoperitoneum and in intraoperative period resulting in greater reduction of HR, SBP, DBP, MAP than that of fentanyl, thus causing better haemodynamic stability in patients undergoing elective laparoscopic surgery.

**Keywords:** Laproscopy, Mean arterial pressure, Pneumoperitonium

## INTRODUCTION

Laparoscopic surgeries are becoming popular due to several postoperative benefits allowing quicker recovery, less tissue damage, avoiding big surgical incision, shorter hospital stay with consequent reduction in health care cost [1].

But anaesthetic management in these patients has become complicated due to cardiopulmonary changes occuring during creation of pneumoperitoneum with $CO_2$ and patient position required for different laparascopic surgeries. Laryngoscopy, tracheal intubation and pneumoperitoneum are associated with sympathetically mediated adverse haemodynamic effect like elevation of arterial pressure, heart rate, decrease in cardiac output due to pneumoperitoneum and increase of systemic and pulmonary vascular resistances. Peritoneal insufflations also results in ventilatory and respiratory changes and can contribute to stress response [2,3].

Many studies have been done using $\alpha 2$ adrenergic agonist compounds like clonidine as premedicant in laparoscopic surgeries [4-6]. Newer drug like dexmedetomidine shows a high ratio of specificity ($\alpha 2/\alpha 1$ 1620:1) making it a complete $\alpha 2$ agonist [7]. When used as an adjuvant it attenuates stress response associated with anaesthesia and surgery providing haemodynamic stability without significant respiratory depression [8]. It has the ability to sedate and provide analgesia while maintaining patient's arousability and respiratory function.

Fentanyl citrate is a narcotic analgesic interacting predominantly with the opioid µ receptor and exerting its principal pharmacological effect on CNS. Its primary action of therapeutic value is analgesia andsedation. It is extensively used for anaesthetic and analgesic most often in operating room and ICU [9].

The study was aimed to compare the effect of dexmedetomidine Vs fentanyl on haemodynamic response to tracheal intubation, following pneumoperitoneum and intraoperative period in patients undergoing laparoscopic surgery.

## MATERIALS AND METHODS

After obtaining approval from Hospital Ethical Committee (Ref No PPDYPU/164/2013) and informed consent from all patients, a prospective randomized, double blinded study was conducted on sixty patients admitted posted for different laparoscopic surgeries under general anaesthesia at Dr DY Patil Medical College and Hospital, Navi Mumbai, Maharashtra, India from January 2013 to January 2014.

Inclusion criteria were patient belonging to ASA Grade I and II, aged between 18-60 years, and of either sex. Exclusion criteria were pregnant and lactating women, patient with acute and chronic renal failure, compromised cardiovascular function, severe deranged liver function, patients with ASA Grade III and IV, haemodynamically compromised patients, emergency cases, patients with uncontrolled systemic disease, patients on α blocker and patients with HR <55/min.

Sixty patients were randomly allocated into two groups of 30 each to receive either dexmedetomidine (Group-D) or fentanyl (Group-F) using sequentially numbered envelopes. Sample size required was thirty in each group, determined based on previous study results on outcome, with a power of 0.9 and type 1 error 0.05 [10,11]. Patients were examined one day before scheduled surgery. Informed consent along with proper preoperative evaluation and relevant investigation as per case record form was done. No hypnotic medication was given on night before surgery. In operation theatre, preoperative base line parameters like HR, ECG, RR, $SpO_2$, noninvasive SBP, DBP, MAP were recorded.

The study drugs were then prepared as follows.

About 2 ml (200 µg) of study drug dexmedetomidine was diluted in 48ml of normal saline to make 50 ml (concentration 4 µg/ml.). About 4 ml (200 µg) of study drug fentanyl was diluted in 46 ml normal saline to make 50 ml (conc. 4 µg/ml.)

Intra Venous access was secured with a 20 G cannula and infusion of Ringer's lactate was started. The prepared drug dexmedetomidine or fentanyl was given as follows:

**Group-D (N=30):** IV dexmedetomidine 0.5 µg/kg was given as loading dose over 10 minutes prior to induction.

**Group-F (N=30):** IV fentanyl 0.5 µg/kg was given as a loading dose over 10 minutes prior to induction.

Ten minutes after infusion of drug dexmedetomidine or fentanyl, the parameters ECG, HR, RR, SBP, DBP, MAP and $SpO_2$ were recorded.

