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ORIGINAL ARTICLE

A DOUBLE BLIND COMPARATIVE STUDY OF I.V. CLONIDINE AND FENTANYL TO SEE THE HAEMODYNAMIC RESPONSE DURING LARYNGOSCOPY AND INTUBATION

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ABSTRACT: In the present study we have compared Clonidine (1μg/kg) and Fentanyl (2μg/kg) with minimum equipotent doses to attenuate the pressure response and at the same time avoiding the adverse effects of the respective drugs. After getting permission from the Ethical committee, a randomized double blinded study carried out in Department of Anesthesiology, JNMC, Sawangi (Meghe), Wardha, Maharashtra (India). The study comprises of 100 patients of both gender between 25 to 65 yrs. with Mallampatti grade I & II between ASA grade 1&2. They were randomly allocated into 2 groups of 50 each. Statstical analyses were done with Z test. Intravenous Clonidine was found to be more effective than intravenous Fentanyl in attenuating pressure response to laryngoscopy and intubation with the minimum equipotent dose.

KEYWORDS: Clonidine, Fentanyl, laryngoscopy, Intubation and Stress response.

INTRODUCTION: Tracheal intubation with the aid of direct laryngoscopy became a very popular method of securing the airway during general anesthesia. Laryngoscopy results in sympathetic system activation leading to various cardiovascular changes like increase in heart rate, blood pressure, intracranial pressure, intraocular pressure, dysrhythmias, cardiac asystole and even sudden death.[1-4] These changes may prove to be detrimental especially in patients with ischemic heart disease, cerebrovascular disease, hypertension, old age and diabetes mellitus. Several techniques have been studied to attenuate this stress response but none of them are completely satisfactory. Hence there is a constant search for an ideal drug to attenuate hemodynamic response.

In this study an attempt was made to study the effect of Intravenous Clonidine 1 μg/kg Intravenous Fentanyl 2 μg/kg for attenuation of stress response given as a bolus 15 minutes and 5 minutes respectively prior to laryngoscopy.

AIMS AND OBJECTIVES:

1. To compare the relative efficacy of Fentanyl and Clonidine for attenuation of hemodynamic response during laryngoscopy and endotracheal intubation in ASA grade I and II patients.
2. To find out hemodynamically stable premedicant during laryngoscopy and intubation.

PHYSIOLOGY:

Stress Response: The body reacts to external stimuli ranging from minor to massive insult both locally and generally. The general response is in the form of wide spread endocrinal, metabolic and biochemical reaction through the body.[5,6] The magnitude of the response is dependent on the severity, duration and intensity of the stimulus for triggering such reflex response and presenting a

complex interplay of substances between the hypothalamic pituitary axis. This chemical reflex in neuroendocrinal hormone system and autonomic nervous system is brought to action and is called as "Stress response" affecting cardiovascular changes, blood volume distribution, fluid and electrolyte changes and cerebrovascular changes:

Reflex pathway during laryngoscopy and Intubations: During laryngoscopy there is mechanical stimulation of upper respiratory tract which includes tongue, nasopharynx, oropharynx and most importantly the epiglottis. Afferents are carried by the glossopharyngeal nerve and vagus nerve. These afferents are carried to the cardioaccelerator or vasomotor centre. Sympathetic efferent from this centre results in transient rise in heart rate and blood pressure.

It has been shown by Kaplan that stress due to sympathetic activation causes myocardial oxygen demand to exceed beyond its coronary supply resulting in parts of myocardium being rendered ischemic.

The best indirect index of myocardial oxygen consumption is the rate pressure products (RPP) = systolic blood pressure X heart rate.

PHARMACOLOGY: Fentanyl[7,8] is a synthetic narcotic analgesic which has sympatholytic effect and it can attenuate cardiovascular response to laryngoscopy and intubation.

Clonidine[9,10] is a centrally acting selective partial α2 adrenergic agonist which also has a sympatholytic effect and it can attenuate cardiovascular response to laryngoscopy and intubation.

MATERIALS AND METHODS: After getting permission from the Ethical committee, a randomized double blinded study carried out in Department of Anesthesiology, JNMC, Sawangi (Meghe), Wardha, Maharastra (India) during the period from October 2008 to January 2011. The study comprises of 100 patients of both gender between 25 to 65 yrs. with Mallampatti grade I & II between ASA grade 1&2.

