

A Comparative Study of One Glyceryl Trinitarte Spray versus Two Sprays in Attenuation of Pressor Response Following Laryngoscopy and Endotracheal Tube

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ABSTRACT

Background: Laryngoscopy and tracheal intubation is invariably associated with certain pressor response like hypertension, tachycardia as well as a variation in cardiac arrhythmias. Many pharmaceutical therapies had been applied to attenuate this response with different degree of success. **Aims of the Study:** To compare the efficacy of one glyceryl trinitarte (GTN) spray versus two sprays in attenuation of pressor response following laryngoscopy and endotracheal tube.

Patients and Methods: This is a prospective single observational study including 150 consecutive patients scheduled for elective general surgery under general anesthesia. Control group, group treated with one GTN sublingual spray as (0.4 mg) and group treated with two metered sprays (0.8mg). Heart rate, blood pressure and oxygen saturation values were recorded at baseline (before induction), after induction, 2, 4, 6, 8 and 10 after intubation.

Results: SBP, DBP and MAP were significantly reduced in GTN groups (either in one or two sprays) compared to the control group in post induction and at 2 minutes post-intubation (for SBP and DBP) and till 4 minutes post-intubation (for MAP). Furthermore, in post induction and 2 min post intubation. Patients treated with 2 sprays had significantly lower SBP, DBP than those treated with one spray and patients treated with two spray had significantly lower MAP in 2 minutes post intubation than patients treated with one spray. In contrast, HR Post induction and at 2, 4 and 6 min post intubation two sprays group had higher mean HR than control group with significant differences. one spray group had higher mean HR than control group post induction with significant difference. Patients treated with two sprays had higher mean HR than patients treated with one spray at 2 minutes and 4 minutes post intubation with significant difference.

Conclusions: The sublingual administration of GTN spray in a dose of 0.4 mg or 0.8 mg prior to intubation in normotensive can attenuate the pressor response to laryngoscopy and intubation. However, one spray GTN is better than two spray considering the attenuation of blood pressure.

Keywords: glyceryl trinitarte, hemodynamic response, sublingual spray

INTRODUCTION

The process of laryngoscopy and intubation (LI) can cause an obvious changes in presser response and therefore, minimizing this response is a topic of many studies. The hemodynamic response to LI is regulated by the hypothalamo-pituitary-adrenocortical and sympathetic adreno-medullary responses⁽¹⁾.

The results of these responses are attributed mainly to the release of catecholamines. The consequence of this system can range from minor issues to major fatal one⁽²⁾. This is at its peak about 30-45 seconds after L&I. In response to LI, the hemodynamic parameters have a slight increase in their values; all returning within 5 minutes to baseline. However, after 10 minutes of L&I, plasma catecholamine levels in hypertensive patients have a triple increment and return to the original measurement. Furthermore, 1 minute after a laryngoscopy, hypertensives' catecholamine levels rise⁽³⁾. These responses may result in ischemic changes in patients with coronary artery disease or may increase ICP, push vitreous gel forward during open-eye surgery, rupture an aortic or cerebral aneurysm, or increase intraocular pressure in an intact eye. The usual autoregulation process may be impaired by disease. Patients who have low

intracranial compliance reserve and elevated intracranial pressure are susceptible to brainstem herniation and abrupt mortality during L&I.⁽⁴⁾

Now infants and small children, there is an increase in parasympathetic tone and hence, bradycardia. In geriatric patients, there is a decrease response to LI with the advance of the age⁽⁵⁾. The period of laryngoscopy, the services and stretching practical near the tissues have a deleterious effect on the hemodynamic changes⁽⁶⁾.

Different tactics have been devised to counteract these reactions, focusing on various sympathetic reflex pathway levels. The afferent route can be blocked with topical applications of local anesthetics or superior laryngeal nerve blocks.

A vasodilator called glyceryl trinitarte (GTN) is generally used to treat hypertension in emergency situations, coronary artery spasm, congestive heart failure (CHF), and chronic anal fissures⁽⁷⁾. Plasma concentrations of the metabolites are many orders of magnitude higher than those of the parent drug⁽⁸⁾. Increased vasodilatory response is the main cause of Glyceryl trinitrate overdose toxicity resulted in hypotension, venous pooling and decreased cardiac

output. There may also be compensatory effects, like tachycardia and palpitations (7).

This study aimed to compare the efficacy of one Glyceryl trinitrate spray versus two sprays in reduction of pressor reply following laryngoscopy & endotracheal tube.

