“AWAKE EXTUBATION RESPONSE: COMPARISON OF SUPERIOR LARYNGEAL NERVE BLOCK ANDIN LINE NEBULISATION WITH LGNOCAINE- A RANDOMISED CONTROLLED STUDY”

By

REG NO. BA0121002

Dissertation

Submitted to the

KLE Academy of Higher Education & Research

(Deemed University) Belagavi, Karnataka

In Partial Fulfillment

of the requirements for the degree of

M. D.

in

ANAESTHESIOLOGY

DEPARTMENT OF ANAESTHESIOLOGY,
JAWAHARLAL NEHRU MEDICAL COLLEGE,
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Sub: Institutional Ethical Clearance for the study.

With reference to the above, we wish to inform you that your proposed research project titled **"AWAKE EXTUBATION RESPONSE: COMPARISON OF SUPERIOR LARYNGEAL NERVE BLOCK AND IN LINE NEBULIZATION WITH LIGNOCAINE- A RANDOMISED CONTROLLED STUDY"** is ethical and justifiable. The proposed research project has been cleared by the JNMC Institutional Ethics Committee.

(Dr. Smita Sonoli)
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(Dr. Harsha Hegde)
Chairman,
JNMC Institutional Ethics Committee
J.N.Medical College, Belagavi

LIST OF ABBREVIATIONS USED

SLN	-	Superior laryngeal Nerve
ASA	-	American Society of Anaesthesiology
SLNB	-	Superior laryngeal Nerve Block
HR	-	Heart rate
SBP	-	Systolic blood pressure
DBP	-	Diastolic blood pressure
MAP	-	Mean arterial pressure
mg	-	milligrams
ECG	-	Electrocardiograph
ETT	-	Endotracheal Tube
dl	-	Decilitre
IV	-	Intravenous
MHz	-	MegaHertz

min	-	Minute
kg	-	kilogram
mcg/µg	-	microgram
TM	-	Thyrohyoid membrane
US	-	Ultrasound
USG	-	Ultrasonograph
CTM	-	Cricothyroid membrane
Group B	-	Group with Superior Laryngeal Nerve Block
Group N	-	Group with nebulisation
ETCO2	-	end-tidal carbon dioxide

ABSTRACT

Introduction

Extubation is the critical phase of anaesthetic management that can trigger significant stress responses in the form of hemodynamic fluctuations. These responses are mediated by the stimulation of the larynx and trachea, leading to sympathetic nervous system activation. Effective management of extubation stress is crucial for patient safety and comfort. This study aims to compare the efficacy of superior laryngeal nerve block versus in-line nebulization with lignocaine in mitigating extubation responses in surgical patients.

Objectives

Primary objective of the study is to compare the hemodynamic stress response post-extubation in the form of HR, SBP, DBP and MAP and secondary objective is to grade the severity of post-operative cough and postoperative sore throat at different time interval post-extubation between the group receiving superior laryngeal nerve block and in line nebulisation with lignocaine.

Materials and Methods

This randomized controlled trial was conducted in the Department of Anaesthesiology, Jawaharlal Nehru Medical College, KAHER, Belagavi, from June 2022 to May 2023. A total of 100 patients meeting the inclusion criteria were enrolled and randomized into two groups (Group N: superior laryngeal nerve block, Group B: in-line nebulization with lignocaine) using a computer-generated randomization table. Hemodynamic parameters, cough severity, and sore throat incidence were measured at various intervals post-extubation. Data analysis was performed using SPSS 22.0 and R environment ver.3.2.2.

Results

Demographic data showed no significant differences between the groups. Heart rate changes were not significant at any time point post-extubation. Systolic, diastolic, and mean arterial pressures were significantly lower in Group B compared to Group N at pre-extubation, 1, 5, and 10 minutes post-extubation. Group B also exhibited significantly lower cough severity and incidence of sore throat immediately and 10 minutes post-extubation.

Conclusion

In-line nebulization with lignocaine is more effective than superior laryngeal nerve block in controlling hemodynamic responses, reducing cough severity, and minimizing sore throat post-extubation. This method provides better management of extubation-related complications, suggesting a preferable approach for patient care in the perioperative setting.