They were randomly allocated into 2 groups of 50 each. Clonidine Group (Patients premeditated with IV Clonidine 1μg/kg) & Fentanyl Group (Patients premedicated with IV Fentanyl 2μg/kg). All the patients undergoing planned elective surgery requiring general anesthesia were assessed as per the routine preoperative protocol. After getting consent, all the basic monitoring parameters were attached and recorded. Intravenous access established and Ringers Lactate was started.

All patients were premedicated with Inj. Glycopyrollate 0.004 mg/kg IM half an hour prior to induction, Inj. Midazolam 0.02 mg/kg IV 3 minutes prior to induction and study drug.

The observer was totally blind about the groups or premedication given to the patient.

Anesthésia Technique Protocol: All patients were preoxygenated with 100% oxygen for 3 minutes. This was followed by induction of general anesthesia with inj. Thiopentone sodium 2.5%, 5 mg/kg intravenous followed by Inj. Vecuronium 0.08mg/kg intravenous to facilitate endotracheal intubation. Patients were ventilated with N_2O(50%)+O_2(50%) + isoflurane(1.2% dial concentration) for 3 minutes and with 100% O_2 + isoflurane (1.2 % dial concentration) for another 1 minutes then laryngoscopy and intubation was carried out.

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The laryngoscopy and intubation were done by anaesthesiologist with at least 24 months of experience. All intubations were smooth and gentle and were done within 15 seconds.

Immediately after intubation following parameters were monitored and studied - Heart rate (HR), Systolic Blood pressure (SBP), Rate pressure product (RPP), Diastolic blood pressure (DBP), Oxygen saturation (SPO2), Mean arterial pressure (MAP), Electrocardiogram monitoring (lead II) at the following intervals, Baseline (0 minute), 5 minutes of premedication, 10 minutes of premedication, 15 minutes of premedication, After Induction (16 minutes of premedication), After laryngoscopy and intubation (20 minutes of premedication), Post intubation 1 min, Post intubation 3 min, Post intubation 5 min, Post intubation 10 min

Anesthesia was maintained on oxygen: nitrous oxide (50:50%). and isoflurane (1.2 % dial concentration) with Baines circuit. Intermittent bolus dose of 0.02 mg/kg of non-depolarizing muscle relaxant inj. vecuronium were given for maintenance. Further anesthesia was maintained as per patients' requirements.

Any airway manipulation such as insertion of Ryle's tube and throat packing were withheld till 10 minutes after laryngoscopy. Incision was allowed to be taken after 12 minutes of induction.

Mean and standard deviation for all values were calculated and compared. A Z-test was applied to find out the p-values (significance). Efficacy of both drugs to reduce hemodynamic response was compared. Any adverse effect due to either of drug i.e. inj. Clonidine and Fentanyl were noted.

RESULTS: The weight, age and gender comparison were insignificant so they are comparable.

INTERGROUP COMPARISON OF HEART RATE: The Baseline heart rates between the two groups were comparable with no statistical significance. Both the groups showed a fall in heart rates till laryngoscopy. Prior to laryngoscopy, clonidine group had a mean heart rate of 73.16±9.7 per minute which was 9.7% below the baseline values. The Fentanyl group had mean heart rate of 84.60±16.81 per minute which was almost similar to the baseline values. After intubation, clonidine group had a mean heart rate of 81.36±12.39 per minute (0.42% above the baseline values) which is almost similar to the baseline values.

Fentanyl group had a mean heart rate of 102.90±18.78 per minute which was 22.4% above the baseline values, statistically significant with p value of 0.00. At 1 minute post-intubation, the heart rates in both the groups were at its peak value. In clonidine group the mean heart rate was 82.30±11.64 per minute (1.6% above the baseline) which was statistically significant comparing the findings in the Fentanyl group with the mean heart rate being 100.68±20.01 (19.8% above the baseline) p-value 0.00. After this point there was gradual fall in heart rate till 10 minutes post-intubation in both the groups with the heart rate reverting to the baseline values in Fentanyl group, while it remained below baseline in clonidine group.

