

# Superior laryngeal nerve block with in-line lignocaine nebulization for awake extubation response

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## Abstract

**Background and Aims:** Tracheal extubation is associated with various undesirable hemodynamic and airway responses. Various drugs are used effectively to curb these responses. But these drugs have limitations and produce side effects. Hence, the study was planned to assess the effects of superior laryngeal nerve block with inline lignocaine nebulization on awake extubation responses to suggest an alternative. The aim of this study was to assess the effect of bilateral superior laryngeal nerve block with inline lignocaine nebulization on awake extubation responses.

**Material and Methods:** A study was conducted in 35 patients aged 18-60 years, posted for surgery less than 3 h under general anesthesia. The hemodynamic responses like heart rate, arterial blood pressure, and mean arterial pressure were recorded preoperatively and at 1, 5, and 10 min postextubation. Undesirable respiratory responses like bucking, severity of sore throat, and cough response were also assessed. Repeated measures analysis of variance followed by the Tukey HSD test was used to find the significance of hemodynamic parameters. Qualitative data were expressed as percentages.

**Results:** Decrease in Systolic Blood Pressure, Diastolic Blood Pressure and Mean Arterial Pressure was statistically significant at 5 mins (T2) and 10 mins (T3) postextubation as compared to baseline (T0). No cough was observed postextubation in 80% patients while 20% had mild Grade 1 cough.

**Conclusion:** Superior laryngeal nerve block with in-line lignocaine nebulization for awake extubation is effective in curbing the haemodynamic and respiratory responses of extubation.

**Keywords:** Awake extubation, in-line lignocaine nebulization, superior laryngeal nerve block

## Introduction

Tracheal extubation is associated with responses including hypertension, tachycardia, coughing, bucking, laryngospasm, negative pressure pulmonary edema, left ventricular failure, raised intraocular and intracranial pressure. The actual incidence of postoperative sore throat, cough, and hoarseness ranges from 6.6% to 91%.<sup>[1]</sup> These various undesirable, acute, and significant hemodynamic and airway responses may persist in the recovery period in

susceptible individuals.<sup>[2]</sup> These responses are mainly due to increase in the circulatory catecholamine and irritation of the respiratory tract at the supraglottic and subglottic level. Patients with history of hypertension, coronary artery disease, and valvular heart diseases are more susceptible to develop such responses.<sup>[3]</sup> Drugs such as propofol, fentanyl, lignocaine, and dexmedetomidine are used effectively to curb these responses. But these drugs have limitations and produce side effects.<sup>[4]</sup> Moreover, extubation in deeper planes increases the incidence of respiratory complications further. These respiratory complications can be dramatically decreased by

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extubating the patients when with eyes open and ventilating spontaneously, that is awake extubation.<sup>[5]</sup> Hence the following study was planned to assess the effects of superior laryngeal nerve block with In-line lignocaine nebulization on awake extubation responses.

The aim of this study was to assess the effect of bilateral superior laryngeal nerve block with inline lignocaine nebulization on awake extubation responses.

The primary objective was to record, analyse and compare the hemodynamic responses like heart rate, arterial blood pressure and mean arterial pressure pre – operatively and during extubation.

The secondary objectives were to analyse the severity of undesirable respiratory responses by assessing the severity of cough just before extubation (bucking) and post extubation, Severity of sore throat post – operatively, incidences of complications like aspiration, laryngospasm, reintubation, desaturation, bronchospasm, negative pressure pulmonary edema in the postoperative period and to assess the level of sedation after extubation.

## Material and Methods

A prospective observational study was conducted in 35 patients from August 2018 to August 2019 in the age group of 18-60 years, posted for surgeries lasting for less than 3 h and requiring general anesthesia, at a tertiary care center associated with rural medical college. Sample size was calculated as 35 subjects with an alpha error of 0.05 and power 80% based on pilot study done in 10 patients in our institute, with Systolic Blood Pressure as primary outcome.

Institutional Ethical Committee Approval was taken for the study (Outword no. 19/2018 dated 26/08/2018). Written informed consent taken from all the patients.

Patients of age 18-60 years with ASA grade I & II were included in this study while patients with history of hypertension, diabetes, cardiovascular diseases, respiratory diseases, endocrinological diseases, gastro - esophageal reflux disease, stroke, Smoking, alcoholism and patients undergoing surgery lasting for more than 3 hours were excluded from this study.

