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## Comparison of MAP between sublingual Nitroglycerin spray and normal saline spray in attenuating pressor response to extubation

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### Abstract

Various methods have been tried to decrease this stressor response to extubation such as non pharmacological methods like using laryngeal mask airway or extubation in deeper planes of anaesthesia and pharmacological methods such as pre-treatment with beta blocker), fentanyl, remifentanyl, magnesium sulphate or nitroglycerin. Participants in the study aged 18-60 years, of either gender, belonging to ASA grade I and II, undergoing elective surgery in supine position under general anaesthesia with tracheal intubation in tertiary hospital. Mean MAP at the time of reversal (TR) was 95.20+5.68 and at the time of administration of NTG spray (T0) was 96.27+7.48. The MAP increased till 3 minutes when the maximum mean BP was 99.29+4.15. This MAP subsequently reduced gradually till 10 minutes (T10) with the mean being 84.80+2.60. The mean MAP at the time of reversal (TR) was 95.43+3.06 and at the time of administration of saline spray (T0) was 98.1 +3.60. The MAP increased till 4 minutes (T4) when the maximum mean BP was 120.98+2.80. This MAP remained high till 10 minutes. This increase in MAP when compared was statistically highly significant with p value of <0.0001.

**Keywords:** MAP, Nitroglycerin spray, normal saline spray

### Introduction

Tracheal extubation after general anaesthesia requires skill and judgment learned through experience. Extubation is associated with increase in heart rate, increase in systolic blood pressure, diastolic blood pressure and mean arterial pressure. Various methods have been tried to decrease this stressor response to extubation such as non pharmacological methods like using laryngeal mask airway or extubation in deeper planes of anaesthesia and pharmacological methods such as pre-treatment with beta blockers, fentanyl, remifentanyl, magnesium sulphate or Nitroglycerin [1, 2].

In the study done by Katsuya Mikawa, Makato Hasegawa, Takeshi Suzuki [3] in the year 1991, where they assessed efficacy and safety of I.V Nitroglycerin to attenuate hypertensive response to laryngoscopy and intubation. Study was randomized controlled and double blind. In this study 30 patients belonging to ASA I posted for elective surgeries were randomized into three groups having 10 patients in each group. Group I patients received 1.5mcg/kg of Nitroglycerin whereas, Group II received 2.5 mcg/kg of NTG and group C received saline, administered through intravenous route, with start of laryngoscopy (lasting 30 seconds) which was attempted 2 minutes after administration of Thiopental sodium(5 mg/kg) and Vecuronium (0.2 mg/kg). Study concluded that Nitroglycerin is effective in attenuating hypertensive response to tracheal intubation.

Another study done by Mohammadreza Safavi, Azim Honarmand, Neda Azavi [4] titled "Attenuation of pressor response to tracheal intubation in severe preeclampsia: relative effectiveness of Nitroglycerin infusion, Sublingual Nifedepine and Intravenous Hydralazine" was undertaken in 2011. A total number of 120 patients who were undergoing elective caesarian section were randomized into three groups. Each group received one of the following drugs before intubation\_ Nitroglycerin group receiving 5mcg/min infusion (Group NTG n=40), Nifedepine group receiving 10 mg sublingual tablet (Group NIF n=40), Hydralazine group receiving 5-10 mg Intravenous Hydralazine (Group H n=40). Patient were pre-oxygenated for 5 min and received the study drug following which anaesthesia was induced with inj.

Thiopentone 5mg/kg and Scoline 1.5mg/kg was given and Rapid sequence intubation was done after 100 seconds of giving the study drug. Heart rate, systolic arterial pressure, diastolic arterial pressure and mean arterial pressure were recorded pre induction, pre intubation and at 1, 3, 5 and 10 minute after intubation. This study concluded that attenuation of the pressor response to tracheal intubation was better with Nitroglycerin infusion in severe pre eclampsia.

**Methodology**

**Source of data:** Participants in the study aged 18-60 years, of either gender, belonging to ASA grade I and II, undergoing elective surgery in supine position under general anesthesia with tracheal intubation in tertiary hospital.

