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Original Research Article

# Comparison of Hemodynamic Responses During intubation with Superior Laryngeal and Transtracheal Nerve Block versus without Block

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**Abstract**

**Background:** Laryngoscopy and endotracheal intubation is the commonest method of securing a definitive airway for administering general anaesthesia. This noxious stimuli is associated with a transient increase in hemodynamic response. Airway anaesthesia used as blunting hemodynamic stress response, variety of technique like mucosal application of local anesthetic as a spray, viscous solutions, soaked cotton pledgets, and nebulization or as airway nerve blocks. In this study we compared the efficacy of superior laryngeal nerve block, transtracheal block along with general anaesthesia and muscle relaxant for blunting hemodynamic response to laryngoscopy and oral intubation and their side effects.

**Material & Methods:** This was a prospective, randomized and comparative study. Study was conducted on 100 patients of ASA I and II, from age group of 30 -70 years under going planned surgery under general anaesthesia requiring oral intubation. Patients were randomly selected and allocated in to two groups (50 patients in each group). Group B (n=50) received bilateral superior laryngeal nerve block and trans tracheal block. In Group C (n=50) no airway block given. The cardiovascular parameters were monitored at time intervals like, Base line, Induction, Intubation, 1 min after intubation, 2 min after intubation, 4 min after intubation, 5 min after intubation, 7 min after intubation, 10 min after intubation, 15 min after intubation. Statistical analysis was carried out using Microsoft Excel 2007 & Quickcalc Graphpad Prism 8.0 statistical software.

**Result:** There was statistically significant increase in heamodynamic parameters like Heart Rate, Systolic Blood Pressure, Diastolic Blood Pressure and Mean Arterial Pressure in Group C compare to Group B

**Conclusion:** Combining the bilateral block of the internal branch of superior laryngeal nerve and trans tracheal nerve block as an adjuvant to general anaesthesia was associated with stable hemodynamic response

**Keywords:** Hemodynamic Responses, Intubation, Superior Laryngeal Nerve Block, Transtracheal Nerve Block

## Background

Laryngoscopy and endotracheal intubation is the commonest method of securing a definitive airway for administering general anaesthesia. This noxious stimuli is associated with a transient increase in hemodynamic response and it was first described by Reid [1] and Brace [1] in 1940 and King [2] *et al* in1951. Laryngoscopy and intubation is always associated with haemodynamic changes due to reflex sympathetic discharge caused by epipharyngeal and laryngo pharyngeal stimulation and then it turn leads to increased catecholamine levels. This increased sympatho-adrenal activity may result in hypertension, tachycardia and arrhythmias and described by kumar s, Mishra [3], and Forbes [4]. Magnitude of this response is greater with increase force and duration of laryngoscopy [4]. This elevation in hemodynamic response starts within 5 sec of laryngoscopy, peak in 1-2 min and lasting for less than10 minutes thereafter. If no active attempt to blunt this haemodynamic response, there is increase in SBP by 41-53mmHg, HR by 20-23 beats per minute and MAP by up to100% above baseline [2]. Although these hemodynamic responses are thought to be of little consequence in healthy people, they are of more concern and hazardous in patients with hypertension, myocardial infarction, coronary artery disease, cerebrovascular disease, hyperactive airway, penetrating eye injuries and intracranial lesion. So it was necessary to blunt this response [5]. Various systemic intravenous as well as topical agents have been used for blunting these response. The commonest pharmacological options available are local anaesthetics, opioids, $\alpha_2$agonists, $\beta$2blockers, calcium channel blocker, MgSO4, Gabapentin, but they have side effects like hypotension, bradycardia, circulatory collapse in various disease patient and old age patient [6,7]. It was also known that the block of internal branch of superior laryngeal nerve can attenuate hemodynamic response and catecholamine release associated with direct laryngoscopy in patients of coronary artery bypass grafting [8]. Airway anaesthesia also used as blunting hemodynamic stress response. variety of technique like mucosal application of local anesthetic as a spray, viscous solutions, soaked cotton pledgets, and nebulization or as airway nerve blocks [9]. In this study we compared the efficacy of superior laryngeal nerve block, transtracheal block along with general anaesthesia and muscle relaxant for blunting hemodynamic response to laryngoscopy and oral intubation and their side effects.