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INTRODUCTION

A crucial stage in general anaesthesia is tracheal extubation. Significant physiological reactions are triggered by this process, including sympathetic discharge, which results in hemodynamic abnormalities like hypertension, tachycardia, and arrhythmias. These changes, albeit brief and erratic, increase the dangers for people who already have a medical history of hypertension or heart failure. Handling these difficulties is crucial to guarantee patient safety and maximize results. [(1)(2)]

Successful extubation indicates good breathing and the patient's ability to tolerat e removal of the endotracheal tube. "Successful extubation" goes beyond this li mitation and includes the absence of physiological consequences that could lead to adverse outcomes. This difference is important, especially because previous studies on successful extubation technique have focused mainly on critically ill patients receiving prolonged ventilation. [(10)]

Sympathetic responses involve polysynaptic pathways in which the glossophary ngeal nerve and vagus nerve create afferent arcs through the brain and spinal cor d to the sympathetic nervous system. This leads to stimulation of adrenergic me diators such as norepinephrine and epinephrine, resulting in increased heart rate and blood pressure. Parasympathetic reflexes are monosynaptic.

In order to combat these undesirable hemodynamic responses after extubation and provide smooth extubation, non-pharmacological methods as extubation under deeper plane of anaesthesia, exchange of ETT with placement of LMA, "No touch" extubation and pharmacological methods such as use of fentanly, preservative free lignocaine, beta-blockers like esmolol and labetalol, nitroglycerine, propofol, dexmeditomedine and remifentanil has been extensively studied. (7) (8) (9)

Superior laryngeal Nerve block (SLNB) is now commonly used for intubation and bronchoscopic maneuvers. (6) According to recent studies exploring SLNB as an option for prevention of postoperative sore throat, have concluded that SLNB could control the erratic hemodynamic changes and shorten the duration of extubation. (3)

In-line nebulisation with local anaesthetics is another option to alleviate extubation stressor response. Nebulisation with Ropivacaine and Lignocaine are found to be useful during intubation, but there is a lack of information about nebulisation of local anaesthetics just before extubation. (3)(4)(5)

The percentage of patients who experience postoperative sore throat, cough, and hoarseness varies greatly, from 6.6% to 91%. Apart from the property of maintaining the hemodynamic homeostasis during extubation, pre-extubation nebulisation and superior laryngeal nerve block can reduce the incidence of sore throat postoperatively. (4)(5)

Hence in our study we compared the efficiency of Superior laryngeal Nerve block and in-line nebulisation of lignocaine for hemodynamic stress response, post-operative sore throat and cough.

OBJECTIVES

- **Primary objective** is to compare hemodynamic changes during extubation between the following groups: -
    - Superior laryngeal nerve block
    - In-line lignocaine nebulisation

- **Secondary objective** is to compare the severity of cough and post-operative sore throat between the above-mentioned groups.

REVIEW OF LITERATURE

Tracheal extubation stands as a pivotal phase in the continuum of general anesthesia, marking the transition from controlled sedation to the emergence of consciousness. This process initiates a cascade of physiological responses, prominently characterized by sympathetic discharge, which precipitates hemodynamic fluctuations, notably hypertension, tachycardia, and arrhythmias. While transient and unpredictable in nature, these alterations pose heightened risks, particularly for individuals with preexisting medical conditions such as hypertension or heart failure. Managing these complexities with precision and diligence is imperative to ensure patient safety and optimize clinical outcomes, underscoring the paramount importance of vigilant peri-extubation care. [(1)(2)]

In the study by Kashinath K. Jadhav et al., it has been concluded that 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 due to extubation were observed. It was found that there was significant reduction in systolic blood pressure at 5th minute and 10th minute after extubation which is supposed to be the crucial time for heightened stressor response, while significant heart rate reduction was found at 10th minute. Though combining both techniques have all the advantages mentioned above, they have serious disadvantages of aspiration risk if the patient is not on adequate nil per oral before surgery and cough reflex is completely abolished. The study stated that 57.1% of patients scored 3 on Mordified Ramsay scoring scale (which means patients were drowsy but awake on arousal). [(3)]