Sedation was evaluated after the infusion of study drug, dexmedetomidine or fentanyl according to modified Ramsay sedation score [11,12].

The patient was pre-oxygenated with 100% oxygen for three minutes. Following this, inj. Glycopyrolate 0.2 mg IV (as and when required when HR<55/min), inj. ondansetron 4 mg I.V, inj. Tramadol 2 mg/kg I.V were given before induction.

Anaesthesia was induced with Inj Thiopentone 4-5 mg/kg I.V till there was loss of eye-lash reflex. Neuromuscular blockade was achieved with inj atracurium 0.75 mg/kg I.V. The parameters ECG, HR, RR, SBP, DBP, MAP and $SpO_2$ were recorded after injection of induction drugs.

The patient was ventilated for three minutes with 100% $O_2$ and isoflurane 0.8%. This was followed by laryngoscopy and tracheal intubation. Once tube position was confirmed, positive pressure ventilation was started with tidal volume 8 ml-10 ml/kg and respiratory rate 12-14/minute. The same parameters along with $EtCo_2$ were again recorded immediately after tracheal intubation and five minutes after tracheal intubation. Depending upon the vital parameters, pulse and BP, maintenance infusion rate of dexmedetomidine or fentanyl was increased in a stepwise manner from 0.2-0.7 µg/kg/hour till the end of surgery.

Closed circuit breathing system with soda lime was used. Anaesthesia was maintained with isoflurane 0.8%-10% and $O_2$, Nitrous oxide (40:60) along with atracurium 0.25-0.4 mg/kg for maintenance of blockade. Intraoperative sedation was augmented as and when required with Inj. propofol IV.

Intraoperatively the parameters like ECG, HR, SBP, DBP, MAP, $SpO_2$, and $EtCO_2$ were continuously recorded.

The above parameters were then recorded at predetermined time intervals as follows: $T^0$ (prior to infusion of study drug), $T^1$ (10 minutes after the study drug), $T^2$ (after Inj. of induction drug), $T^3$ (After intubation), $T^4$ (five minutes after intubation), $T^5$ (after pneumoperitoneum), $T^6$ (five minutes after pneumoperitoneum), $T^7$ (10 minutes after pneumoperitoneum), $T^8$ (15 minutes after pneumoperitoneum), $T^9$ (30 minutes after pneumoperitoneum), $T^{10}$ (45 minutes after pneumoperitoneum), $T^{11}$ (60 minutes after pneumoperitoneum), $T^{12}$ (five minutes after release of pneumoperitoneum).

Adverse effects like bradycardia, tachycardia, hypotension, hypertension, nausea, vomiting, respiratory depression, if any, noted during operative procedure, were treated as follows:

Bradycardia - (HR<55/min): Inj. Glycopyrolate 0.2 mg I.V

Tachycardia – (HR >30% above baseline value): Inj. Propofol 20 mg I.V in titrated dose

Hypotension – (SBP<60 mmHg) Inj. Ephedrine 6 mg I.V in titrated dose

Hypertension – (SBP> 140 mmHg): Inj. Propofol 20 mg I.V in titrated dose and increasing concentration of isoflurane up to 1.2%.

First dose of rescue analgesia in postoperative period with IV paracetamol and subsequent amount of rescue analgesia with IV paracetamol administered in recovery room were recorded depending on Visual Analogue Scale (VAS) pain score.

At completion of surgery port site was infiltrated with 0.5% bupivacaine 2-3 ml per port for postoperative analgesia. Fluid deficit, maintenance and loss were replaced with an infusion of lactated Ringer solution.

Infusion of drug (dexmedetomidine or fentanyl) was stopped and isoflurane was discontinued 10 minutes before reversal. Residual paralysis was reversed with Inj. Neostigmine 0.05 mg/kg IV, and Inj. Glycopyrolate 8 µg/kg IV. Patient was then extubated after thorough oral suction.

Parameters were again recorded at five minute ($T^{13}$) and 10 minute ($T^{14}$) after extubation.

