Original Article

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Comparative Effect of Nifedipine, Nitroglycerine, and Metoprolol in Attenuating Rise in Pulse Rate, Blood Pressure, and Cardiac Arrhythmias during Laryngoscopy and Intubation

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Abstract

Background: During laryngoscopy and intubation rise in pulse rate, blood pressure (BP), and cardiac arrhythmias occurs.

Objective: The aim of the present study was to attenuate the rise in pulse rate, BP, and cardiac arrhythmias due to laryngoscopy and intubation with nifedipine, nitroglycerine (NTG), and metoprolol.

Materials and Methods: A total of 40 patients undergoing surgery were randomly divided into four groups. Group 1 control group: No medication, Group 2: NTG 1 mg sublingually given 2 min before intubation, Group 3: Nifedipine gelatin capsule 10 mg sublingually 20 min before intubation, Group 4: Injection metoprolol 2 mg intravenous (IV) 5 min before intubation.

Result: Metoprolol was more effective in attenuating the rise in BP, pulse rate, and cardiac arrhythmia.

Conclusion: All three drugs significantly attenuates the rise in pulse rate, BP, and cardiac arrhythmias during laryngoscopy and in intubation, but metoprolol 2 mg IV 5 min before intubation was more effective than other two drugs.

Key words: Intubation, Laryngoscopy, Metoprolol, Nifedipine, Nitroglycerine

INTRODUCTION

Despite the emergence of new airway devices in the recent years, rigid laryngoscopy and tracheal intubation still remains the gold standard in airway management. In 1940, Reid and Brace first described the hemodynamic response to laryngoscopy and intubation both of which are known to cause sympathoadrenal stimulation.[1] These procedures lead to increase in heart rate (HR), blood pressure (BP), intraocular, and intracranial pressure. The arterial hypertension is due to increase in cardiac output rather than an increase in systemic vascular resistance, and is associated with the transient rise in central venous pressure. Arrhythmias also tend to occur. These changes are of little significance in normal healthy patients but may be dangerous in cases of coronary artery diseases, raised intracranial pressure, intracranial aneurysm, partial or complete heart block, and hypertensive patients.[2-4] Therefore, many drugs are often used in combination with the primary anesthetic in an attempt to decrease these hemodynamic responses associated with intubation so as to limit patient risk.[5,6] The present study was done to compare the effect of nifedipine and nitroglycerine (NTG) in attenuating cardiovascular response due to laryngoscopy and intubation.

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MATERIALS AND METHODS

The study was conducted on 40 patients American Society of Anesthesiologists Grade I and II undergoing general anesthesia.

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The patients were randomly divided into four groups.

Group 1: Total number of patients studied - 10. This group was considered as a control group and no medication was given

Group 2: Total number of patients studied - 10. Patients were given nitroglycerine 1 mg sublingually 2 min before induction of anesthesia

Group 3: Total number of patients studied - 10. Patients were given nifedipine gelatin capsule 10 mg sublingually 20 min before induction of anesthesia

Group 4: Total number of patients studied - 10. Patients were given metoprolol 2 mg intravenous (IV), 5 min before induction of anesthesia.

Investigation

All the patients were routinely investigated for:

- Hemoglobin
- Total leucocyte count
- Differential leukocyte count
- Erythrocyte sedimentation rate
- Blood group and Rhesus factor
- Blood sugar
  a. Fasting
  b. Postprandial
- Blood urea
- Serum creatinine
- Electrocardiography (ECG)

Procedure

Before subjecting the patients for the study, thorough clinical examination and laboratory investigations were done once again. Indication for surgery was noted and written informed consent was obtained.

All the patients were premedicated with 0.01 mg/kg glycopyrrolate and 1 mg/kg promethazine, intramuscular 30 min before surgery.

IV line was secured using dextrose normal saline/ringer lactate and pre-oxygenated for 5 min. Anesthesia was induced with thiopentone sodium 4-7 mg/kg, over 20 s and when eyelash reflex abolished, suxamethonium 1-2 mg/kg was given.

When fasciculation due to suxamethonium disappeared patients were intubated with cuffed lubricated (with xylocaine 2% jelly) endotracheal tube, after laryngeal spray with xylocaine 1%. After the procedure following, four observations were recorded for 15 min *viz*. baseline, after induction at 3, 5, 10, and 15 min after intubation.

- Pulse rate
- Arterial BP
- HR and rhythm by ECG
- Oxygenation
- Input-output charting

After laryngoscopy and intubation anesthesia was maintained with N_2O 66%, oxygen 33%, and vecuronium 0.05 mg/kg body weight.

OBSERVATIONS AND RESULTS

Demographic profile is shown in Tables 1 and 2 which shows that most of the patients belonged to age group 30-40 years followed by those in 40-50 years. Mean weight of the male patients in control and study groups were 59.00 ± 2.70 kg and 61.42 ± 5.04 kg, respectively, while mean weight of the female patients in control and study groups were 47.83 ± 3.92 kg and 52.39 ± 6.74 kg, respectively. There was no significant difference in the demographic parameters between different groups.