Mathur et al. concluded that Superior Laryngeal Nerve (SLN) Block exhibits superior hemodynamic stability, ease of intubation, and postoperative patient satisfaction compared to the group receiving lignocaine nebulization during awake intubation. However, there were no significant differences observed in postoperative sore throat and cough between the two groups. [(23)]

Zhipeng et al. suggested that SLN block outperforms nebulization with lignocaine and buprenorphine suspension in reducing postoperative sore throat and mean arterial pressure (MAP), although the reduction in MAP was not statistically significant, there was a noticeable decrease. This intervention was administered prior to the commencement of the procedure. [(20)]

In controlled trials conducted by Ahmed et al. and Bao et al., SLN block was compared with a control group, where the intervention was administered before the initiation of the procedure. The studies concluded that patients receiving SLN block experienced significantly alleviated intubation stressor responses compared to the control group. [(4)(6)]

In the trail comparing ultrasound guided airway block and nebulisation with lignocaine for awake fiberoptic intubation in case of difficult airway, where primary objective was to assess the time taken for intubation while secondary objective assessed the hemodynamic responses which was not statistically significant within the two group. [(31)]

Randomised control trail that determined the efficiency of lignocaine nebulisation for alleviating intubation stressor response amongst pregnant patient with pre-eclampsia undergoing general anaesthesia for Caesarean section, systolic blood pressures were significantly lower at time interval of

1^{st}, 3^{rd}, 5^{th} and 10^{th} minute after intubation while the heart being significant at 1^{st} and 3^{rd} minute when compared with the control group, the sample size of this study being 101 with 50 and 51 in each group. [(30)]

In a study conducted by Gaidhankar et al., medications were administered 15 minutes before the conclusion of the surgery. Inhalational agents and nitrous oxide were gradually tapered off, and upon the adequate return of spontaneous respiratory efforts, patients in Group D received a dose of Dexmedetomidine at 0.5 µg/kg, while those in Group L received intravenous lignocaine at a dose of 1.5 mg/kg. Dexmedetomidine exhibited superiority over lignocaine in terms of hemodynamic stability following extubation. However, it induced significant sedation in patients [(1)]

Luthra et al. recommended administering dexmedetomidine at 0.5 µg/kg diluted to 10 ml before initiating the infusion, over a 10-minute period at the commencement of dural closure. Infusion rates of 0.2 and 0.4 mcg/kg were initiated at 4 ml/hour. Although there were no significant differences in hemodynamic parameters between the two groups, emergence from anesthesia was delayed in the 0.4 mcg/kg group [(2)]

Amutharani et al. concluded that dexmedetomidine, when compared to fentanyl, resulted in a significant reduction in both systolic and diastolic pressures. However, patients in the dexmedetomidine group experienced profound bradycardia. Sedation scores did not significantly differ between the two groups [(18)]

Zhao et al. proposed continuous infusion of Remifentanil at different doses along with a single dose of parecoxib until extubation criteria were met. The study revealed that increased Remifentanil doses led to delayed emergence, respiratory depression, and reduced postoperative cough. The study population underwent total intravenous anesthesia using a combination of propofol and remifentanil [(19)]

In a comparative study by Nagrale MH et al., it was observed that while lignocaine, propofol, or esmolol improved the quality of extubation, propofol and esmolol were most effective in controlling stressor responses. Propofol induced significant sedation compared to other drugs, while esmolol emerged as an ideal choice [(7)]

Another multi-drug comparative study, which included lignocaine, labetalol, and fentanyl, found that heart stability was significant with fentanyl and lignocaine. However, fentanyl induced significantly higher sedation scores, making labetalol a preferable option [(8)]

Chungsamarnyart et al. concluded that a combination of propofol and ketamine reduced the incidence of postoperative cough and laryngospasm more effectively than propofol alone [(9)]

In three separate studies, different doses and methods of administering nitroglycerin were evaluated for their effectiveness in attenuating the pressor response during intubation.The first study by Indira Kumari et al. in 2016 involved 90 ASA I and II patients undergoing surgeries under general anesthesia. Patients were randomized into three groups: Group C (control), Group N1 (1 puff of NTG spray), and Group N2 (2 puffs of NTG spray) administered one minute before intubation. Both doses of nitroglycerin effectively attenuated the pressor response in normotensive patients.