## STATISTICAL ANALYSIS

The results were expressed as number of occurrences, percentage (%) and mean±S.D. Demographic characteristics, preoperative vitals were compared using Student's t-test and nominal data were compared with Chi-square test. Repeated measures of analysis of variance (RMANOVA) was used to compare continuous variables. Statistical analysis was performed using Graph Pad Instat software package. A p-value of <0.05 was considered statistically significant.

## RESULTS

Demographic profile including age, sex, weight, ASA physical status, duration of anaesthesia and type of operation proposed in both the groups have been presented in [Table/Fig-1,2].

The preoperative baseline haemodynamic parameters like mean HR, SBP, DBP, $SPO_2$ in Group D and in Group F were also comparable between two groups [Table/Fig-3-6].

Ten minutes after the infusion of test drug ($T^1$), when sedation score is compared, 12 (40%) in Group D patients were calm and cooperative, 18 (60%) were sedated but responded to commands.

| Parameters | Group-D | Group-F | p-value |
|---|---|---|---|
| Age (in years) | 37.9±13.168 | 34.7±11.47 | 0.748 |
| Sex (M/F) | 10:20 | 11:19 | 0.787 |
| Weight (in Kg) | 55.93±10.793 | 54.13±10.957 | 0.124 |
| ASA status (1/2) | 24/6 | 25/5 | 0.739 |
| Duration of surgery (minutes) | 96.77±31.041 | 84.633±17.793 | 0.053 |

**[Table/Fig-1]:** Demographic profile.
Comparison using Chi square test

| Operation proposed | Group-D | Group-F | p-value |
|---|---|---|---|
| Lap cholecystectomy | 11 (36.66%) | 10 (33.33%) | 0.231 |
| Lap appendicectomy | 9 (30%) | 8 (26.66%) | |
| LAVH | 5 (16.66%) | 4 (13.32%) | |
| Lap myomectomy | 2 (6.66%) | 2 (6.66%) | |
| Diagnostic laparoscopy | 3 (19%) | 6 (20%) | |

**[Table/Fig-2]:** Operation proposed.
Comparison by Chi-square test
[Lap-Laparoscopic, LAVH- Laparoscopic assisted vaginal hysterectomy]

| Time | T | Group D | Group F | p-value |
|---|---|---|---|---|
| | | Mean±S.D | Mean±S.D | |
| Prior to infusion of drugs | $T^0$ | 84.9±2.893 | 81.03±7.672 | 0.240 |
| 10 minutes after the drug | $T^1$ | 73.6±3.185 | 73.4±8.889 | 0.951 |
| After inj. of induction drug | $T^2$ | 80.1±3.121 | 80.1±8.676 | 1.000 |
| After intubation | $T^3$ | 88.47±14.282 | 100.37±13.294 | 0.001 |
| 5 minutes after intubation | $T^4$ | 80.53±11.89 | 95.8±10.902 | 0.001 |
| After pneumoperitoneum | $T^5$ | 81.3±13.679 | 90.1±13.897 | 0.012 |
| 5 minutes after pneumoperitoneum | $T^6$ | 79.03 ±12.263 | 87.9±10.417 | 0.008 |
| 10 minutes after pneumoperitoneum | $T^7$ | 79.4±12.757 | 87.47±9.13 | 0.013 |
| 15 minutes after pneumoperitoneum | $T^8$ | 79.33±13.322 | 91.87±10.444 | 0.002 |
| 30 minutes after pneumoperitoneum | $T^9$ | 85.73±13.854 | 91.37±10.213 | 0.072 |
| 45 minutes after pneumoperitoneum | $T^{10}$ | 82.47±12.362 | 90.73±9.566 | 0.010 |
| 60 minutes after pneumoperitoneum | $T^{11}$ | 82±10.917 | 92.23±10.037 | 0.001 |
| 5 minutes after release of pneumoperitoneum | $T^{12}$ | 77.67±10.691 | 89.77±9.797 | 0.002 |
| 5 minutes after post extubation | $T^{13}$ | 82.63±10.581 | 94.43±10.871 | 0.001 |
| 10 minutes after extubation | $T^{14}$ | 83.27±9.677 | 94.33±9.181 | 0.003 |

**[Table/Fig-3]:** Perioperative means of heart rate in Rates/minutes.
Comparison using Student t-test

In Group F, 20 (66.6%) patients were calm and cooperative, 10(33.3%) were sedated but responded to commands. Though sedation was significantly higher in dexmedetomidine Group (Group D) than fentanyl (Group F) (p=0.001), most of the patients could be easily aroused and none were deeply sedated.