Table 3 shows that there was fall in mean systolic arterial pressure after induction of anesthesia in all four groups, *viz*., control, nifedipine, NTG, and metoprolol. This

Table 1: Distribution of patients according to age in various groups

Age	Nifedipine	Metoprolol	NTG	Control
<30	1	0	0	1
30-40	8	3	4	6
40-50	1	4	2	3
50-60	0	1	2	0
>60	0	2	2	0

NTG: Nitroglycerine

Table 2: Distribution of patients according to weight

Groups	Male - weight (kg)	Female - weight (kg)
Control	59±2.70	47.83±3.92
Study	61.42±5.04	52.39±6.74

Table 3: Systolic BP at different times in various groups (mean ± SD)

Time	Group 1	Group 2	Group 3	Group 4
Baseline	123.80±9.86	120.20±8.36	119.00±9.12	121.00±9.82
Induction	85.60±8.53	86.4±8.24	81.40±9.38	84.8±8.37
1 min after intubation	149.00±8.89	132±8.98	135±9.26	139±9.58
3 min	139±9.58	131±9.62	132±8.69	136±9.36
5 min	128±9.43	127±9.28	128±9.34	128±9.58
10 min	126±8.96	123±8.69	124±8.74	126±9.84
15 min	124±9.47	120±8.49	121±9.58	123±8.88

BP: Blood pressure, SD: Standard deviation

fall was statistically insignificant ($P > 0.05$) in control, metoprolol, and NTG groups, but significant only in nifedipine group.

There was also immediate increase in mean systolic arterial pressure after laryngoscopy and intubation in all four groups *viz.* control, nifedipine, NTG, and metoprolol. This rise was significant in the control group ($P < 0.01$), while in nifedipine, NTG, and the metoprolol groups rise was slight but statistically insignificant ($P > 0.05$). On comparing various groups, significant difference was observed between the control group and treatment groups ($P < 0.05$), suggesting that all the groups were effective in attenuating the increased BP response of intubation.

Further, there was a decline in mean systolic arterial pressure in serial recording at 3, 5, 10, 15 min after intubation in all four groups (Table 3).

Similar to the response on systolic BP, there was a decrease in mean diastolic arterial pressure after induction of anesthesia in all four groups *viz.* control, nifedipine, NTG, and metoprolol ($P < 0.05$) (Table 4).

Maximum increase in mean HR after intubation was observed in control group, compared to the treatment groups and the difference in response between the control and treatment groups was statistically significant ($P < 0.05$) (Table 5). The response was maximum in the metoprolol group.

Cardiac dysrhythmias seen in 4 of the control group and 1 each in nifedipine and NTG group, but there was no cardiac dysrhythmias in the metoprolol group. Cardiac dysrhythmias were found in the form of sinus tachycardia, premature ventricular contraction, decrease P-R interval (Details of ECG not shown).

Table 4: Mean changes of diastolic BP at different times in various groups

Time	Group 1	Group 2	Group 3	Group 4
Baseline	86.8±5.46	82.0±5.53	86.00±5.64	85.6±5.59
Induction	85.6±5.85	81.6±5.78	86.4±4.97	84.2±5.28
1 min after intubation	94.7±5.76	94.4±5.68	93±5.78	96±5.26
3 min	92.3±5.91	91.83±4.93	92±5.52	92±5.36
5 min	90±5.36	90±5.74	88±5.97	90±5.42
10 min	88±5.92	88±5.26	86±4.85	89±5.36
15 min	86±4.92	83±5.83	84±5.66	87±5.74

BP: Blood pressure

DISCUSSION

Direct laryngoscopy and tracheal intubation cause an increase in BP and HR.[6] This cardiovascular response is supposed to be due to reflex increase in sympathetic response to mechanical stimulation of the larynx and trachea. This leads to an average increase in BP of 40 50%, and a 20% increase in HR.[7] Significant elevations in serum levels of norepinephrine and epinephrine subsequent to the laryngoscopy, with and without tracheal intubation, have been reported.[8-10] The pressor response to laryngoscopy and intubation also increases myocardial oxygen requirement and risk of cerebrovascular accidents, and can also induce cardiac arrhythmias and pulmonary edema.[11-14] In the past, many drugs have been successfully used for attenuation of these responses.[15,16]

The results of the present study shows that all the three drugs are effective in attenuating the cardiovascular response to laryngoscopy and intubation which is in correspondence with other studies which shows a similar type of response.[17-20]

Our study also demonstrates that metoprolol was more effective in normalizing the HR and decreasing the chances of arrhythmia. This could be due to the release of renin from juxtaglomerular apparatus stimulated by the sympathetic system is blocked by metoprolol.[21] Metoprolol also improves the relationship between cardiac oxygen supply and demand.[22]

CONCLUSION

Hence, we concluded that all three drugs *viz.* nifedipine, NTG, and metoprolol, were able to attenuate the rise in pulse rate and BP due to laryngoscopy and intubation but not completely. NTG and metoprolol decreases the severity of tachycardia rise in BP, significantly and less fluctuations, during and after laryngoscopy, and intubation except nifedipine which cause significant tachycardia during laryngoscopy and intubation.

Table 5: Mean changes of pulse rate at different times in various groups

Groups	Baseline	Induction	1 min after intubation	3 min	5 min	10 min	15 min
Group 1	85±7.48	84±7.59	112±7.53	107±7.36	98±7.46	94±7.15	88±7.45
Group 2	86±7.26	78±7.46	98±6.98	92±7.48	92±7.51	88±6.97	86±7.26
Group 3	84±7.34	76±7.79	102±7.28	96±7.25	94±7.53	93±6.98	90±7.18
Group 4	83±7.89	68±7.58	88±7.59	83±7.95	79±7.82	78±6.95	76±7.39

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