The second study by Mona Panchal and Upasana Bhatia compared two doses of intranasal nitroglycerin spray (400 mcg and 800 mcg) administered two minutes before laryngoscopy and intubation in 50 ASA I and II patients. The study found that 400 mcg effectively attenuated the pressor response, while 800 mcg did not provide additional benefit.In the third study by V. Madhuri Gopal in 2017, 60 ASA I and II patients received either oropharyngeal lignocaine spray or oral nitroglycerin spray before induction. Nitroglycerin spray was found to be superior in attenuating the pressor response compared to lignocaine spray during laryngoscopy and intubation. [(26)(27)]

In Safavi, Honarmand, and Azavi's 2011 study, 120 patients undergoing elective cesarean section were divided into three groups: Nitroglycerin infusion (Group NTG), Sublingual Nifedipine (Group NIF), and Intravenous Hydralazine (Group H). The study concluded that Nitroglycerin infusion was most effective in attenuating the pressor response to tracheal intubation in severe preeclampsia. [(25)]

In studies where local anesthetics were administered via intramuscular injection and nebulization, effective reduction in hemodynamic stressor responses and postoperative cough was observed. Gao et al. found no significant difference between lignocaine and ropivacaine at the time of intubation. Both lignocaine and ropivacaine demonstrated efficacy in halting neural conduction and inhibiting airway reflexes triggered by contact with an endotracheal tube. Given that the discrepancy primarily lies in the duration of topical anesthesia induced by each agent (approximately 45–60 minutes for lignocaine and over 2 hours for ropivacaine), there was no discernible difference between the two local anesthetic groups at the time of intubation, which typically occurred within 20 minutes of nebulization administration. Thangavelu et al. reported similar findings, although mean arterial pressure (MAP) and heart rate (HR) values during intubation were lower in the lignocaine group compared to the saline group, achieving only partial statistical significance with $P = 0.062$ and $P = 0.060$, respectively. Conversely, ropivacaine effectively attenuated the intubation response compared to saline ($P < 0.05$). There was no significant disparity between lignocaine and ropivacaine concerning intubation responses ($P = 0.998$ and $P = 0.986$ for HR and MAP, respectively). [(5)(24)]

In our study, we compared the effectiveness of ultrasound-guided superior laryngeal nerve block with lignocaine nebulization for managing extubation stress response, avoiding other drugs due to their potential for causing significant hemodynamic changes and cost considerations.

BASIC SCIENCE

ANATOMY

LARYNX NERVE SUPPLY

Motor and sensory innervation of larynx are from the two branches of vagal nerve- the superior laryngeal nerve and recurrent laryngeal nerve [16](17)

SUPERIOR LARYNGEAL NERVE

Superior laryngeal nerve originates from the inferior vagal ganglion, runs along the medial side of internal carotid and divides into internal and external branch at the level of superior horn of hyoid bone bilaterally.

- The external branch or external laryngeal nerve runs down the lateral wall of larynx, providing innervation to and penetrating the inferior constrictor of pharynx. Its pathway culminates by supplying the cricoid muscle
- Internal branch or internal laryngeal nerve, follows an anteroinferior course penetrating the thyrohyoid membrane. Primarily a sensory nerve fanning out its fibers throughout the laryngeal cavity till level above the vocal cord [16](17)

RECURRENT LARYNGEAL NERVE

The left recurrent laryngeal nerve originates within the thorax, while its counterpart, the right recurrent laryngeal nerve, arises in the root of the neck. Typically, both nerves ascend through the neck, following a path nestled between the esophagus and trachea. Upon reaching the larynx, they traverse beneath the margin of the inferior constrictor muscle. Along their journey, these nerves may adopt various routes relative to the lateral ligament of the thyroid gland. This ligament, which connects the thyroid gland to the trachea and lower portion of the cricoid cartilage on each side, may see the nerves pass medial to, lateral to, or even through it