There was 13% fall in HR, 9% fall in SBP, 5% fall in DBP and 10.8% fall in MAP below baseline in Group D as compared to 10% fall in HR, no fall in SBP, 4% fall in DBP and 2% decrease in MAP in Group F, 10 minutes after infusion of test drug [Table/Fig-3-6].

After intubation ($T^3$) there was 5% rise in HR, 9% rise in SBP, 3% rise in DBP and 2% rise in MAP from baseline value in Group D as compared to 18% rise in HR, 19% rise in SBP, 15% rise in DBP and 15% rise in MAP in Group F with $p<0.05$ which is significant [Table/Fig-3-6].

After pneumoperitoneum ($T^5$) HR decreased by 3.5%, SBP and DBP fell by 8.8% and 4.2% respectively in Group D (dexmedetomidine) as compared to 3.5% rise in HR, 4.2% rise in SBP and 3.8% rise in DBP in fentanyl Group [Table/Fig-3-6].

Throughout intraoperative period of pneumoperitoneum Group D showed significant fall in HR, SBP, DBP, MAP from baseline value at all points of time intervals whereas it remains above baseline value in Group F.

At five minutes and 10 minutes after extubation the HR, SBP, DBP showed fall from baseline in Group D whereas, it remains above baseline in Group F, though not statistically significant.

Intraoperative hypertension was found in three patients (10%) in Group D whereas, it was 19 (63.3%) in Group F. Bradycardia was observed in one patient (3.3%) in Group D whereas, tachycardia was observed in four patients (10%) in Group F during intubation and in perioperative period.

Nausea and vomiting were found in two patients (6%) in Group D and three patients (10%) in Group F in postoperative period.

Postoperatively the mean duration of adequate analgesia was 81.233±16.515 minutes in Group D whereas it was 41.87±10.180 minutes in Group F, (p-value 0.001) which is statistically significant.

| Time | T | Group-D | Group-F | p-value |
|---|---|---|---|---|
| | | Mean±S.D | Mean±S.D | |
| Prior to infusion of drugs | $T^0$ | 125.67±11.751 | 119.43±22.269 | 0.173 |
| 10 minutes after the drug | $T^1$ | 114.73±13.630 | 123.20±10.978 | 0.010 |
| After inj.of induction drug | $T^2$ | 108.23±13.650 | 121.80±11.263 | 0.001 |
| After intubation | $T^3$ | 125.13±13.903 | 142.57±22.125 | 0.001 |
| 5 minutes after intubation | $T^4$ | 113.90±12.783 | 126.90±9.151 | 0.001 |
| After pneumoperitoneum | $T^5$ | 114.23±12.204 | 124.63±15.187 | 0.006 |
| 5 minutes after pneumoperitoneum | $T^6$ | 116.87±11.038 | 128.40±14.517 | 0.004 |
| 10 minutes after pneumoperitoneum | $T^7$ | 120.20±9.939 | 131.43±12.514 | 0.001 |
| 15 minutes after pneumoperitoneum | $T^8$ | 119.43±10.740 | 124.87±25.318 | 0.283 |
| 30 minutes after pneumoperitoneum | $T^9$ | 123.53±8.253 | 128.30±14.697 | 0.145 |
| 45 minutes after pneumoperitoneum | $T^{10}$ | 120.37±8.231 | 129.57±14.246 | 0.005 |
| 60 minutes after pneumoperitoneum | $T^{11}$ | 121.60±9.050 | 126.27±15.328 | 0.177 |
| 5 minutes after release of pneumoperitoneum | $T^{12}$ | 115.30 ± 10.723 | 125.73 ± 14.056 | 0.001 |
| 5 minutes after post extubation | $T^{13}$ | 121.47±10.938 | 129.47±14.734 | 0.030 |
| 10 minutes after extubation | $T^{14}$ | 123.93±10.255 | 126.03±12.845 | 0.541 |

