

Original Research Article

Oral clonidine versus intravenous fentanyl in attenuation of hemodynamic responses to laryngoscopy and endotracheal intubation: a comparative study

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ABSTRACT

Background: During endotracheal intubation, it has been observed that there is evolution of the responses of the circulatory in nature. These are difficult to control using the IV anesthetic drugs. Hence various agents are tried to overcome this drawback. Objective of research work was to study efficacy of oral clonidine on hemodynamic responses compared to IV fentanyl while patients undergo laryngoscopy and endotracheal intubation.

Methods: The patients were allocated into two groups of 30 each. i.e. 30 patients in clonidine group and 30 patients in fentanyl group. All the patients received were pre-medicated with glycopyrrolate 0.2mg, ondansetron 4mg and tramadol 1mg/kg body weight. Cardiovascular parameters (heart rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure,) were recorded at the following intervals: pre-induction, after induction, at endotracheal intubation, one minute, three minutes and five minutes after intubation.

Results: The heart rate was significantly more at various intervals in patients who belonged to fentanyl group and it was significantly lesser in clonidine group. The systolic blood pressure was significantly more at various intervals in patients who belonged to fentanyl group and it was significantly lesser in clonidine group. The diastolic blood pressure was significantly more at various intervals in patients who belonged to fentanyl group and it was significantly lesser in clonidine group. Similar was the case with mean arterial blood pressure.

Conclusions: Clonidine has been found to be more effective than IV fentanyl in stabilizing the cardiovascular parameters. Not only that orally it is easier to administer and cost effective.

Keywords: Attenuation, Endotracheal intubation, Fentanyl, Hemodynamic responses, Laryngoscopy

INTRODUCTION

It is well known that the procedure like laryngoscopy and tracheal intubation increases not only the heart rate but also the blood pressure in the arteries. These changes depend on various factors.

These factors can be like how deep the anesthesia was given, it also depends upon the corrective action taken

before manipulation of the airways, it also depends upon the anesthetic drug used, it also depends upon the how long the intubation and laryngoscopy lasts. It is not clear as to how and why the heart rate and arterial blood pressure increases after laryngoscopy and intubation. It has been suggested that there is response from the sympathetic system which leads to an increase in the activity of the catecholamines which leads to these changes.¹

This increase is of short duration, it may increase in some patients and may not increase in some patients and it is difficult to tell exactly in which patients it will change. If the patients were healthy before surgery, then these mild changes may not affect his health after surgery. But even these small changes can be dangerous for patients with high blood pressure, insufficiency of the myocardium, or having diseases of the cardiovascular system. Such patients can land up in complications like edema of the pulmonary, insufficiency of the myocardium or accident of the cerebrovascular in nature.²

If the patient is having high blood pressure under treatment, and he was given drugs to lower the blood pressure before surgery, even then it cannot be said with precision that he will not develop the as mentioned complications. There are chances that such patients who had high blood pressure under treatment, and he was given drugs to lower the blood pressure before surgery can land in complications like left ventricular failure of acute nature, infarction of the myocardium, bleeding in the intra cranium etc.³

Thus, it is clear that the drugs given IV as anesthetic agents fail to maintain the heart rate, pulse rate, and blood pressure of the arteries which is usually body response to the endotracheal intubation. Hence there is need to use some other drugs to minimize these side effects. Many agents have been tried by many in this regard to prove efficacy and to give comfortable experience to the patients.⁴ The ideal such an agent should be able to control the response of the cardiovascular events like heart rate and blood pressure. At risk patients should also get equal benefit as healthy patients. Hence such an ideal agent should be such that it can be given to any category of the patients. It should not cause the changes in the blood flow to the brain. It should not be time consuming. It should not affect the recovery from anesthesia.⁵

The present study is undertaken to study efficacy of oral clonidine on hemodynamic responses compared to IV fentanyl while patients undergo laryngoscopy and endotracheal intubation.

METHODS

Present study was hospital based follow up study. Present study was done at Osmania Medical College and Hospital, Hyderabad. Present study was carried out from October 2010 to September 2012. Sample size was 60 patients. All patients were aged 20-55 years of age. Both male and female were included in the present study. All patients underwent surgery involving general anesthesia.

Inclusion criteria

- Patients aged 20-55 years,
- ASA grade I,
- Willing to participate.

Exclusion criteria

- Patients aged <20 and >55 years,
- Not willing to participate.

Patients underwent gynecological procedures like laparoscopic assisted vaginal hysterectomy, and diagnostic laparoscopy and ENT procedures like functional endoscopic sinus surgery, parotidectomy and modified radical mastoidectomy and general surgical procedures like hemithyroidectomy and laparoscopic cholecystectomy and laparoscopic appendectomy.