Sensory component is supplied to area below the vocal cord, while motor component innervates all intrinsic muscles of larynx except for cricothyroid (16)(17)

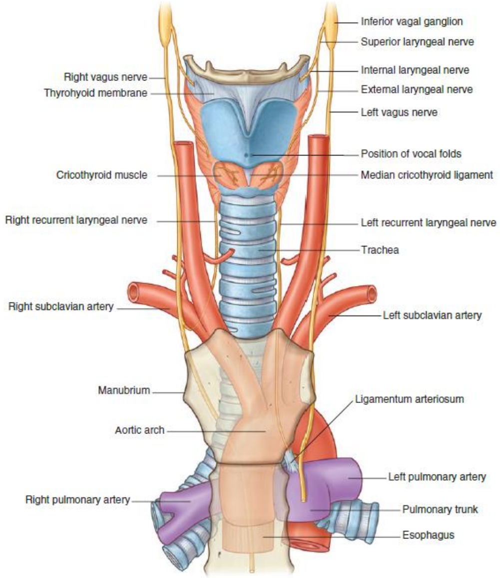


FIGURE 1: Anatomy of Laryngeal Nerve supply A-P view

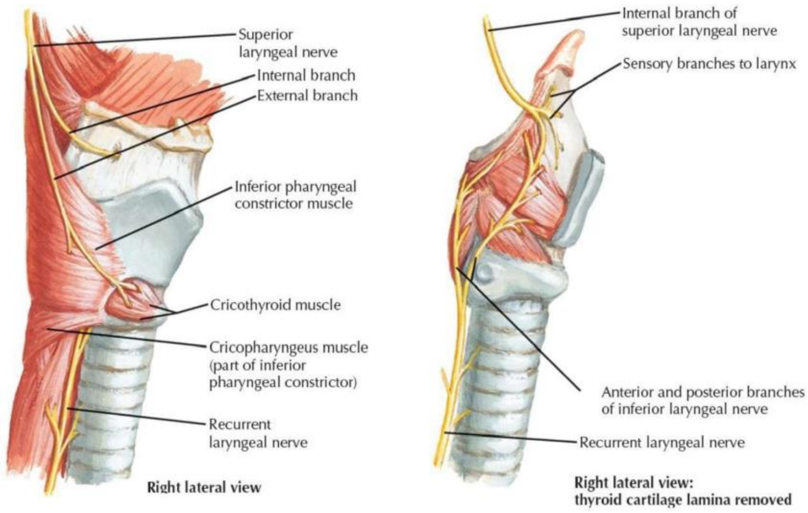


FIGURE 2: Anatomy of Laryngeal Nerve supply Lateral view

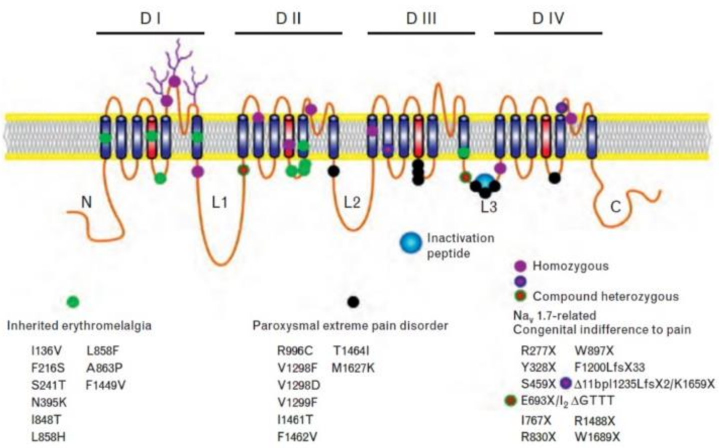
LOCAL ANAESTHETICS

Local anaesthetics encompass a diverse group of compounds that function by blocking voltage-gated sodium channels (VGSCs). Structurally, they share common features, including a hydrophobic aromatic group, an amide group, and an intermediary chain connecting them. This structural composition grants the molecule both hydrophobic and hydrophilic properties. [(14)]