PATIENTS AND METHODS

This study is a prospective single observational training including 150 consecutive patients planned for elective overall surgery under overall anesthesia (GA)

Inclusion Criteria

- Both genders, adult between 18-55 years old
- Surgeries done under GA
- Have American Society of Anesthesiologists (ASA) I

Exclusion Criteria

- Patients belonging to ASA Grade II or more
- Atrioventricular conduction block, congestive heart failure, cardiac arrhythmias, or hypertension are examples of cardiovascular diseases that may affect a person.
- Receiving phosphodiesterase inhibitors, antidepressants, sympathomimetics, vagomimetics, and antihypertensives.
- Mallampati class \geq III

A thorough preoperative evaluation was conducted, paying close attention to the haemodynamic parameters and taking a thorough medical history. Patients were randomly divided into three groups, each with 50 patients: group A, which received one GTN spray, group B which received two GTN sprays and group C which is the control group. Two IV cannula (G = 18) were attached to the patient's hands as soon as they entered the operation room, and they were then monitored for electrocardiography (ECG), noninvasive blood pressure, pulse rate, and pulse oximetry. All patients received 500 mL of Ringer lactate that had been boiled to 37°C before to GA. Fentanyl 1-2mcg/kg intravenously was used to premedicate the patients. After three minutes of preoxygenation, anesthesia was induced in the patients using rocuronium (0.6 mg/kg) and propofol (2 mg/kg) over a 15-second period.

GTN sublingual spray was given as one metered spray (400 mcg) in group A and two metered sprays (800 mcg) in group B right after induction. Following the administration of GTN spray and the induction of anesthesia, laryngoscopy was attempted. An expert anesthesiologist performed the GTN spray and intubation, and orotracheal intubation was accomplished using a typical McIntosh curved blade laryngoscope and an appropriate-sized cuffed endotracheal tube. The instance was removed from the research if intubation took longer than 30 seconds or required more than one attempt. Isoflurane was used to maintain anesthesia once the location of the endotracheal tube had been confirmed. When breathing was sufficient, all patients had their tracheas removed.

Heart rate, blood pressure, and oxygen saturation (SpO2) values were obtained at baseline (before premedication), just before intubation (5 min after induction and GTN spray), 2, 4, 6, 8, and 10 min after intubation. Standard monitoring was continued for all patients. A drop in systolic blood pressure of more than 20% from baseline was regarded as hypotension. A heart rate reduction of 40 beats per minute was referred to as bradycardia.

Ethical approval:

The study was approved by the Ethics Board of Al-Muthanna University, Iraq.

RESULTS

Generally, there stayed no significant differences between patients in the control group and those exposed to one spray GTN or to two sprays in all demographic characteristics. The mean age in the controls, one spray and two spray groups were 38.62±7.11 years, 39.18±9.23 years and 41.97±11.9 years respectively. Males were slightly less frequent among one spray group (54%) than two sprays group (62%) or controls (60%); however, the change was no significant. Likewise, the two clusters were comparable in BMI with no significant difference (Table1).

Table 1: Demographic and clinical parameters

	Characteristics	Controls (50)	One Spray (50)	Two sprays (50)	P-value
Stage, years	Mean±SD	38.62±7.11	39.18±9.23	41.97±11.9	0.338
	Range	18-55	18-58	19-60	
Sex	Male	30(60%)	27(54%)	31(62%)	0.544
	Female	20(40%)	23(46%)	19(38%)	
BMI	Mean±SD	26.44±6.11	28.8±4.9	29.7±5.2	0.438
	Variety	21.8-31.81	22.18-34.9	23.81-33.72	

SD: standard deviation, BMI: body mass index

As MAP reflects systolic and diastolic, it showed similar time trend to that of SBP and DBP as shown in table 2 and figure 1. The control group had higher MAP than treated groups post induction, 2, 4 minutes post intubation with significant difference. Patients treated with one spray group had higher MAP than patients treated with two sprays group at 2 minutes post intubation with significant difference (table 2).