INTERGROUP COMPARISON OF SYSTOLIC BLOOD PRESSURE: The baseline SBP was comparable between two groups with no statistically significant difference. There was a gradual fall in the mean SBP in both the groups till laryngoscopy and intubation. Prior to laryngoscopy and intubation the mean SBP in clonidine group was 112.46±8.45 mmHg, which was 10.3% lower than baseline values while in Fentanyl group the mean SBP was 113.60±12.49 mmHg, which was also 9.2% lower than the

baseline values. The difference being statistically not significant (p=0.594). After laryngoscopy and intubation the rise is SBP in clonidine group was 125.30±10.43 mmHg which was significantly lesser than the rise in the Fentanyl group with the mean SBP of 135.92±17.04 mmHg (p=0.000). At 1 minute post-laryngoscopy and intubation clonidine group showed slightly fall in mean SBP of 125.08±12.26 mmHg and fentanyl group of 132.78±14.74 mmHg, statistically significant(p=0.006). The SBP gradually reduced from 1 minute post-laryngoscopy till 5 minutes post-laryngoscopy in both the groups. At 10 minutes post-laryngoscopy and intubation the mean SBP in clonidine group was below baseline values being statistically not significant (p=0.528)

INTERGROUP COMPARISON OF DIASTOLIC BLOOD PRESSURE: The mean DBP at baseline was statistically not comparable between two groups, the difference being not significant. Both the groups showed a fall in mean DBP gradually till laryngoscopy and intubation. Prior to laryngoscopy and intubation, clonidine group had mean DBP of 73.24±8.46 mmHg which was non-significant as compared to fentanyl group having a mean of 72.56±10.1 mmHg (p=0.716). At laryngoscopy and intubation both the groups showed rise in DBP at its peak which was non-comparable statistically (p=0.50.).

At 1 minute post-intubation, the DBP of clonidine group was of 81.56±8.68 mmHg as compared to the fentanyl group having mean DBP of 82.70±8.62 mmHg the difference being statistically non-significant(p=0.512). After this point, there was a gradual fall in DBP in both the groups till 10 minutes post-laryngoscopy, the fall in clonidine being greater as compared to fentanyl group.

INTERGROUP COMPARISON OF MEAN ARTERIAL PRESSURE: The baseline MAP in clonidine was 94.09±9.83 mmHg statistically comparable with MAP in fentanyl group of 93.56±10.15 mmHg. There is significant fall in MAP prior to laryngoscopy and intubation in clonidine group, the mean being 85.37±9.24 mmHg as compared to fentanyl group having mean MAP of 86±9.58 mmHg, the difference being statistically not significant (p=0.739).

After laryngoscopy and intubation, the mean MAP in clonidine group was 96.60±7.84 mmHg as compared to fentanyl group having a mean MAP of 101.33±11.77 mmHg which is statistically significant (p=0.020). Both the groups had shown a transient rise in MAP at laryngoscopy and intubation and reduced to 94.71±11.4 mmHg in clonidine group and 99.17±9.85 in fentanyl group at 1 minute post intubation which is statistically significant (p=0.039). At 5 minutes post intubation, the mean MAP was 89.82±8.94 mmHg in clonidine group and 89.65±7.82 mmHg in fentanyl group, both of which were lower than the baseline values. At 10 minutes post-intubation, the mean MAP in clonidine group was 88.05±7.94 mmHg which was still below the baseline values, whereas mean MAP in fentanyl group was 97.16±56.13 mmHg which was above the baseline values.

INTERGROUP COMPARISON OF RATE PRESSURE PRODUCT: The baseline RPP in clonidine group was 9959.14±1757.08 which was comparable statistically with the mean RPP in fentanyl group of 10153.97±2869.13. The RPP gradually reduced till laryngoscopy and intubation in both the groups. Prior to laryngoscopy and intubation, there was fall in RPP in both the groups with the clonidine group showing a greater fall in RPP with a mean value of 8221.96±1132.22 as compared to that in fentanyl.

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After laryngoscopy and intubation, RPP in clonidine group was 10223.40±1952.07 which was statistically significant as compared to that in fentanyl group which was 14071.06±3599.15 higher with 38.5% above the baseline value. The RPP in clonidine group at 1 minute post-intubation was at its peak with a value of 10270.28±1638.62 which was 3.1% above the baseline values. The RPP in the fentanyl group at 1 minute post-intubation was 13425.64±3315.85 which was 32.2% above the baseline, statistically significant with p value of 0.000.