**Type of study:** A one year randomized controlled trial.

**Criteria for selecting patients were**

**Inclusion Criteria**

- Patient who provided consent.
- ASA I and II.
- Age - 18 to 60 years.
- Patients scheduled for elective surgeries under general anaesthesia with endotracheal intubation.

**Exclusion Criteria**

- Hypertensive patients.
- ASA grade III and IV
- Patients allergic to study drug
- Patients with difficult airway

**Sample size**

Total sample - 60  
 Group A - 30  
 Group B - 30

**Results**

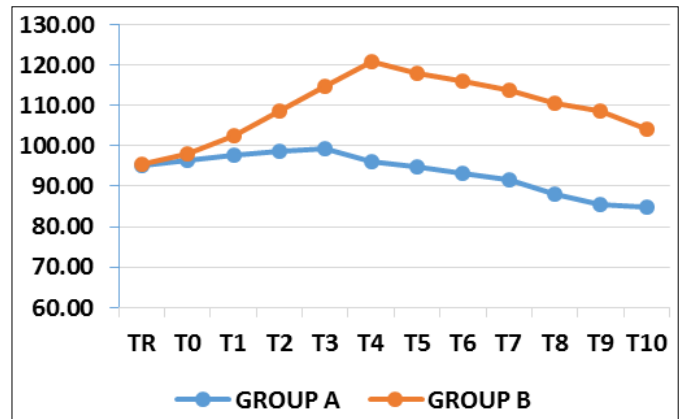
In Group A there were 16 females and 14 males. In Group B there were 18 females and 12 males. The distribution of gender across both the groups was comparable with p value 0.602.

**Table 1:** Gender distribution of the sample

	Group a	Group b	Total
Female	16	18	34
Male	14	12	26
Total	30	30	60

**Table 2:** MAP

	Group a		Group b		P value	Inference
	Mean	S.d.	Mean	S.d.		
TR	95.20	5.68	95.43	3.06	0.8437	NS
T0	96.27	7.48	98.10	3.60	0.2313	NS
T1	97.62	4.79	102.67	3.54	<0.0001	HS
T2	98.67	4.25	108.71	2.85	<0.0001	HS
T3	99.29	4.15	114.72	2.47	<0.0001	HS
T4	96.03	4.67	120.98	2.80	<0.0001	HS
T5	94.72	3.78	118.07	3.69	<0.0001	HS
T6	93.34	3.88	116.02	4.13	<0.0001	HS
T7	91.67	4.17	113.86	3.39	<0.0001	HS
T8	88.02	3.55	110.64	3.12	<0.0001	HS
T9	85.38	2.31	108.67	2.48	<0.0001	HS
T10	84.80	2.60	104.01	3.32	<0.0001	HS



**Fig 1:** Mean Map

**In Group A**

Mean MAP at the time of reversal (TR) was 95.20+5.68 and at the time of administration of NTG spray (T0) was 96.27+7.48. The MAP increased till 3 minutes when the maximum mean BP was 99.29+4.15. This MAP subsequently reduced gradually till 10 minutes (T10) with the mean being 84.80+2.60.

**In Group B**

The mean MAP at the time of reversal (TR) was 95.43+3.06 and at the time of administration of saline spray (T0) was 98.1 +3.60. The MAP increased till 4 minutes (T4) when the maximum mean BP was 120.98+2.80. This MAP remained high till 10minutes. This increase in MAP when compared was statistically highly significant with p value of <0.0001.

**PERCENTAGE OF OXYGEN SATURATION**

The saturation remained between 98-100% throughout the study period in both the groups.

**Discussion**

The minimum age in Group A was 19 years and maximum was 55 years. In Group B, the minimum age was 19 years and maximum was 58 years. When compared the difference was statistically not significant with p value of 0.2663. In Group A there were 16 females and 14 males, in Group B there were 18 females and 12 males. 15 patients were of ASA I whereas 15 patients were of ASA II status in Group A. There were 19 patients of ASA I & 11 patients were of ASA II status in Group B. Thus age, gender distribution and ASA physical status was comparable between the two groups.

General anaesthesia technique was standardized between the two groups with the average duration of surgery being 90-120 minutes in both the groups.