## Material And Methods

This was a prospective, randomized and comparative study. After approval by the Institutional Ethical Committee and written informed consent from all patients about airway block and general anesthesia, study was conducted on 100 patients of ASA I and II, from age group of 30 -70 years undergoing planned surgery under general anaesthesia requiring oral intubation. Patients were randomly selected and allocated in to two groups (50 patients in each group). Pre-anaesthesia checkup was conducted with complete airway evaluation (mouth opening, malampatti grading, thyromental distance, teeth) detailed medical history, complete physical examination and required investigation. Premedication was done with Tablet Lorazepam Hydrochloride 1 mg night before surgery. After checking pre anaesthesia report, consent, identity and fasting, patient was taken in the operation theatre, Monitors for pulse oximetry, 5 lead electrocardiography, and NIBP were applied. Intravenous access was secured and intravenous fluids (Inj. Ringer lactate) was started at rate of 4ml/kg. All the patients

were premedicated with Inj. Glycopyrrolate 0.004 mg/kg, Inj. Ondansetron 0.08 mg/kg. Group B (n=50): received bilateral superior laryngeal nerve block and trans tracheal block. Group C (n=50): No airway block given. The cardiovascular parameters were monitored at time intervals like, Base line, Induction, Intubation, 1 min after intubation, 2 min after intubation, 4 min after intubation, 5 min after intubation, 7 min after intubation, 10 min after intubation, 15 min after intubation. Statistical analysis was carried out using Microsoft Excel 2007 & Quickcalc Graphpad Prism 8.0 statistical software. Continuous data are represented as mean ± SD.

Analysis between the groups was done using unpaired t-test. Probability was considered to be significant if less than 0.05 and highly significant if less than 0.001. Chi-Squared test was applied for categorical data.

## Results

The study was done on 100 patients belonging to ASA class I and II undergoing elective surgery under general anaesthesia. The patients were categorized into two groups Group B (with block) and Group C (without block). The demographic profiles of the both groups were comparable and there were no significant differences between the two study groups (P > 0.05).

**Table 1: Comparison of Heart rate at different time interval between two groups**

| Time interval | Group B | Group C | P Value |
|---|---|---|---|
| Baseline | 77.72 ± 8.26 | 78.94 ± 8.27 | 0.46 |
| Induction | 73.78 ± 7.37 | 75.06 ± 7.94 | 0.9 |
| Intubation | 86.8 ± 9.58 | 91.7 ± 9.72 | 0.012 |
| 1 min | 80.56 ± 8.35 | 88.9 ± 9.68 | 0.0001 |
| 2 min | 78.42 ± 8.70 | 86.06 ± 10.11 | 0.0001 |
| 3 min | 75.68 ± 9.21 | 84.14 ± 8.72 | 0.0001 |
| 4 min | 74.86 ± 8.54 | 80.58 ± 10.62 | 0.003 |
| 5 min | 74.5 ± 9.13 | 78.24 ±9.49 | 0.04 |
| 7 min | 75.00 ± 8.13 | 76.48 ± 6.65 | 0.32 |
| 10 min | 75.24 ± 7.29 | 76.18 ± 6.57 | 0.49 |
| 15 min | 75.22 ± 8.42 | 76.26 ± 6.64 | 0.49 |

As shown in Table 1 the basal heart rates were comparable and statistically not significant in two groups. After laryngoscopy and intubation heart rate were statistically increased in group C compared to group B till 5 minutes. As per table 2 the basal mean SBP were comparable and statistically not significant in two groups. After laryngoscopy and intubation SBP were statistically increased in group C compared to group B till 5 minutes. As shown in Table 3 the basal mean DBP were comparable and statistically not significant in two groups. After laryngoscopy and intubation DBP were statistically increased in group C compared to group B till 5 minutes.