All patients were kept nil by mouth 8 h before the surgery and aspiration prophylaxis was done with i.v. Rantidine 50 mg and i.v. Metaclopromide 10 mg as a premedication. Baseline values ( $T_0$ ) of heart rate and blood pressure were recorded by the first observer in preoperative room. On arrival of patients to

operating room, further care was taken by the second observer till the extubation. Standard monitoring was done by continuous recording of arterial blood pressure, electrocardiogram, saturation level, and  $PCO_2$  level. In all patients general anesthesia was induced with i.v. Fentanyl  $2\mu\text{g kg}^{-1}$ , i.v. Propofol  $2\text{ mg kg}^{-1}$  with Vecuronium  $0.08\text{ mg kg}^{-1}$  to facilitate tracheal intubation and maintained with  $O_2$ ,  $N_2O$ , Isoflurane with continuous mandatory ventilation. Adequate analgesia was provided in all patients with i.v. Fentanyl  $2\mu\text{g kg}^{-1}$  and i.v. Paracetmol  $15\text{ mg kg}^{-1}$ .

Towards the end of surgery, when skin closure started, the second observer connected a Jet nebulizer for In-line nebulization to the inspiratory limb of closed circuit. Jet nebulizer was kept near to the fresh gas flow outlet. We gave 5 ml of 4% lignocaine through Jet nebulizer during both inspiratory and expiratory phase of respiration.

Then bilateral superior laryngeal nerve (Internal sensory branch) block was given on each side by the second observer of the grade of Associate professor with 6 years of experience. Block was given by landmark technique as follows. Patient was in supine position with head maximally extended, hyoid bone was identified. With all aseptic precautions a 25 gauge needle over the loaded 5 ml syringe was inserted perpendicular to the greater cornu of the hyoid bone. On feeling the resistance by the bone, the needle was withdrawn slightly and then redirected caudally till it slipped over the bone and pierced the thyrohyoid membrane. Aspiration was done to reassure the correct position of the needle, then 2 mL of 1% lignocaine was injected. The same technique was repeated on the other side.

The inhalational agent was stopped and i.v. Ondansetron 8 mg was given. After about 5 mins, when patient started breathing spontaneously, reversal agents i.v. Neostigmine ( $0.05\text{ mg kg}^{-1}$ ) and Glycopyrolate ( $0.01\text{ mg kg}^{-1}$ ) were given. Coughing just before extubation, that is, buckings, if any were noted.

After the patient was fully awake, extubation was done smoothly following proper suctioning of the oropharynx. After extubation, severity of cough was assessed by four point scale up to 10 mins postoperatively.

Four point score for assessment of severity of cough<sup>[6]</sup>

- Grade 0 No coughing
- Grade 1 Minimal coughing (1-2 times)
- Grade 2 Moderate coughing (3-4 times)
- Grade 3 Severe coughing (5 or more times)

HR (Heart rate) and BP (Blood pressure) were monitored after extubation at 1 min ( $T_1$ ), 5 mins ( $T_2$ ) & 10 mins ( $T_3$ ).

Patients level of sedation was observed just before the extubation by Modified Ramsay sedation scale.

Modified Ramsay sedation scale<sup>[4]</sup>

1. Anxious or agitated and restless or both
2. Cooperative, tranquil and oriented
3. Drowsy but responds to commands
4. Asleep, brisk response to light glabellar tap or loud auditory stimulus
5. Asleep, sluggish response to light glabellar tap or loud auditory stimulus
6. Asleep and unarousable

The severity of sore throat was assessed immediately postoperatively and after 24 h by four point scale.

Four point score for assessment of severity of sore throat<sup>[1]</sup>

- Grade 0 No sore throat
- Grade 1 Mild (complained of sore throat only on inquiry)
- Grade 2 Moderate (complained of sore throat only on his / her own)
- Grade 3 Severe coughing (severe pain associated with marked change in voice)

After extubation patients were kept in semi-upright position and no oral intake was allowed till 2 h postoperatively. Patients were further monitored in the postoperative recovery room.

**Statistical analysis**

Continuous quantitative normally distributed data were expressed as mean and standard deviations. Qualitative data expressed as number (percentages). Microsoft Excel 2010 was used for analysis. Repeated measures analysis of variance followed by the Tukey HSD test was used to find the

significance of hemodynamic parameters. A *P* value <0.05 was considered statistically significant.

**Results**

Table 1 shows that the systolic blood pressure (SBP), Diastolic blood pressure (DBP) and Mean arterial pressure (MAP) decreased at 1 min (T<sub>1</sub>), 5 mins (T<sub>2</sub>) and 10 mins (T<sub>3</sub>) postextubation when compared with baseline (T<sub>0</sub>) values. But the decrease in SBP, DBP, and MAP was statistically significant at 5 mins (T<sub>2</sub>) and 10 mins (T<sub>3</sub>) postextubation as compared to baseline (T<sub>0</sub>).