Onset of action of NTG spray is 2-3 minutes with peak action at 4 minutes. As most patients in our study were extubated at 3-4 minutes, action of NTG spray coincided with stimulus.

Though not much of the data is available on use of NTG during extubation, however it is effectively used as rescue drug by many authors during tracheal intubation with a wide dose variation (0.3 – 1.2 mg). Satisfactory results were obtained with 0.4-0.8 mg of NTG. In the study done by Indira Kumari et al. titled “ Attenuation of pressor response following intubation: Efficacy of nitroglycerin lingual spray [5] concluded that 1 puff (0.4 mg) or 2 puffs (0.8 mg) of sublingual spray given 1 minute prior intubation is effective. In another study done by Upasana Bhatia et al. titled

“Comparison of different doses of Nitroglycerin spray for attenuation of stress response to laryngoscopy” where they compared 0.4 mg versus 0.8 mg of sublingual nitroglycerin spray 2 minute before induction of general anesthesia it was found that 0.8 mg of sublingual NTG spray does not offer any extra advantage over 0.4 mg of sublingual NTG spray. Hence use of 0.4 mg (1 puff) of sublingual NTG spray in our study is justified. study undertaken in 2016 by Harminder Kaur, Sanjay Kumar Morwal, Fareed Ahmed and Monika Rathore titled “A comparative study of effects of intravenous Nitroglycerin and Esmolol on hemodynamic response following tracheal extubation [6]” where study was double blind randomized comparative and interventional. A total of 100 patients belonging to ASA I, age between 20-60 years were randomized to Group A (Esmolol group n=50) who received Intravenous Esmolol 1mg/kg and Group B (Nitroglycerin group n=50) who received intravenous Nitroglycerin 1mcg/kg. After pre medication patients were intubated as per general anesthesia protocol. Once surgery was concluded and spontaneous respiratory attempts were noted residual neuromuscular blockade was reversed and one minute after reversal of drug study drug was given over 60 seconds. Extubation was done as per criteria. Hemodynamic parameters were noted every minute till extubation from time of stoppage of Isoflurane. After extubation HR, SBP, DBP, MAP and O<sub>2</sub> saturation were noted every 2 minutes for 10 minutes, then every 5 minutes for 30 minutes. Unpaired T test was used to test significance of means and Chi square test was used to test significance of proportions, ANOVA test was used for intra and inter group variance. This study concluded that Esmolol had better hemodynamic stability compared to Nitroglycerin but rise in systolic blood pressure, diastolic blood pressure and mean arterial pressure is significantly controlled by intravenous Nitroglycerin.

Ameya Arun Tagalpallewar, Bhushan. M. Ambare, J.N. Agrawal and Monica. S. Masare carried out a study in 2017 named ‘Efficacy of sublingual nitroglycerin spray in attenuation of hemodynamics to tracheal extubation [7]’, where the study was prospective, randomized controlled, open study enrolling 60 normotensive and 60 hypertensive patients (total 120 patients). This study included ASA I and II patients, weighing 20-60 kgs who were posted for elective surgery under general anesthesia. Both the types of patients were randomized into two groups of 30 patients in each group, where 50% received NTG spray and 50% did not receive spray. Patients were induced as per general anesthesia protocol. At the end of surgery the study group was given two puffs of NTG spray through sublingual route when spontaneous respiratory attempts were noticed. Immediately following this residual neuromuscular blockade was reversed. After extubation heart rate, SBP, DBP and oxygen saturation was noted every 2 minutes for 10 minutes and thereafter every 5 minutes. Paired t test was used to compare intra-group hemodynamic variables. Inter-group analysis of hemodynamic parameters was done by unpaired t test. In the study they observed that in normotensive and hypertensive group HR increased after NTG spray and after reversal. After NTG spray SBP, DBP and MAP were close to baseline for 2 minutes during extubation. Increase in HR along with reduction in BP seen after Nitroglycerin spray did not produce significant increase in RPP as compared to control group [8].

## Conclusion

We observed that MAP increased till 3<sup>rd</sup> minute in Group A and thereafter had better hemodynamic control of pressor response to extubation compared to baseline and returning to baseline after 9 minutes. Whereas in Group B, MAP increased progressively till 10 minutes.

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