**Table 2: Comparison of SBP at different time interval between two groups**

| Time interval | Group B | Group C | P Value |
|---|---|---|---|
| Baseline | 126.84 ± 9.08 | 128.08 ± 8.68 | 0.48 |
| Induction | 122.48 ± 10.11 | 124.2 ± 9.56 | 0.38 |
| Intubation | 146.8 ± 13.36 | 155.18 ± 11.90 | 0.005 |
| 1 Min | 141.98 ± 9.58 | 148.98 ± 12.03 | 0.001 |
| 2 Min | 133.24 ± 13.41 | 140.2 ± 12.40 | 0.007 |
| 3 Min | 130.52 ± 13.91 | 138.76 ± 12.48 | 0.002 |
| 4 Min | 128.34 ± 12.04 | 136.32 ± 14.74 | 0.004 |
| 5 Min | 126.88 ± 10.46 | 132.28 ± 12.10 | 0.01 |

| | | | |
|---|---|---|---|
| 7 Min | 124.34 ± 9.55 | 126.36 ± 7.47 | 0.24 |
| 10 Min | 123.52 ± 9.50 | 125.58 ± 7.49 | 0.23 |
| 15 Min | 123.9 ± 9.28 | 125.24 ± 8.42 | 0.45 |

**Table 3: Comparison of DBP at different time interval between two groups**

| Time interval | Group B | Group C | P value |
|---|---|---|---|
| Baseline | 75.7 ± 7.46 | 74.88 ± 6.50 | 0.55 |
| Induction | 71.98 ± 6.60 | 71.44 ± 5.70 | 0.66 |
| Intubation | 81.04 ± 7.00 | 90.08 ± 8.28 | 0.0001 |
| 1 min | 79.62 ± 7.02 | 88.92 ± 9.42 | 0.0001 |
| 2 min | 78.5 ± 7.89 | 85.24 ± 6.37 | 0.0001 |
| 3 min | 76.28 ± 6.51 | 82.12 ± 6.81 | 0.0001 |
| 4 min | 75.12 ± 7.51 | 79.32 ± 6.44 | 0.001 |
| 5 min | 73.88 ± 7.41 | 77.76 ± 6.87 | 0.007 |
| 7 min | 73.92 ± 6.97 | 75.76 ± 6.44 | 0.17 |
| 10 min | 73.32 ± 6.86 | 74.72 ± 6.41 | 0.11 |
| 15 min | 73.00 ± 6.31 | 73.88 ± 7.04 | 0.51 |

**Table 4: Comparison of MAP at different time interval between two groups**

| Time interval | Group B | Group C | P value |
|---|---|---|---|
| Baseline | 89.86 ± 7.64 | 89.74 ± 7.01 | 0.99 |
| Induction | 85.46 ± 7.62 | 86.08 ± 7.38 | 0.95 |
| Intubation | 97.02 ± 8.73 | 103.44 ± 10.35 | 0.001 |
| 1 min | 95.04 ± 8.22 | 101.02 ± 9.31 | 0.001 |
| 2 min | 93.04 ± 8.72 | 98.26 ± 7.85 | 0.002 |
| 3 min | 90.14 ± 7.79 | 94.98 ± 9.03 | 0.003 |
| 4 min | 89.78 ± 7.83 | 93.54 ± 8.78 | 0.02 |
| 5 min | 88.72 ± 7.94 | 91.68 ± 5.92 | 0.03 |
| 7 min | 87.5 ± 6.60 | 88.16 ± 7.30 | 0.63 |
| 10 min | 86.98 ± 6.92 | 86.94 ± 7.71 | 0.97 |
| 15 min | 87.14 ± 6.63 | 87.02 ± 8.73 | 0.93 |

As per table 4 the basal MAP were comparable and statistically not significant in two groups. After laryngoscopy and intubation MAP were statistically increased in group C compared to group B till 5 minutes.