The RPP showed a gradual decline in both the groups from 1 minute post-intubation, till 10 minutes post-intubation. At 5 minutes post-intubation, the RPP had reached near the baseline values in fentanyl group with mean of 10426.60±2326.12. In clonidine group the mean RPP at 5 minutes post-intubation was 9011.84±1291.93 showing statistically significant difference between the two groups(p=0.000). At 10 minutes post-intubation, RPP in clonidine was 8645.80±1201.41 which was much lower as compared to baseline values. In Fentanyl group RPP at 10 minutes post laryngoscopy was 10159.22±2076.29 being near to the baseline readings which is statistically significant(p=0.000).

DISCUSSION: In the present study we have compared Clonidine (1μg/kg) and Fentanyl (2μg/kg) with minimum equipotent doses to attenuate the pressure response and at the same time avoiding the adverse effects of the respective drugs. Base on the study conducted by Maleg J et al[11] and Kim DC et al,[12] Clonidine and Fentanyl were administered at 15 minutes and 5 minutes prior to laryngoscopy respectively.

HEART RATE (HR): The baseline heart rate in Fentanyl group was 84.06±13.98 per minute as compared to that of Clonidine group with 81.02±9.07 per minute which shows no significant difference from statistical point of view(p>0.05). The changes in the heart rate in both the groups after study drug was given were statistically significant(p<0.05) with Fentanyl group having mean heart rate of 83.06±14.3 per minute and clonidine group having mean heart rate of 76.76±11.86 per minute.

After laryngoscopy and intubation, mean heart rate in Fentanyl group was 102.90±18.76(22.4% above baseline value) per minute as compared to the mean heart rate of 81.36±12.39(0.42% above baseline value) per minute in the clonidine group which was statistically significant (p<0.05). However, post intubation Clonidine group had mean heart rate of 82.30±11.64(1.6% above baseline value) per minute, which was much more significant (p<0.05)as compared to mean heart rate of Fentanyl group with 100.68±20.01(19.8% above the baseline) per minute.

This shows that Clonidine shows greater suppression of rise in heart rate after laryngoscopy than Fentanyl. 5 minutes after laryngoscopy the heart rate in both the groups had come back nearly to baseline value with Clonidine group having mean heart rate of 75.74±9.61 per minute which was even lower than the baseline values. Fentanyl group had a mean heart rate of 87.54±16.99 per minute at 5 minutes after laryngoscopy which was above the baseline values.

At 10 minutes post laryngoscopy clonidine group showed mean heart rate of 73.50±8.3 per minute which was still below the baseline values. Whereas Fentanyl group had mean heart rate of 85.80±14.37 which was almost the baseline reading. This shows that heart rate remains suppressed for a longer period of time in Clonidine group than Fentanyl group.

In the present study the change in heart rate was similar to those mentioned in the studies by M et al,[13] Kulka PJ et al[14] and Youshi U et al[15]

SYSTOLIC BLOOD PRESSURE (SBP): The baseline mean systolic blood pressure in the Fentanyl group was 125.20±14.87mmHg which was comparable with Clonidine group having average systolic blood pressure of 125.38±9.59mmHg.The difference being statistically not significant($p>0.05$).

The values of systolic blood pressure showed no statistically significant difference even after study drugs were administered but there was a fall in both the groups. At laryngoscopy rise in mean systolic blood pressure in Clonidine group was 125.3±10.43mmHg (almost similar with the baseline) which is significantly lower than in the Fentanyl group in which systolic blood pressure rose to 135.92±17.04mmHg(8.47% above baseline value)($p<0.05$).

At 1 minutes post intubation the value of mean SBP in Fentanyl group was 132.78±14.74 while in the Clonidine group was 125.08±12.26mmHg which was significantly lower ($p <0.05$). There was gradual decrease in mean SBP below the baseline in both the groups after 1 minute but more in the Clonidine group. This shows that suppression of systolic blood pressure with the Clonidine group was maximum prior to laryngoscopy and it remains suppressed till 5 minutes post intubation. At 10 minutes post-intubation, mean SBP in clonidine group was 117.18±9.6mmHg and in Fentanyl group mean SBP was 118.18±12.62 mmHg, statistically not significant($p>0.05$).