Table 2: Variation in MAP over time in the three groups

Time	Controls	One Spray	Two sprays	P1	P2	P3
Baseline	88.13±9.31a	93.67±8.3a	94.78±9.6a	0.172	0.164	0.815
Post induction	98.72±8.84b	73.46±7.94b	69.0±11.2 b	0.007	0.002	0.118
2 min post-intubation	101.58±11.26b	75.54±8.53b	67.7±8.38b	<0.001	<0.001	0.036
4 min post-intubation	93.82±10.17a	83.5±9.2c	82.0±7.18c	0.010	0.008	0.894
6 min post intubation	89.21±8.95a	88.6±9.5a	89.17±10.1a	0.716	0.946	0.728
8 min post intubation	88.72±9.29a	90.0±7.43a	89.78±9.9a	0.627	0.737	0.622
10 min post intubation	88.81±10.1a	91.5±8.33a	89.6±8.73a	0.512	0.746	0.488
P-value	<0.001	<0.001	<0.001			

P1: p-value between one spray and control

P2: p-value between two sprays and control

P3: p-value between one spray and two sprays

Different small letters indicate significant differences in vertical comparison, i.e when a value bears “a” it does not differ significantly from any value bearing the same letter in the same column, while it differs significantly from values bearing different letter such as “b” or “c”.

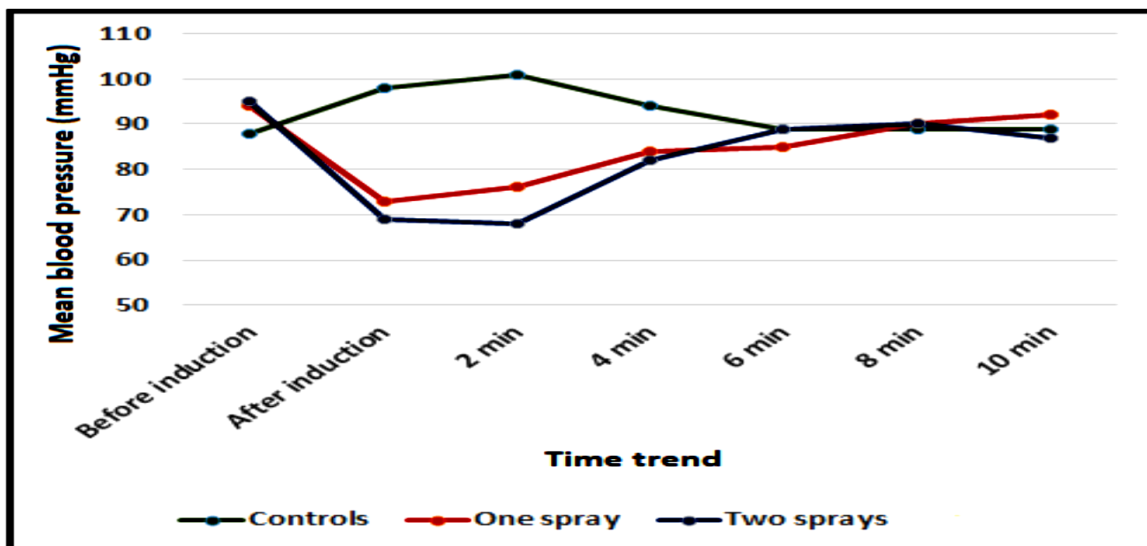


Figure 1: Variation in MAP over time in the three groups

In all time trends, the SPO2 did not drop below 98 in the three groups that were almost identical in their means of SPO2 with no significant differences.

The heart rate in the three groups started to rise immediately after induction until 6 min post induction where the rate began to return to its baseline values. Immediately after induction, control group showed lower mean of HR (91.69±10.2 beats/min) than either one spray group (106.81±11.2 beats/min) or two-spray group (108.81±11.12 beats/min). Post induction and at 2, 4 and 6 min post intubation, two sprays group had higher mean HR than control group with significant differences. One spray group associated with a higher HR than control group in post induction period with significant difference. Patients treated with two sprays had higher mean HR than patients treated with one spray at 2 minutes and 4 minutes post intubation with significant difference. However, from 8 min and in post intubation periods, there are no significant variations between all groups (figure 2).