## Discussion

The main findings in this study was that using bilateral superior laryngeal nerve block and transtracheal nerve block along with general anaesthesia during planned surgeries in which oral intubation was needed, resulted with better hemodynamic response to intubation. The hemodynamic responses to direct laryngoscopy and endotracheal intubation and their potential hazards have been well studied [10,11]. It is always a dilemma to choose perfect sequence for safe and sound anaesthesia to each patient, with unexpected results with anatomical variability, patient expectations, and the available resources. So, this double blinded randomized control group study was designed to evaluate the effect of bilateral block of the internal branch of superior laryngeal nerve (SLN) and trans-tracheal nerve block as an adjuvant to general anaesthesia during oral intubation. Internal branch of the SLN block has been frequently used during awake intubation and laryngoscopic examination as adjuvant to general anaesthesia to facilitate intubation without using muscle relaxant [12,13]. The magnitude of cardiovascular

response is directly related to the force and duration of laryngoscopy. Airway regional anaesthesia is an under used technique. Highly effective topical techniques, results safe intubation options to anaesthesia practitioners. These techniques has the common goal of reducing sensation over the specific regions like larynx, pharynx [14]. Superior laryngeal nerve block is a percutaneous block that focuses on the internal branch at the level of thyrohyoid membrane. Clinical studies on the effectiveness of this block has described success rates of 92% to 97.5% [15]. Most reports have described use of the procedure to relieve patient discomfort during tracheal intubation or instrumentations such as endoscopy and trans oesophageal echocardiography [16]. Hunt and Boyd [17] described the usefulness of SLNB for insertion of a rigid laser bronchoscope in a patient with myasthenic syndrome without use of a muscle relaxant. The hemodynamic responses to direct laryngoscopy and endotracheal intubation and their potential hazards have been well studied [10,11]. These circulatory changes are thought to be somato visceral reflexes that are triggered during laryngoscopy by stimulation of proprioceptors at the base of the tongue. It is essential to anesthetize the upper airway adequately and suppress the gag, swallow, and cough reflexes [18]. In 2009, V. Trivedi [14] evaluated airway blocks versus general anaesthesia concluded that hemodynamic changes were less in airway block patients. Other study Dr. Jamal A [19]. shows the inability to suppress the hyper dynamic response to tracheal intubation with the upper airway anaesthesia with either bilateral superior laryngeal nerve block or nebulized lidocaine .This was due to light anaesthesia in the absence of narcotics. This finding is contradict to our finding because we have given trans tracheal nerve block, muscle relaxant and fentanyl citrate in group B of our study. In our study, we observed an increase in HR, SBP, DBP and MAP during oral intubation (maximum seen at the time of tracheal intubation) which returned to near baseline at 3rd minute in block group after intubation, which was similar to that observed by Ovassapian *et al* [20]. The neuromuscular blocking agent was given during intubation in both the groups in our study; we observed less frequent cough and gag reflex during intubation in patients who received airway block. This finding is supports that the of SLN block can suppress irritant sensations to laryngeal mucosa which results less cough reflex [14,21,22]. We had used 3 ml of 2% lignocaine for trans-tracheal block.Trans-tracheal block alone is as effective as combination of bilateral superior laryngeal blocks with trans-tracheal block. No statistically significant difference found between frequency of cough and gag reflex between two groups (P=0.640) during awake fibreoptic intubation [23].

## Conclusion

Combining the bilateral block of the internal branch of superior laryngeal nerve and Trans tracheal nerve block as an adjuvant to general anaesthesia was associated with, stable hemodynamic response, less coughing incidence to oral intubation. This simple and safe method should be acquired by anaesthesiologists in addition to traditional methods.

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