Classification of local anaesthetics often revolves around whether they are ester-linked or amide-linked, based on the type of intermediary chain. Additionally, they are further categorized into short-acting (e.g., chloroprocaine), intermediate-acting (e.g., mepivacaine, lidocaine), and long-acting (e.g., bupivacaine, ropivacaine) compounds. [(14)(15)]

Metabolism of ester-linked local anaesthetics primarily occurs via plasma cholinesterases and tissue esterases, while amide-linked counterparts are predominantly metabolized in the liver through the mixed-function oxidase system. These compounds possess distinct physicochemical properties that dictate their mode of action, including the pKa value, lipophilicity, protein binding, and intrinsic vasoactivity. In the bloodstream, local anaesthetics bind to albumin and alpha-1-acidic glycoprotein (AAG), with the latter being an acute phase protein whose synthesis increases postoperatively and after trauma. This increase in AAG levels leads to decreased levels of free local anaesthetic, thereby mitigating systemic toxicity. [(14)(15)]

Commonly used local anaesthetics typically follow the classic hydrophilic pathway, reaching the local anaesthetic binding site from the cytoplasmic compartment. However, some may also act via the lipid membrane (the "hydrophobic pathway") or gain entry through large-pore channels (the "alternative hydrophilic pathway"). [(15)]



Spatial configuration of the alpha subunit of the voltage-gated sodium channel. The most frequent mutations related to inherited erythromelalgia, paroxysmal extreme pain disorder congenital insensitivity to pain are given.

FIGURE 3: Diagrammatic representation of Voltage gated Sodium channel

LIGNOCAINE

Lignocaine, an intermediate-acting local anesthetic, is classified as an amide-linked compound. Being achiral, it possesses a singular molecular configuration.

Lignocaine binds to specific sites in voltage-gated sodium channel. They block sodium current causing a reduction in excitability of neuronal, cardiac or central nervous system tissue. There is intermission of nerve impulse transmission in the sodium ion passage through ion selective sodium channel in nerve membrane, due to which there is slow rate of depolarisation such that threshold potential is not reached and thus action potential is not achieved [(14)]

This amide local anaesthetic has a rapid onset of action due to its high lipid solubility characteristics that hastens the process of drug getting diffused faster through the nerve sheath and get to the site of action. Duration of action solely depends on the protein binding ability; lignocaine has a duration of action of 60-120 minutes after infiltration [(28)]

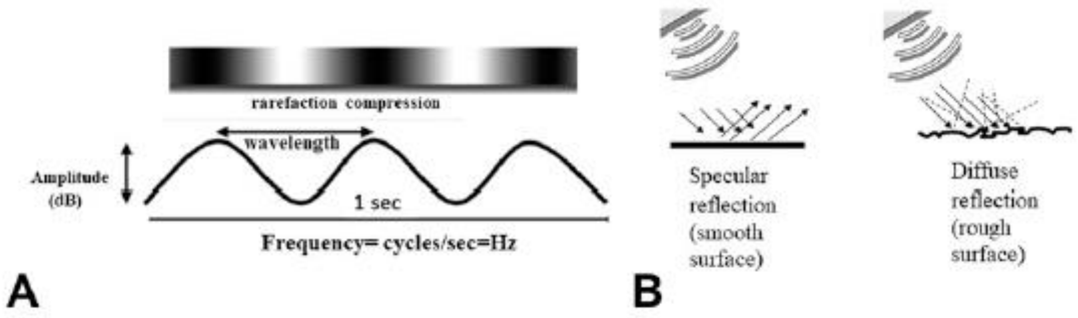
Lignocaine being a weak alkaline amide with a pK value of 7.9 (just above normal physiological pH 7.4) action during acidosis environment as in case of sepsis is reduced. pH reflects the amount of ionised and unionised form of drug available at the action site. Intrinsic vasodilatory activity will also influence the potency and duration of action of drug [28][29]

The principal metabolic pathway of lignocaine is oxidative dealkylation in liver to monoethylglycinexylidide followed by hydrolysis to metabolites of xylidide, the precursor having a property of protecting from cardiac dysrhythmias. 75% of the xylidides are excreted as urine. In case of hepatic disease half-life of drug might increase by five folds, hence caution to be taken during such condition [29]

Notably, it exhibits a significant anti-inflammatory effect by modulating various stages of the inflammatory process, including leucocyte adhesion, shape alteration, trans-endothelial migration, phagocytosis, and the release of inflammatory mediators. In vivo studies have demonstrated lignocaine's efficacy in attenuating inflammatory conditions such as reperfusion injuries in vital organs like the heart, lungs, and brain, as well as injuries induced by endotoxins or hyperoxia in the lungs.