Before surgery, as a routine protocol, thorough clinical examination with detailed history to rule out any risk factors for surgery under general anesthesia was done. This was also accompanied along with the surgical profile investigations. Any patient who was found to have any risk factors which can threaten his life because he was undergoing surgery under general anesthesia was not included in the present study and same was explained to him. If any patients were found such that it was not easy to carry out endotracheal intubation in him or her then such patients were also not included in the present study. The 60 patients selected for the present study were grouped in two groups using computer table of random numbers to avoid improper validity of the present study. Each group had equal number of patients.

The hemodynamic parameters were observed and recorded at regular intervals i.e. recording before induction, recording after induction, recording exactly at the time of laryngoscopy, recording at one min after the intubation, recording at three min after the intubation and last recording at five min after the intubation.

Statistical analysis

The data was expressed as means and standard deviation. The student's t test was used to compare means and p value <0.05 was considered significant.

RESULTS

Table 1 shows comparison of baseline characteristics in two groups. Both the groups consisted of more patients in the age group 21 to 30 years. Both the age groups were statistically comparable ($p>0.05$). Group fentanyl consisted of more female patients whereas group clonidine consisted of more male patients. The mean weight values in both the groups were statistically comparable ($p>0.05$).

Table 2 shows comparison of mean heart rate at various time intervals compared to pre-induction. The heart rate at pre-induction was comparable in both the groups. The mean heart rate after induction was also comparable in both the groups. The mean heart rate at laryngoscopy and intubation was also comparable in both the groups. But post intubation at one minute the mean rate was

significantly more in the fentanyl group compared to the clonidine group. Post intubation at three minute the mean rate was significantly more in the fentanyl group compared to the clonidine group. Post intubation at five minute the mean rate was comparable in both the groups.

Table 1: Comparison of baseline characteristics in two groups.

Baseline characteristics	Clonidine group (N = 30)	Fentanyl group (N = 30)	P value
Mean age (years)	28.4±9.16	30.73±7.26	0.14
Gender	Male 20 (66.6%)	14 (46.4%)	0.25
	Female 10 (33.4%)	16 (53.4%)	
Mean weight (kg)	56.53±9.40	59.73±7.39	0.241

Table 3 shows comparison of systolic blood pressure at various time intervals compared to pre induction values. The mean systolic blood pressure at pre-induction was comparable in both the groups. The mean systolic blood pressure after induction was also comparable in both the groups. The mean systolic blood pressure at laryngoscopy and intubation was significantly more in the fentanyl group compared the clonidine group. The mean systolic blood pressure at one minute post intubation was significantly more in the fentanyl group compared the clonidine group. The mean systolic blood pressure at three minute post intubation was significantly more in the fentanyl group compared the clonidine group. The mean systolic blood pressure at three minute post intubation was comparable in both the groups.

Table 2: Comparison of mean heart rate at various time intervals compared to pre-induction.

Time interval	Fentanyl group	Clonidine group	T value	P value
Pre induction	80.47±9.30	82.20±7.56	0.7906	0.4324
After induction	85.27±11.44	87.13±6.24	0.7818	0.4375
Laryngoscopy and intubation	116.43±33.94	107.80±8.18	1.3539	0.1810
Post intubation	1 min 107.80±9.27	98.00±11.79	3.5790	0.0007
	3 min 109.53±17.47	98.00±11.79	2.9964	0.0040
	5 min 96.40±13.04	92.00±9.71	1.4829	0.1435

Table 3: Comparison of systolic blood pressure at various time intervals compared to pre induction values.

Time interval	Fentanyl group	Clonidine group	T value	P value
Pre induction	116.33±12.12	111.60±9.66	1.6716	0.1000
After induction	102.07±10.01	100.60±10.29	0.5609	0.5771
Laryngoscopy and intubation	136.07±9.98	115.73±10.07	7.8579	0.0001
Post intubation	1 min 131.47±8.52	112.53±8.48	8.6299	0.0001
	3 min 120.47±8.34	108.40±7.69	5.8276	0.0001
	5 min 110.67±8.61	107.67±6.33	1.5376	0.1296

Table 4: Comparison of mean diastolic blood pressure at various time intervals compared to pre induction values.

Time interval	Fentanyl group	Clonidine group	T value	P value
Pre induction	80.60±8.21	79.67±9.66	0.4018	0.6893
After induction	76.93±8.98	77.57±7.66	0.2970	0.7675
Laryngoscopy and intubation	93.60±7.87	78.27±7.55	7.6991	0.0001
Post intubation	1 min 93.60±7.87	78.27±7.55	7.6991	0.0001
	3 min 85.20±6.78	75.93±6.20	5.565	0.0001
	5 min 77.87±8.50	74.27±5.09	1.9974	0.505

Table 4 shows comparison of mean diastolic blood pressure at various time intervals compared to pre induction values. The mean diastolic blood pressure at pre-induction was comparable in both the groups. The mean diastolic blood pressure at post-induction was comparable in both the groups. The mean diastolic blood pressure at laryngoscopy and intubation was significantly more in the fentanyl group compared the clonidine group.