**[Table/Fig-4]:** Perioperative systolic blood pressure in mmHg.
Comparison using Student t test

| Time | T | Group-D | Group-F | p-value |
|---|---|---|---|---|
| | | Mean±S.D | Mean±S.D | |
| Prior to infusion of drugs | $T^0$ | 78.33±7.608 | 77.10±8.829 | 0.573 |
| 10 minutes after the drug | $T^1$ | 74.63±8.231 | 74.00±7.634 | 0.774 |
| After inj.of induction drug | $T^2$ | 70.43±11.069 | 79.13±9.321 | 0.002 |
| After intubation | $T^3$ | 81.07±10.017 | 88.23±13.903 | 0.027 |
| 5 minutes after intubation | $T^4$ | 73.73±9.270 | 78.80±7.581 | 0.031 |
| After pneumoperitoneum | $T^5$ | 74.67±12.279 | 80.23±11.921 | 0.066 |
| 5 minutes after pneumoperitoneum | $T^6$ | 76.90±8.687 | 82.57±13.333 | 0.085 |
| 10 minutes after pneumoperitoneum | $T^7$ | 76.87±9.971 | 83.57±11.878 | 0.015 |
| 15 minutes after pneumoperitoneum | $T^8$ | 76.67±8.723 | 80.40±13.713 | 0.208 |
| 30 minutes after pneumoperitoneum | $T^9$ | 76.80 ± 7.863 | 79.67±11.376 | 0.217 |
| 45 minutes after pneumoperitoneum | $T^{10}$ | 74.27±4.168 | 79.17±11.815 | 0.037 |
| 60 minutes after pneumoperitoneum | $T^{11}$ | 76.60±4.980 | 77.43±11.181 | 0.698 |
| 5 minutes after release of pneumoperitoneum | $T^{12}$ | 74.67±5.498 | 80.10±9.686 | 0.005 |
| 5 minutes after post extubation | $T^{13}$ | 78.17±10.557 | 80.97±10.460 | 0.340 |
| 10 minutes after extubation | $T^{14}$ | 78.13±9.387 | 79.50±8.912 | 0.581 |

**[Table/Fig-5]:** Perioperative diastolic blood pressure in mmHg.
Comparison using Student t-test

| Time | T | Group-D | Group-F | p-value |
|---|---|---|---|---|
| | | Mean±S.D | Mean±S.D | |
| Prior to infusion of drugs | $T^0$ | 92.23±8.451 | 91.17±7.461 | 0.546 |
| 10 minutes after the drug | $T^1$ | 82.47±7.990 | 89.40±8.183 | 0.002 |
| After inj. of induction drug | $T^2$ | 81.70±10.812 | 92.43±9.438 | 0.001 |
| After intubation | $T^3$ | 93.80±10.233 | 105.43±15.843 | 0.002 |
| 5 minutes after intubation | $T^4$ | 85.50±9.666 | 94.13±7.243 | 0.001 |
| After pneumoperitoneum | $T^5$ | 85.97±11.406 | 93.80±12.743 | 0.011 |
| 5 minutes after pneumoperitoneum | $T^6$ | 89.10±8.347 | 96.90±12.653 | 0.015 |
| 10 minutes after pneumoperitoneum | $T^7$ | 90.17±8.069 | 98.03±11.028 | 0.001 |
| 15 minutes after pneumoperitoneum | $T^8$ | 90.33±7.867 | 95.27±12.228 | 0.075 |
| 30 minutes after pneumoperitoneum | $T^9$ | 91.50±7.328 | 94.47±10.510 | 0.179 |
| 45 minutes after pneumoperitoneum | $T^{10}$ | 89.00±4.386 | 94.70±11.093 | 0.015 |
| 60 minutes after pneumoperitoneum | $T^{11}$ | 90.97±5.385 | 92.87±10.833 | 0.409 |
| 5 minutes after release of pneumoperitoneum | $T^{12}$ | 88.03±6.283 | 94.37 ± 9.757 | 0.002 |
| 5 minutes after post extubation | $T^{13}$ | 91.93±9.808 | 96.07±9.745 | 0.137 |
| 10 minutes after extubation | $T^{14}$ | 91.97±8.838 | 95.23±9.187 | 0.185 |