ULTRASONOGRAPHY

Ultrasonography operates by emitting high-frequency ultrasound waves, which subsequently bounce off tissues within the body, generating echoes. Among the primary modalities of ultrasonic imaging, B-mode (brightness mode) stands as the foundation. B-mode imaging furnishes physicians with a two-dimensional portrayal of anatomical structures, showcasing various grayscale changes. Regions containing fluid appear dark or hypoechoic due to their adeptness in transmitting ultrasound waves. Conversely, dense structures like bone reflect the



FICURE 4: Principle and functioning of Ultrasonography

majority of the waves, resulting in a bright or hyperechoic image, often accompanied by pronounced acoustic shadowing. By manipulating the position of the ultrasound probe, physicians can elucidate anatomical details and detect pathological findings by generating 1 mm-thin images in each plane. It serves as a valuable and indispensable diagnostic tool, offering physicians immediate, high-resolution insights into internal organs and pathology. [(11)(12)]

Ultrasound waves in the frequency range of around 2 to 15 megahertz have a wide range of diagnostic and treatment purpose in the field of medicine. The ultrasonography works on the principle of Piezoelectric effect. This effect converts mechanical / kinetic energy into electrical energy by deformation of crystals. Piezoelectric effect can also be reversed i.e., by electrical energy the crystals can be oscillated to form ultrasound waves (mechanical energy).[(12)(13)]

TRANSDUCER:

This is the hand-held part of the ultrasound machine. It has the function of inter-converting the energies (electrical and mechanical) based on piezoelectric effect. They contain lead zirconate titanate crystals commonly.

It comprises 5 major components:

- Crystals: possessing piezoelectric property. Can be arranged in either linear or curvilinear manner.
- Electrodes: positive and ground. For electrical connection
- Damping block: to dampen stray sound waves.
- Matching layer: For proper transmission of sound waves to one or multiple tissues.
- Housing.

They produce the ultrasound waves in either linear(sequential) arrays or phased array. In our study we have used linear probe for superior laryngeal nerve block. (13)

Linear Transducer:

- The piezoelectric crystals – Linearly arranged
- Produce rectangular ultrasound beam
- Used for superficial imaging.

- Footprint – wide with frequency of 2.5 – 12MHz at the centre in 2D imaging probe and frequency 7.5 – 12 MHz at the centre in 3D imaging probe.

- Applications of linear probe in anaesthesia:
    - Airway assessment
    - Visualisation of superficial structures like Brachial plexus
    - Vascular access
    - Vascular examination
    - Ultrasonic velocity change imaging. (12)

FIGURE 5: Linear array probe

SONOANATOMY OF SUPERIOR LARYNGEAL NERVE BLOCK

The structures to be identified are: -

- Hyoid bone
- Thyroid cartilage
- Thyrohyoid membrane
- Superior laryngeal artery
- Superior laryngeal nerve

Place the transducer probe in the sagittal plane to locate the greater cornu of the hyoid bone, then rotate it transversely to pinpoint the superior lateral aspect of the thyrohyoid membrane. Rotate the medial aspect of the probe cephalad to visualize the superior laryngeal nerve, which lies superficial to the thyrohyoid membrane. The internal branch of the superior laryngeal nerve runs alongside the superior laryngeal artery, just below the greater cornu of the hyoid bone. An alternative method involves identifying the hyperechoic hyoid bone in the midline and then visualizing the greater cornu and internal branch of the nerve by moving the probe laterally. Using an in-plane technique, insert a needle perpendicular to the skin just below the greater cornu of the hyoid bone and inject 1–2 mL of local anesthetic after ensuring negative aspiration.

