

THE EFFECT OF INTRAVENOUS NITROGLYCERINE ON BLOOD PRESSURE DURING INTUBATION

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Abstract

Objectives: Hypertension is one of the most frequent complication during laryngoscopy and intubation; thus in the premedication or induction stages, many drugs have been used to control this hypertension. Nitroglycerine is one of the drugs thought to be effective and the purpose of this study is to appraise this deliberation.

Methods: 150 patients of 20-50 years of age were enrolled in this randomized double blind clinical trial. They were randomly divided into two group, one received 2 µg/kg nitroglycerine while the other group did not received any drug. Blood pressure was checked in 3 different stages and compared.

Results: In both groups, pre and post intubation systolic pressure had a significant difference; whereas this relation could not be found for the diastolic pressure. These variables did not have a statistically significant relation prior to intubation; whilst after intubation, a significant relation was elicited.

Conclusion: Injection of 2 µg/kg nitroglycerine immediately after anesthetic induction is effective in preventing the unwanted increase in the

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blood pressure, and as a result, complications following this response in patients with ischemic heart disease would be reduced.

Keywords: Laryngoscopy – Intubation – Nitroglycerine.

Introduction

Intubation is commonly associated with cardiovascular response including hypertension, cough reflexes, increased intracranial and ocular pressure. During anesthetic induction, a 26-66% increase in heart rate and a 36-45% increase in systolic blood pressure are reported when no pre treatment is used to prevent this hemodynamic response. In 1950, Newman and Hopinto first reported that laryngoscopy and intubation stimulate the sympathetic system. As a result, a 40-50 percentage increase in the blood pressure and a 20 percentage increase in the heart rate might occur 1-2 minutes after intubation. This response reaches its peak and returns to baseline in 10 minutes^{1,2}. No such changes were noted in patient's without history of cardiovascular disease, but in those who suffer from restricted heart reservoir, heart failure or ischemia, hemodynamic complications may occur^{3,4}. Rupture of cerebral aneurysm is an other complication reported in such cases⁵. It seems that administration of the appropriate premedication, inducing a good anesthesia and rapid intubation would reduce this response to the minimum and would prevent the associated risks and complications. Several studies have been carried out in this domain, but the results are controversial⁶⁻⁸.

The purpose of the present study was to evaluate the effect of nitroglycerine 2 mcg/kg on the increase of blood pressure following laryngoscopy and intubation prior to surgery.

Materials and Methods

Following approval of the institutional Ethical Committee, a double blind randomized clinical trial was carried out in Amir Alam and Mirzakochak Khan Hospital in 2006. Hundred and fifty patients (83 males, 67 females), 20 to 40 years old ASA I or II scheduled for elective

general surgery were enrolled in this double blind clinical trial. Those with positive history of cardiac disease or hypertension and patients receiving antihypertensive, sympathomimetic, vagomimetic and antidepressant drugs, were excluded from the study. All patients signed a written informed consent and underwent a complete examination before the operation. The basic data was gathered through a predesigned questionnaire.

Patients were randomly assigned into two equal groups (75 each) using a computer random number generator. The first group received nitroglycerine for induction (case group) and the second group received a placebo (control group).

In the operating room, regular monitoring including pulse oxymetry, non-invasive blood pressure recording and EKG for all patients. Prior to operation, all patients received 7 cc/kg Ringer via an 18 gage angiocath inserted in a peripheral vein. Systolic and diastolic blood pressures were recorded from the right cuff of all patients by a single technician at several different intervals: at the entrance to the operating room, after anesthetic induction and before intubation, and in 0, 1, 2 and 5 minutes following intubation.

Induction was performed in a similar fashion in all subjects in order to overcome the hemodynamic effects of muscular relaxant and hypnotics. Anesthesia was begun with preoxygenation (8 liter/min) for 5 minutes. Midazolam (0.02 mg/kg) and fentanyl (1.5 mcg/kg) were then administered as premedication and induction was performed using nesdonal (4 mg/kg). Atracurium (0.5 mg/kg) (muscular relaxant) was injected in time symptoms of sleepiness appeared (disappearance of palpebral reflexes).

At this time, patients received either of two 2 different injections using a 10 cc labeled syringe previously prepared by nurses who were not informed of the objectives of the study. The syringes for the case group contained 1 mg nitroglycerine plus 9 ml of sterile water and the syringes for the control group were filled with 10 ml sterile water both were given as a single i.v. bolus and the administrator had no idea of content of either syringe. The syringes were that labeled according to the number recorded

on the patient's questionnaire. The rest of the procedures were the same for all patients; 3 minutes after oxygenation with mask, patients were intubated via Macintosh laryngoscope and intubated by a portex tube by the anesthesiologist responsible for the study. Anesthesia was maintained in both groups equally using 1-1.5 MAC of isoflurane, N₂O and O₂ (4 lit/min).

During the operation, occurrence of any types of arrhythmias, or cardiovascular complications (such as hypo or hypertension) was recorded. Hypertension was defined as an increase in blood pressure to more than 120% of baseline values, and when it was reduced to less than 80% of the baseline, it was considered as hypotension.