**[Table/Fig-6]:** Perioperative mean arterial pressure in mmHg.
Comparison using Student t-test

| Time | T | Group-D | Group-F | p-value |
|---|---|---|---|---|
| | | Mean±S.D | Mean±S.D | |
| After intubation | $T^3$ | 32±4.2 | 32.1±4.8 | 0.13 |
| 5 minutes after intubation | $T^4$ | 33.9±4.8 | 32.4±5.3 | 0.06 |
| After pneumo | $T^5$ | 32.4±5.9 | 34.4±6.4 | 0.19 |
| 5 minutes after pneumo | $T^6$ | 33.6±4.1 | 34.5±5.5 | 0.15 |
| 10 minutes after pneumo | $T^7$ | 34±6.2 | 33.5±4.9 | 0.82 |
| 15 minutes after pneumo | $T^8$ | 34.6±4.5 | 33.2±5.1 | 0.66 |
| 30 minutes after pneumo | $T^9$ | 31.9±5.1 | 31.6±5.4 | 0.48 |
| 45 minutes after pneumo | $T^{10}$ | 31.2±3.1 | 31.7±4.6 | 0.15 |
| 60 minutes after pneumo | $T^{11}$ | 33.5±4.3 | 32.5±4.6 | 0.40 |
| 5 minutes after release of pneumo | $T^{12}$ | 32.8±5.0 | 32.1±6.6 | 0.23 |

**[Table/Fig-7]:** Comparision of $EtCO_2$ in both groups.
Comparison using Student t-test

None of our patients in both groups have any respiratory depression. None developed any ECG abnormality. There was no significant difference in pre and intraoperative $SpO_2$ and $EtCO_2$ values [Table/Fig-7].

## DISCUSSION

Pneumoperitoneum causes increase in systemic vascular resistance, mean arterial pressure, cardiac filling pressure and decrease in cardiac index. The $CO_2$ insufflation results in its peritoneal absorption producing hypercarbia, which stimulates sympathetic nervous system and thus increases BP, HR and the risk of arrhythmia. Hypercapnia may cause a decrease in myocardial contractility and lowers arrhythmia threshold [13-15].

Only limited studies [16-18] have been done comparing the effect of IV dexmedetomidine versus IV fentanyl as premedicant on perioperative haemodynamic agent in laparoscopic surgery. So we conducted this study to compare the effects of dexmedetomidine and fentanyl on haemodynamic response to tracheal intubation, following pneumoperitoneum and intraoperative period in patient undergoing laparoscopic surgery.

Dexmedetomidine is increasingly being used as a sedative for Monitored Anaesthesia Care (MAC) because of its cooperative sedation, anxiolysis and lack of respiratory depression effect. In our study, we found that both dexmedetomidine and fentanyl produce sedation but patients who received dexmedetomidine are better sedated with higher Ramsay sedation score. Our findings are in agreement with Keniya VM et al., who reported that more patients in the group injected with 1 µg/kg of dexmedetomidine received treatment for bradycardia than patients in the fentanyl group [10]. Patel CR et al., also found that postoperatively dexmedetomidine (1 µg/kg) shows significant sedation at two hours than fentanyl (2 µg/kg) [11].

We used dexmedetomidine in the same dose as Techanivate A et al., [16]. The side effects of dexmedetomidine are hypotension, bradycardia, nausea, vomiting, hypoxia, acidosis and atrial fibrillation. These are dose dependent and an increase in dose (1 µg-2 µg/kg) is associated with more side effects [19] Tufanogullari B et al., also used dexmedetomidine at dose of 0.2–0.8 µg/kg/hour in bariatric surgery to minimize adverse cardiovascular side effects [20].

We have used fentanyl in a dose of 0.5 µg/kg as bolus infusion prior to induction followed by 0.2-0.7 µg/kg/hour infusion till completion of operation. Similar dose was used by other authors like Techanivate A et al., (0.5 µg/kg of bolus infusion of fentanyl) in gynaecologic diagnostic laparoscopy and by Feld J et al., (0.5 µg/kg of bolus infusion of fentanyl) to facilitate anaesthesia and to attenuate autonomic activity during laparoscopic gastric banding [16,17]. 0.25 µg/kg nearly of fentanyl as bolus infusion was also used by Uysal HY et al., to attenuate haemodynamic response to tracheal intubation in hypertensive patients [21].