The mean diastolic blood pressure at one minute post intubation was significantly more in the fentanyl group compared the clonidine group. The mean diastolic blood pressure at three minute post intubation was significantly more in the fentanyl group compared the clonidine group. The mean diastolic blood pressure at three minute post intubation was comparable in both the groups.

Table 5 shows comparison of mean of mean blood pressures at various time intervals compared to pre induction values. The mean of mean blood pressures was significantly more in the fentanyl group compared the clonidine group. The mean of mean blood pressures was comparable in both the groups. The mean of mean blood pressures was laryngoscopy and intubation were significantly more in the fentanyl group compared the

clonidine group. The mean blood pressure at one minute post intubation was significantly more in the fentanyl group compared the clonidine group. The mean blood pressure at three minute post intubation was significantly more in the fentanyl group compared the clonidine group. The mean blood pressure at three minute post intubation was comparable in both the groups.

Table 5: Comparison of mean of mean blood pressures at various time intervals compared to pre induction values.

Time interval	Fentanyl group	Clonidine group	T value	P value
Pre induction	95.21±9.22	90.31±6.58	2.4058	0.0193
After induction	85.31±7.72	85.24±7.04	0.0367	0.9709
Laryngoscopy and intubation	107.76±7.91	90.76±6.55	9.0666	0.0001
Post intubation	1 min 105.87±7.33	89.33±6.78	9.0731	0.0001
	3 min 96.96±6.14	86.76±5.62	6.7119	0.0001
	5 min 88.82±7.91	86.07±4.58	1.6479	0.1048

DISCUSSION

From the present study overall we found that oral clonidine has better though not complete over IV fentanyl. Ko SH et al, showed that when they used fentanyl in the dose of 2mcg/kg and when they gave fentanyl in this dose 5min before intubation was found to be very good in controlling the increase in the hemodynamic parameters.⁶ Adachi YU et al, also gave similar observations of use of fentanyl in the dose of 2mcg/kg. They noted that fentanyl in this dose was successful in reducing the heart rate and blood pressure significantly.⁷

Chadha R et al, in their study used oral clonidine in the dose of 3.6mcg/kg and they give this oral clonidine in this dose 90-110min before the operation and they compared this oral clonidine in this done with diazepam which they give in the dose of 0.2mcg/kg. they observed that the responses like blood pressure and the heart rate were significantly controlled in the clonidine group patients as compared to the diazepam group patients.⁸

Laurito CL et al, in the study, oral clonidine blunts the hemodynamic response to brief (15seconds) but not prolonged laryngoscopy (45seconds), when 300mg dose of oral clonidine given 90minutes prior to laryngoscopy.⁹

Mikawa K et al, studied efficacy of oral clonidine in children of age 4-12 years. They used oral clonidine in two different doses like 2mcg/kg and 4mcg/kg. this was given to these children in these two difference doses one hour before the operation and the surgery was related to eyes. They noted that a good amount of sedation was given by clonidine and more the dose, more sedation was there. It was also able to control the increase in the heart

rate and the blood pressure. There were no side effects observed during the study.¹⁰

Raval DL et al, compared the oral clonidine which they gave in the dose of 4mcg/kg with that of diazepam which was given in the dose of 0.2mg/kg body weight. The authors noted that oral clonidine when given in the above said doses was more effective than diazepam.¹¹ Sessler DI et al, compared five drugs to know which was better in controlling the shivering which occurs after surgery. One of the five drugs was clonidine in the dose of 150mcg. They concluded that all drugs were equally effective.¹²

Lizawa A et al, in their study compared Oral tandospirone and clonidine with placebo terms of pre-op anxiolysis. Pre-treatment evaluation was done the day before surgery, oral medication was given 90min before surgery to all 3 groups, post-treatment examination was done immediately after entering the operating room, p value was <0.05 in both tandospirone and clonidine group and provided similar relief of post-operative anxiety. Both have equivalent effect in reducing pre-op anxiety with different mechanism of action.¹³

Pawlik MT et al, observed that clonidine premedication in patients with obstructive sleep apnea syndrome: oral clonidine premedication stabilizes hemodynamic variables during induction, maintenance and emergence from anaesthesia and reduces the amount of intraoperative anesthetic and postoperative opioids without deterioration of ventilation.¹⁴

CONCLUSION

Clonidine is easily available, cheap, orally administered and does not produce any untoward effects in the peri-

anesthetic therapeutic range. When administered 90min prior to surgery its effect is similar to IV clonidine. The ease of administration and the hemodynamic stability it offers makes clonidine as a useful drug to use in any clinical set up.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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