While the heart rate (HR) also decreased at 1 min (T<sub>1</sub>), 5 mins (T<sub>2</sub>) and 10 mins (T<sub>3</sub>) postextubation as compared to the baseline values but the decrease in HR was statistically significant at 10 mins (T<sub>3</sub>) postextubation as compared with baseline (T<sub>0</sub>) HR. Maximum decrease in HR was 7.80%.

Table 2 - Bucking was not observed in 77.14% patients while 11.43% had bucking once and 11.43% had bucking twice. No cough was observed postextubation in 80% patients while 20% had mild Grade 1 cough. Immediately postextubation, 88.57% patients did not suffer from sore throat while 11.43% patients had mild Grade 1 sore throat. After 24 h postoperatively, none of the patients were suffering from sore throat.

Table 3 and 94.28% patients had a modified Ramsay Sedation Score of 2 while 5.71% had a score of 3. No patient suffered from any postoperative complications like aspiration, laryngospasm. reintubation, negative pressure pulmonary oedema.

**Table 1: Comparison of haemodynamic responses postextubation to baseline**

Variable	Baseline T <sub>0</sub>	1 Min after extubation T <sub>1</sub>	5 Min after extubation T <sub>2</sub>	10 Min after extubation T <sub>3</sub>	<i>P</i>	Tukey's HSD test (alpha=0.05) (Significant difference, <i>P</i> <0.01)
SBP (mm Hg)						
Mean±SD % change from baseline	128.486±14.345	125.567±14.919 2.20% decrease	116.600±13.823 9.25% decrease	123±11.649 4.27% decrease	0.00001	T <sub>0</sub> - T <sub>2</sub> T <sub>0</sub> - T <sub>3</sub>
DBP (mm Hg)						
Mean±SD %change from baseline	82.771±10.053	81.543±9.886 1.48% decrease	77.286±9.266 6.63% decrease	79.143±7.088 4.38% decrease	0.00001	T <sub>0</sub> - T <sub>2</sub> T <sub>0</sub> - T <sub>3</sub>
MAP (mm Hg)						
Mean±SD % change from baseline	98.010±10.838	96.248±10.756 1.79% decrease	90.390±10.037 7.77% decrease	93.762±7.446 4.33% decrease	0.00001	T <sub>0</sub> - T <sub>2</sub> T <sub>0</sub> - T <sub>3</sub>
HR (beats/min)						
Mean±SD % change from baseline	89±12.403	87.629±10.882 1.54% decrease	86.571±10.279 2.73% decrease	82.057±10.406 7.80% decrease	0.00002	T <sub>0</sub> - T <sub>3</sub>

SBP - Systolic blood pressure, DBP - Diastolic blood pressure, MAP - Mean arterial pressure, HR - Heart rate, SD - Standard deviation

**Table 2: Assessment of respiratory extubation responses**

Parameters	Number of patients suffered (out of 35)	Percentage
Number of Buckings		
0	27	77.14
1	4	11.43
2	4	11.43
3	0	
Cough response		
Grade 0	28	80
Grade 1	7	20
Grade 2	0	0
Grade 3	0	0
Sore throat - Immediate		
Grade 0	31	88.57
Grade 1	4	11.43
Grade 2	0	0
Grade 3	0	0
Sore throat 24 h after postextubation		
Grade 0	35	100
Grade 1	0	0
Grade 2	0	0
Grade 3	0	0

**Table 3: Modified Ramsay sedation score**

Ramsay Sedation Score	Number of Patients	Percentage
1	0	0
2	33	94.28
3	2	5.71
4	0	0
5	0	0
6	0	0

**Table 4: Demographic characteristics and duration of the surgery of the patients**

Parameters	Mean ± SD
Age (Years)	39.429 ± 11.738
Weight (Kg)	67.257 ± 7.213
Sex (Male/Female)	16/19
Duration of surgery (Minutes)	110.429 ± 29.886

## Discussion

A prospective observational study was conducted in 35 patients including 16 males and 19 females in the age group of 18–60 years with a mean weight of 67.257 ± 7.213 Kg, posted for surgeries lasting for less than 3 h and requiring general anesthesia [Table 4].