The changes in mean SBP in the present study is similar with the studies conducted by V et al,[16] Ghignone M et al[13] and Helfman SM et al.[17]

DIASTOLIC BLOOD PRESSURE (DBP): The baseline diastolic blood pressures in the two groups were not comparable. The difference being significant from statistical point of view ($p<0.05$). Prior to laryngoscopy and intubation there was gradual fall in diastolic blood pressure in both the groups with no significant difference. After laryngoscopy and intubation the increase in DBP was lower in Clonidine group without any significant difference. Then there was gradual fall in DBP in both the groups after 1 minute post intubation. At 10 minutes post-laryngoscopy diastolic blood pressure in Clonidine group was 74.66±6.56mmHg while Fentanyl group had DBP of 74.94±6.18 mmHg which is still below the baseline in both the groups.

Ghignone M et al[13] conducted a study on anesthesia and hypertension: the effect of Clonidine on perioperative hemodynamic and Isoflurane requirement, found that Clonidine significantly reduces the diastolic blood pressure. But in the present study all results were not significant so, we couldn't come into a conclusion.

MEAN ARTERIAL PRESSURE (MAP): The baseline mean MAP in Clonidine group was of 94.09±9.83 mmHg whereas in Fentanyl group was 93.56±10.15 mmHg, the difference being non-significant($p>0.05$). Prior to laryngoscopy mean MAP dropped to an average of 85.37±9.24 mmHg from the baseline values in Clonidine group with the fall of 10.2%.This fall in mean MAP prior to laryngoscopy were not significant($p>0.05$) from the mean MAP values obtained from the Fentanyl group. Post-intubation mean MAP in both the groups was increased.

After intubation in Fentanyl group, mean MAP was above baseline value at 101.33±11.77 mmHg whereas in clonidine group, mean MAP was nearer to baseline values at 96.60±7.84 mmHg at post-intubation. This difference in the two groups were statistically significant ($p<0.05$). It remained

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significant even at 1 minutes post intubation**.** This shows that Clonidine attenuates more stable hemodynamic during laryngoscopy and intubation. Then there were gradual fall in MAP in both the groups at 3, 5 and 10 minutes post-intubation below the baseline values. The mean MAP in Clonidine group was well below the baseline value as compared to Fentanyl which was statistically not significant ($p>0.05$).

These results obtained in our study were similar to the findings of the studies conducted by Holmberg M et al,[18] J. Lee et al[19] and Prakanrattana U and Suksompongs et al.[20]

RATE PRESSURE PRODUCT (RPP): The rate pressure product is the product of systolic blood pressure and heart rate. Angina threshold for rate pressure product lies between 15000-20000.In this study, the baseline values of rate pressure product between the two groups were statistically non-significant ($p>0.05$). The maximum elevation in rate pressure product occurs after laryngoscopy and intubation in Fentanyl group with a mean of 14071.06±3599.15.

This is statistically more significant than Clonidine group with mean rate pressure product of 10223.4±1952.07 ($p<0.05$). Hence, Clonidine is more capable in suppressing rise in both systolic blood pressure and heart rate and hence suppressing the rate pressure product than the Fentanyl group. Post-intubation at 5 minutes the rate pressure product in Clonidine group remains well below baseline values at 9011.84±1291.93 whereas in Fentanyl group rate pressure product reached near the baseline values with the mean of 10428.60±2326.12.

Similarly even at 10 minutes post-intubation mean rate pressure product value in Clonidine group was 8645.80±1201.41 which was 13.1% still below baseline value whereas in Fentanyl group, it was at the level of baseline($p<0.05$). Thus, Clonidine maintains the rate pressure product value, not allowing it to rise above 12000 which were well below the angina threshold.

The result obtained with this study was comparable with the study conducted by Kulka PJ et al[14] concluding Clonidine 4μg/kg significantly attenuated the hemodynamic and adrenergic reaction to stress response to laryngoscopy in CABG patients but side effects limiting the use of IV Clonidine were observed.

In Clonidine group, 15 patients out of 50 patients had systolic blood pressure below 90 mmHg during induction which was treated by rapid IV fluids. 3 out of 50 patients in the Clonidine group developed bradycardia heart rate less than 60 beats per minutes during intubation. None of the patients developed muscle rigidity, thus advantages of Clonidine compared to Fentanyl was:

1. Clonidine can be used with patients with ischemic heart disease as it reduces the heart rate by negative chronotrophic effect, thus reducing the work load on the heart and myocardial oxygen consumption.
2. Clonidine can be used in hypertensive and tachyarrhythmic patients.