The gathered data were entered in SPSS version 11.5 and analyzed. Chi square was used for the qualitative data while for the continuous ones t-test was used.

Results

The demographic data of the patients enrolled in this study is shown in Table 1. No significant statistical difference between the basic data (age, gender, weight, baseline blood pressure) of the 2 groups were noted (p value = 0.423, 0.644, 0.241, 0.540).

Table 1
Demographic data of patients in the Case a Central groups

	Case group (nitroglyc.)	Control group (sterile water)	P value
Mean Age	37.1 ± 1.06	37.1 ± 1.23	0.423
Male/Female	39/36	44/31	0.644
Mean Weight	65.6 ± 6.7	67.7 ± 8.7	0.241
Base line Sys BP	120.5 ± 14.5	122.5 ± 12.6	0.540
Base line Dia BP	71.7 ± 11.7	73.7 ± 10.5	0.468

Table 2 lists patient's blood pressure measured at different intervals. It shows that the mean arterial pressure and systolic blood pressure

increased less following intubation in the nitroglycerine group. This difference was reported to be statistically significant. On the other hand such a difference was not noted between the diastolic blood pressures of the two groups.

Table 2
Blood pressure of Control and Case groups measured at different intervals

Blood Pressure	Control group (sterile water)		Case group (nitroglycerine)		P value	
	Systolic	Diastolic	Systolic	Diastolic	Systolic	Diastolic
At admission time to OR	122.4±23.6	75.7±12.5	105.5±20.7	69.3±13.4	0.463 (121.5-125.1)	0.108 (75.1-77.2)
Just after intubation	124±10.8	75.7±4.5	122.6±12.2	77±8.1	<0.001 (110.1±117.8)	.003 (70.4-74.7)
1 min after intubation	148.4±17.1	99.4±13.1	138.7±15.9	95.4±13.3	<0.001 (140.7-146.3)	0.066 (95.3-99.6)
2 min after intubation	131.1±16.7	99.4±13.1	124.4±15.1	87±11.2	0.011 (125.1-130.3)	0.135 (86.6-89.9)
5 min after intubation	111.6±14.5	75.5±12.1	105.5±13.0	72.2±9.9	0.008 (106.3-110.8)	0.068 (72.1-75.7)

Discussion

Many studies have reviewed the impact of different drugs on hypertension following intubation; the most important were lidocaine, esmolol, fentanyl and sodium nitro peroxide⁹⁻¹¹. Opiums were reported to have the most stable effect on the blood pressure but they elongate the recovery time¹².

Hill et al first reported the effect of intranasal nitroglycerine in preventing increase in blood pressure following intubation¹³. Van den Berg et al, compared the effects of sulfate magnesium, esmolol, lidocaine, nitroglycerine and placebo as inducing medication prior to cataract surgery. This study revealed esmolol to be the most effective drug in preventing increase in heart rate. Nitroglycerine was shown to successfully prevent increase in blood pressure; however its use was accompanied with significant tachycardia. Conversely, sulfate magnesium

and lidocaine did not have any effect on the hemodynamic changes following intubation¹⁴. In a similar study¹⁵, it was documented that administration of a single dose of intravenous nitroglycerine, was a safe and effectual method in reducing the hypertensive response following intubation.

In contrast, Singh et al.¹⁶ compared the effects of lidocaine, esmolol and nitroglycerine and reported a significant increase in the mean arterial pressure following intubation. They also reported less increase in the heart rate values in the group who had received esmolol. This study could not confirm the effectiveness of nitroglycerine 2 µg/kg in controlling acute hemodynamic responses following intubation.

In a study performed in Greece, 35 females were selected to receive nitroglycerine before induction of anesthesia. In comparison with the control group who received placebo, systolic blood pressure did not increase significantly immediately after intubation ($P > 0.005$); while the heart rate increased significantly in both groups ($P < 0.001$). According to the results of this study, nitroglycerine had an effective influence on post intubation blood pressure diminution, with no effect on heart rate¹⁷.

Several reports have studied the effectiveness of various doses of nitroglycerine. Grover et al, stated nitroglycerine 0.75 mg as the most effective dosage¹⁸. Hwang et al, showed nitroglycerine 0.5 mg (intra nasal) as the dosage accompanied with the least increase in blood pressure¹⁹.

In a study performed on 30 healthy patients, a lower increase in systolic and diastolic blood pressure was reported following administration of nitroglycerine 2 µg/kg. Such a difference was not reported between the heart rates of these groups²⁰. Similarly, no increase in blood pressure was shown in patients who had received nitroglycerine prior a CABG surgery²¹. These results were all supportive to the findings of our current study.

Our current study demonstrated that injection of 2 µg/kg nitroglycerine immediately after anesthetic induction was effective in preventing the unwanted increase in the blood pressure and as a result such complications in patients with ischemic heart disease would be reduced.

Conclusion

The reported results indicate that nitroglycerine is effective in reducing hypertension following intubation in the operating room.

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