The SBP, DBP, and MAP decreased at 1 min (T<sub>1</sub>), 5 mins (T<sub>2</sub>), and 10 mins (T<sub>3</sub>) postextubation when compared with baseline (T<sub>0</sub>) values. But the decrease in SBP, DBP

and MAP was statistically significant at 5 mins (T<sub>2</sub>) and 10 mins (T<sub>3</sub>) postextubation as compared to baseline (T<sub>0</sub>). Maximum decrease in SBP, DBP, and MAP was 9.25%, 6.83%, 7.77%. While the heart rate (HR) also decreased at 1 min (T<sub>1</sub>), 5 mins (T<sub>2</sub>) and 10 mins (T<sub>3</sub>) postextubation as compared to the baseline values but the decrease in HR was statistically significant at 10 mins (T<sub>3</sub>) postextubation as compared with baseline (T<sub>0</sub>) HR. The maximum decrease in HR postextubation was 7.80%. Hence Bilateral superior laryngeal nerve block with in-line lignocaine nebulization is effective in decreasing the SBP, DBP, MAP, and HR response to extubation.

It was found that 77.14% patients had no bucking and only 20% patients developed cough response which was Grade 1 (mild). After 24 h postoperatively, none of the patients were suffering from sore throat. None of the patients suffered from postoperative complications like aspiration, laryngospasm, reintubation, negative pressure pulmonary edema.

A similar study was conducted by Nagarale *et al.*<sup>[7]</sup> where they compared three drugs Lignocaine, Esmolol, and Propofol for preventing extubation response in 90 patients. They observed that SBP, DBP, and HR was decreased with Propofol and Esmolol at 1, 5 and 10 mins postoperatively while with lignocaine the decrease was at 5 and 10 mins postoperatively. They found no cough response in 93.2% with Lignocaine, 96.69% with Esmolol, and 100% with Propofol. While in our study a significant decrease in SBP & DBP was found at 5 and 10 mins postoperatively and a significant decrease in HR was observed at 10 mins. 80% patients had no cough response in our study. Therefore our hemodynamic and cough response results are comparable with those of Lignocaine, Propofol, and Esmolol. Moreover, the incidence of sedation was observed to be 30% with Propofol, 10% with Lignocaine and 0% with Esmolol as compared to 5.71% in our study. Hence the sedation is less in the present technique as compared to Lignocaine and Propofol.

In contrary to our findings Recep Aksu *et al.*<sup>[8]</sup> studied effect of Dexmedetomidine and Fentanyl on extubation response. They observed a significant increase in SBP, DBP & HR at 1, 5, 10 mins postoperatively. 90% patients were awake with Fentanyl and 95% with Dexmedetomidine while in our technique 94.28% were awake.

Ramkumar *et al.*<sup>[9]</sup> studied ultrasound guided Superior Laryngeal Nerve block as an adjuvant to general anesthesia. They also observed the blunting of hemodynamic and cough responses postextubation. Yamasaki *et al.*<sup>[10]</sup> studied efficacy of endotracheal lignocaine via LITA tube with Ramifentanyl infusion for attenuating cough response. 73.35% patients did

not have cough response while in our technique cough response was not seen in 80% patients.

The larynx is potent reflexogenic region rich in sensory afferents that elicit various reflexes in response to mechanical stimulation.<sup>[1]</sup> Internal branch of Superior laryngeal nerve block anaesthetises supraglottic area while inline lignocaine nebulization anaesthetizes subglottic tracheal mucosa. Block of nerve provides sensory blockade alone, without any laryngeal dysfunction secondary to paralysis of any intrinsic laryngeal muscles. The recurrent laryngeal nerve is not in immediate vicinity of this block and there is no risk of it being anesthetized.<sup>[11]</sup> It was also reported that the block of internal branch of superior laryngeal nerve can attenuate hemodynamic response and catecholamine release associated with direct laryngoscopy in patients undergoing coronary artery bypass grafting.<sup>[1]</sup> Hence combine effect of superior laryngeal nerve block and In-line lignocaine nebulization is effective in decreasing the respiratory and hemodynamic responses to extubation.

Though this block is safe, still to avoid any possibility of aspiration, we took certain precautions like nil by mouth for 8 h, aspiration prophylaxis with iv Metaclopramide and iv Ranitidine, extubation when patient completely awake, postoperative semiupright position, postoperative 2 h nil by mouth (as lignocaine effect wears off till then).

Some limitations of our study are as follows-First, This study was conducted in healthy normotensive patients. It needs to be done in hypertensive and Cardiac patients where it will be more helpful. Second, Study needs to be conducted in large number of subjects for better external validity. Third, A comparative study needs to be conducted for further evaluation.

## Conclusion

Superior laryngeal nerve block with in-line lignocaine nebulization for awake extubation is effective in curbing the hemodynamic and respiratory responses of extubation. Moreover, no severe complications of extubation were observed. Hence Superior laryngeal nerve block with in-line lignocaine nebulization could be the better technique among

others because it not only allows extubation of patient in awake plane but also blunts undesirable extubation responses.

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## Conflicts of interest

There are no conflicts of interest.

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