In our study, demographic data showed that Group D (dexmedetomidine) and Group F (fentanyl) were comparable in terms of number of patients, age, sex, weight, ASA status, types and duration of laparoscopic surgeries.

Our observation of significantly less increase in HR in dexmedetomidine group in comparision with fentanyl group after intubation, after pneumoperitoneum, in intraoperative period and after extubation is in accordance with that of other authors [17]. This is because dexmeditomidine effectively blunts sympathoadrenal response to intubation and has good sympatholytic activity. Suparto et al., concluded that both dexmedetomidine at 1 µg/Kg and fentanyl at 1 µg/Kg given intravenously as single bolus dose prior to anaesthesia induction produced lowering of blood pressures and cardiac rates, with significantly lower mean heart rates with dexmedetomidine i.e., 23% decrease in dexmedetomidine group vs 6% decrease in fentanyl group [18]. They also observed that patients receiving dexmedetomidine exhibit less increase in HR from induction level, after laryngoscopy and intubation.

In the present study, there is less fluctuation in SBP and DBP and MAP in dexmedetomidine group in comparision to fentanyl with p-value <0.05 after intubation, after pneumoperitoneum and after extubation. This implies that dexmedetomidine had attenuated stress response at these time points. Similar findings were observed by Patel CR et al., who found lesser increase in SBP (6% vs 23%), DBP (7% Vs 20%) after intubation with dexmedetomidine 1 µg/kg as compared to fentanyl 2 µg/kg when given as loading dose prior to induction [11].

Intraoperatively, an average of 8% fall in SBP and 8.16% fall in DBP in dexmedetomidine group as compared to 3.65% rise in SBP and 3.3% rise in DBP in fentanyl group was also observed. Our observations are consistent with that of Gupta K et al., and Shareef SM et al., who observed that both dexmedetomidine (1 µg/kg) and fentanyl (2 µg/kg), when used as premedicant before induction attenuated the haemodynamic response to pneumoperitoneum during laparoscopic surgeries [22,23]. Dexmedetomidine group showed less increase in SBP, DBP and more stabilization of intraoperative MAP and HR as compared to fentanyl group.

We found that duration of postoperative analgesia was significantly higher in dexmedetomidine group compared to fentanyl group (p=0.001). There was more delay in need for first dose of rescue analgesia in dexmedetomidine group than fentanyl group. Our findings were consistent with that of Turgut N et al., who concluded that fentanyl group require higher dose of postoperative analgesic than dexmedetomidine group [24]. The fentanyl group also required analgesia earlier than dexmedetomidine group (34.8+/-1.35 minutes vs 60.4+/-1.04 minutes).

## LIMITATION

We have done a small study of 60 patients and we did not measure cardiac output, systemic vascular resistance and serum catecholamine levels. Also, the minimal suppression of haemodynamic response observed in the fentanyl group observed in our study may be due to the low dose used. Ko HS et al., reported 2 µg/kg of fentanyl was an optimal dose to attenuate haemodynamic response to laryngoscopy and tracheal intubation. In spite of the above limitations some conclusions could be made [25].

## CONCLUSION

To conclude, dexmedetomidine when compared to fentanyl causes greater attenuation of stress response to tracheal intubation, following pneumoperitoneum and in perioperative period resulting in greater reduction of HR, SBP, DBP, MAP than that of fentanyl, thus causing better haemodynamic stability in patients undergoing elective laparoscopic surgery. Dexmedetomidine also provides better sedation while maintaining patients arousability and has more analgesic sparing effect and causes lesser requirement of anaesthetic agent in perioperative period without much adverse effect.

Hence, intravenous premedication with dexmedetomidine in dose of 0.5 µg/kg as loading dose over 10 minutes prior to induction in laparoscopic surgeries followed by 0.2-0.7 µg/kg infusion till surgery is over, may be recommended for better haemodynamic stability during perioperative period despite high cost.

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**FINANCIAL OR OTHER COMPETING INTERESTS:** None.

Date of Submission: **Jan 29, 2017**
Date of Peer Review: **Mar 09, 2017**
Date of Acceptance: **Jun 21, 2017**
Date of Publishing: **Sep 01, 2017**