CONCLUSION:

- Clonidine 1μg/kg intravenous and Fentanyl 2μg/kg intravenous both produces attenuation of hemodynamic response to laryngoscopy and intubation when given 15 minutes and 5 minutes respectively prior to laryngoscopy.
- Intravenous Clonidine with a dose of 1 μg/kg was found to be safe and effective method with least adverse effect for attenuating pressure response to laryngoscopy and intubation.

- Intravenous Clonidine was found to be more effective than intravenous Fentanyl in attenuating pressure response to laryngoscopy and intubation with the minimum equipotent dose.

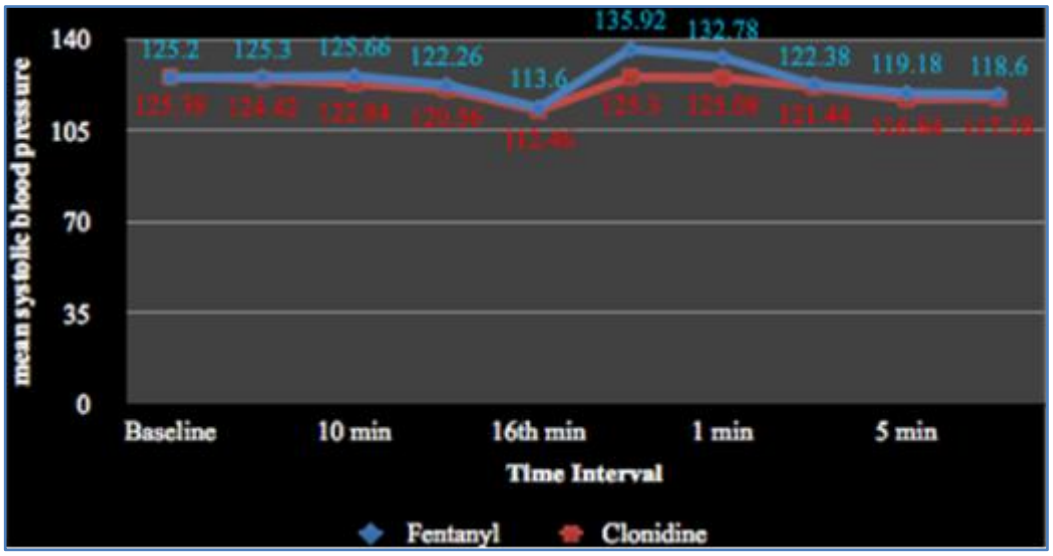
BIBLIOGRAPHY:

1. Reid LC, Bracc DE. Irritation of respiratory tract and its reflex effect on heart rate. Surg Gynaecol Obstet.1940; 70:157
2. Lo Pinto FJ, Burstein CL, Newman W. Electrocardiographic studies during endotracheal intubation. Effects during routine techniques. Anaesthiol.1950;11: 224
3. Miller Forbes A, Dally F. Acute hypertension during induction of Anesthesia and Endotracheal intubation in normotensive patients. Br J Anaesth.1970; 42: 618.
4. Prys Roberts C, Greene LT, Meloche R, Fox p. Haemodynamic consequences of induction and endotracheal intubation. Can J Anaesth.1973; 70 (1):26.
5. Polo-Garvin A, Garchia-Sanchez MJ, et al. Evaluation of hemodynamic and endocrine metabolic response to tracheal intubation patients anaesthesized with thiopental or propofol. Rev Espaniol Anaesthesiol.1993; 40 (6): 344-348.
6. Z. Tomori and J.G. Widdicombe. Muscular, bronchomotor and cardiovascular reflexes elicited by mechanical stimulation of the respiratory tract. January 1, 1969. The Journal of Physiology, 200, 25-49.
7. Robert Stoelting 4th edition. Pharmacology and Physiology in anesthesia practice. Pharmacology of Fentanyl. Page 104-109
8. http://en.wikipedia.org/wiki/Fentanyl
9. http://en.wikipedia.org/wiki/Clonidine
10. Tanaka and T. Nisikawa. Effect of clonidine premedication on the pressor response to α-adrenergic agonists. BJA 1995; 75: 593-597.
11. Maleg J et al. Adverse hemodynamic changes during laparoscopic cholecystectomy and their possible suppression with Clonidine premedication. Comparison with intravenous and intramuscular premedication. Rozhl Chir. 1999; 78:286-91
12. Ko SH, Kim DC, Han YJ. Small dose Fentanyl: Optimal time of injection for blunting circulatory response to tracheal intubation.Br J Anaesth.2002; 89 (6): 857-862
13. Ghignone M, Calvillo O, Quintin L. Anesthesia and hypertension: The effect of Clonidine on peri - operative haemodynamics and isoflurane requirements. Anaesthesiol.1987 july; 67(1): 3-10
14. Kulka PJ, Tryba M, Zenz M. Dose response effects of intravenous Clonidine on stress response during induction of anesthesia in coronary artery bypass graft patients. Anesth Analg. 1995 Feb; 80(2): 263-8
15. Yushi U, Adachi, MD, et al: Fentanyl attenuates the hemodynamic response to Endotracheal intubation more than response to Laryngoscopy. Anesthesia-Analgesia; july 2002 (95)1:233-237.
16. Hossmann V, Maling TJ et al. Sedative and cardiovascular effects of Clonidine and nitrazepam. Clin Pharmacol.Ther.1980 aug; 28(2): 167-76.
17. Helfman SM, Gold MI, De Lisser EA, Herrington CA. Which drug prevents tachycardia and hypertension associated with tracheal intubation: Lignocaine, Fentanyl or Esmolol ? Anaesth Analg.1991; 72(4): 482-486.

18. Frisk Holmberg M, Edlund PO, Paalzow L. Pharmacokinetics of Clonidine and its relation to the hypotensive effect in patients. Br J Clin Pharmacol.1978 sep; 6(3): 227-32.
19. J. Lee, A. T. Lovell, et al. I.V Clonidine: does it work as a hypotensive agent with inhalational anesthesia? B.J.A, 1999 April Vol. 82(4): 639-640.
20. Prakanrattana U, Suksompong S et al. Comparison of sufentanyl and Fentanyl for surgical repair of congenital cardiac defects. J Med Association Thai.2002 sep; 85 (3): S 807- 14.

Comparison of heart rate at different time interval with its baseline in Fentanyl and Clonidine groups (Intergroup comparison):

Comparison of SBP at different time interval with its baseline in Fentanyl and Clonidine groups (Intergroup comparison):