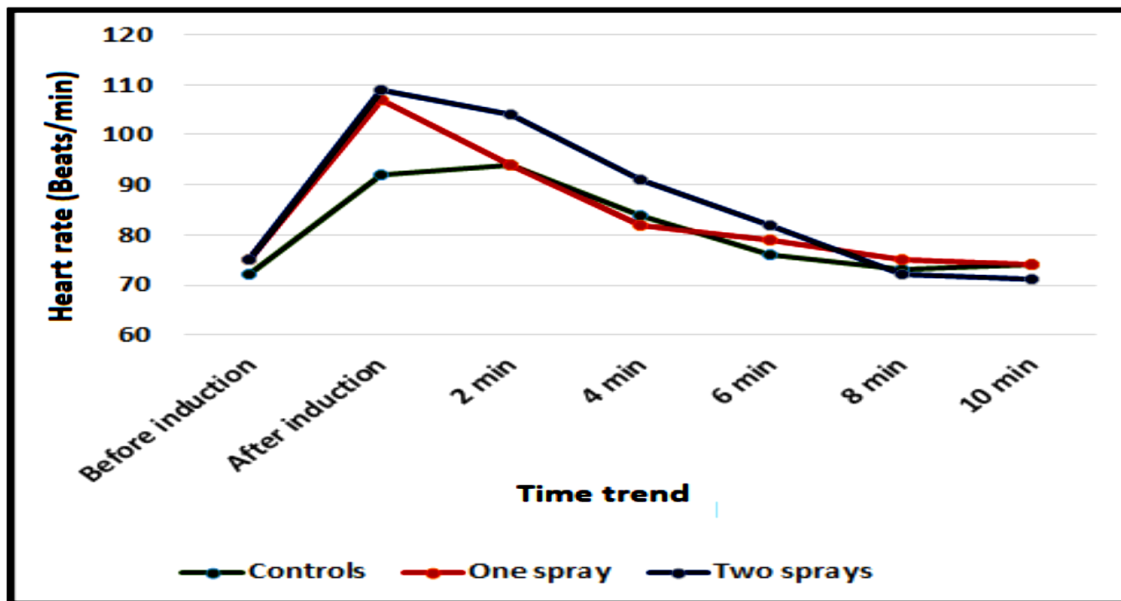


Figure 2: Variation in HR over time in the three groups

DISCUSSION

According to the result of the study, SBP, DBP and MAP have a significant changes in GTN groups (either in one or two sprays) in comparison with the control group in post induction and at 2 minutes post-intubation (for SBP and DBP) and till 4 minutes post-intubation (for MAP). Furthermore, in post induction and 2 min post intubation, patients treated with 2 sprays had significantly lower SBP, DBP than those treated with one spray, patients treated with two spray had significantly lower MAP in 2 minutes post intubation than patients treated with one spray. In accordance with the present study is a prospective study conducted by Kumari et al. in which authors allocated 90 Indian patients scheduled for elective surgeries into three groups: control, 1 spray GTN and 2 sprays GTN. At two minutes after induction, the control group's mean value of SBP, DBP, and MAP was higher than that of the one spray group, which was higher than that of the two sprays group⁽⁹⁾.

In a different investigation, Varshney et al. examined the pressor response after the administration of GTN and lignocaine spray during direct laryngoscopy and endotracheal intubation⁽¹⁰⁾. According to the study, The GTN spray was superior to lignocaine at reducing blood pressure increases during elective laryngoscopy and intubation. In addition, GTN caused a consistent drop in MAP compared to lignocaine, with significant results seen after four minutes.

Regarding the changes in heart rates, the results of the present study are in accordance with the study of Tagalpallewar et al. who evaluated the efficiency of GTN spray on hemodynamic signs in 120 Indian patients undergoing elective surgeries⁽¹¹⁾. Patients were assigned

into two equal groups, with and without sublingually administered GTN. There was a significant rise in HR in treated groups immediately after administration.

However, some other studies did not report a significant difference in HR between patients treated with GTN and non-treated patients. Manjusha et al. compared intraoral GTN spray versus IV lignocaine to attenuate the haemodynamic response due to ETT⁽¹²⁾. Their findings demonstrated non-significant differences between treated groups and controls. This variation may be attributed to the differences in demographic features as well as the prevalence of comorbidities in among the patients in each study.

CONCLUSIONS

1. The sublingually administered nitroglycerin sprig in a amount of 0.4 mg or 0.8 mg prior to intubation in normotensive can attenuate the pressor reply to laryngoscopy and intubation.
2. GTN associated with tachycardia especially during the first 4 minutes after intubation.
3. Generally, one spray GTN is better than two spray considering the attenuation of blood pressure and induction the tachycardia.

RECOMMENDATIONS

1. The sublingual administration of 0.4 mg GTN before to intubation is an efficient, useful, simple, and generally secure technique of preventing hypertension and its consequences in patients with normotension..
2. Although a tachycardia could be associated with such as, it is moderate and does not persist for long period.

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