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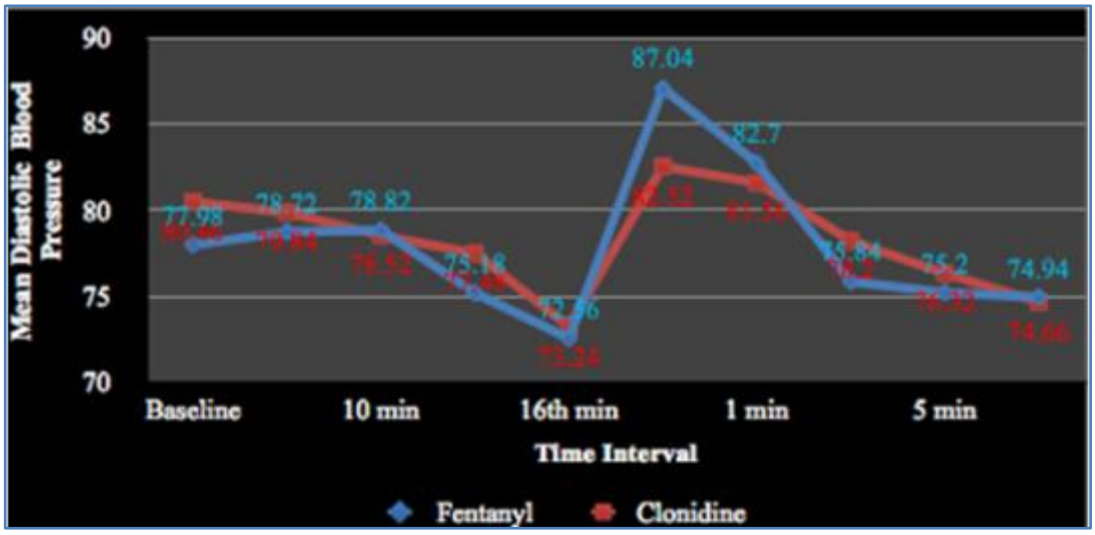
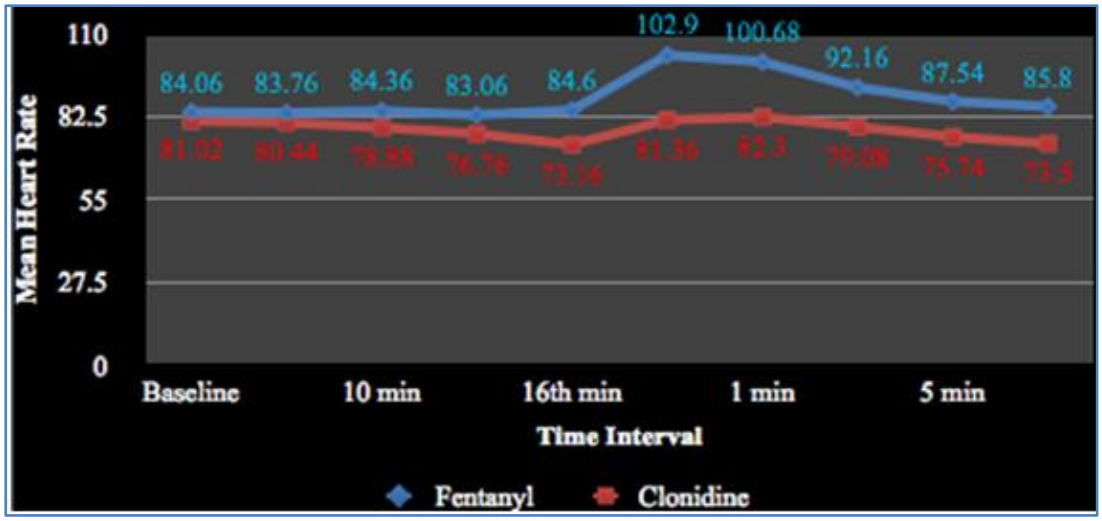
Comparison of DBP at different time interval with its baseline in Fentanyl and Clonidine groups (Intergroup comparison):



Comparison of MAP at different time interval with its baseline in Fentanyl and Clonidine groups (Intergroup comparison):



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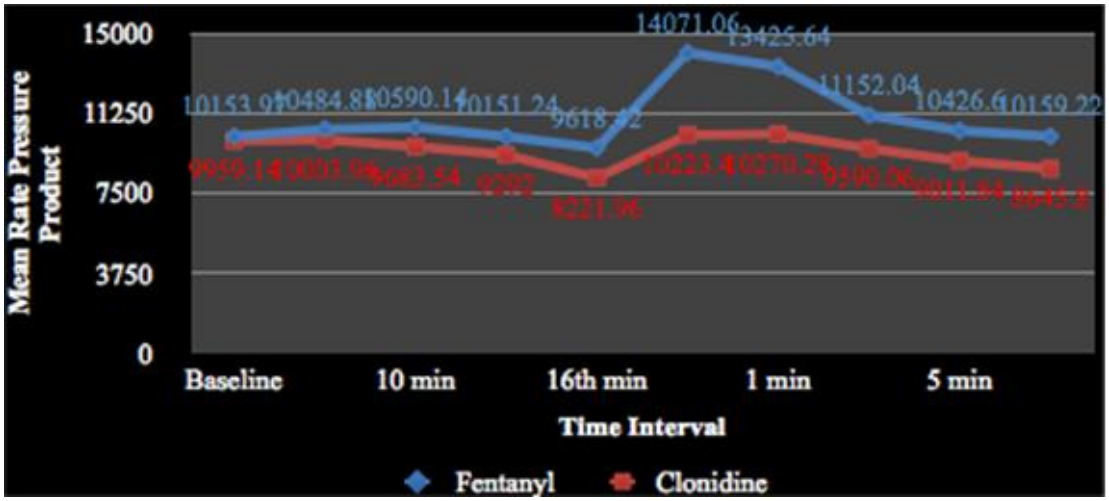
Comparison of Rate Pressure Product at different time interval with its baseline in Fentanyl and Clonidine groups (Intergroup comparison):



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