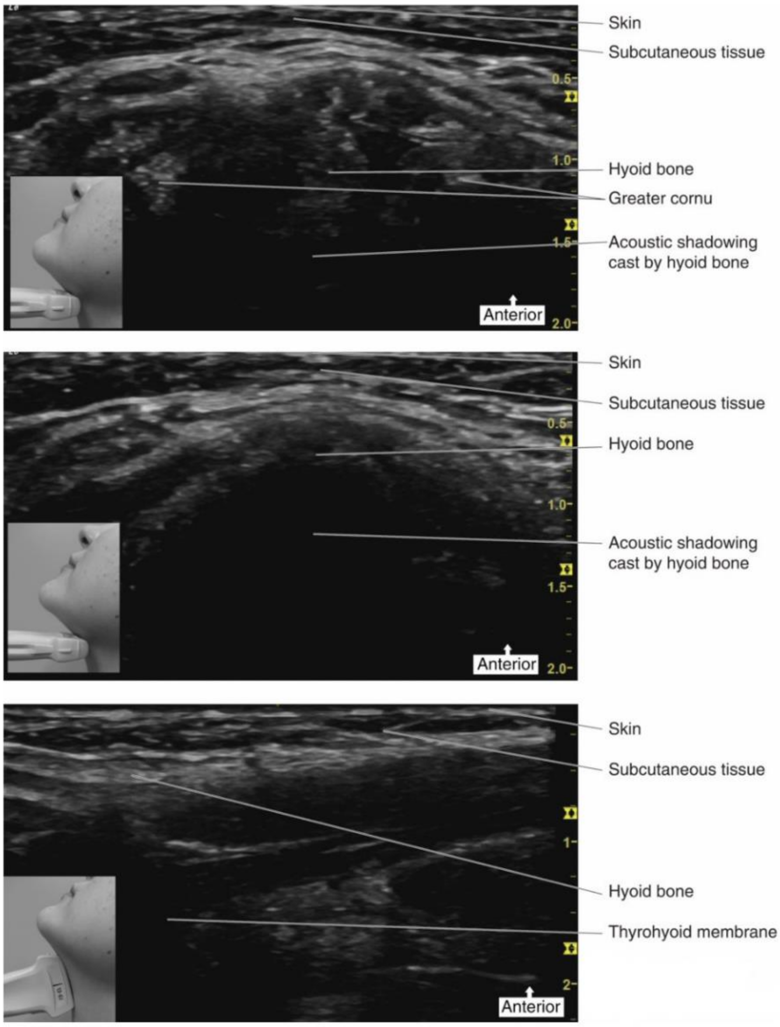


FIGURE 6: Sono-anatomy of superior Laryngeal Nerve Block

MATERIAL AND METHOD

STUDY DESIGN:

A One Year Hospital Based Randomized Control Trail

STUDY PERIOD:

One year (June 2022 – May 2023)

PLACE:

"Department of Anesthesiology, KLE'S Dr. Prabhakar Kore Hospital and Medical Research Centre, KAHER, Belagavi".

SOURCE OF DATA:

Patients between age group of 18-60, ASA-I and II posted for elective surgery under general anaesthesia at KLE'S Dr. Prabhakar Kore Hospital and Medical Research Centre, Nehru Nagar, Belagavi -10.

SAMPLE SIZE:

A total of 100 patients (50 in each group who receive nebulization with lignocaine and superior laryngeal nerve block)

SAMPLING PROCEDURE:

The minimum sample size formula based on mean and standard deviation is

$$n = \frac{(z_\alpha + z_\beta)^2 (s_1^2 + s_2^2)}{(\overline{X}_1 - \overline{X}_2)^2}$$

Where z_α is linked with the level of significance and z_β is linked with the power of the test. For 5% level of the significance z_α =1.96 and z_β =0.84 for 80% power of the test.

Ref: Bao Y, Xiong J, Wang H, Zhang Y, Zhong Q, Wang G. Ultrasound-Guided Block of the Internal Branch of the Superior Laryngeal Nerve Reduces Postoperative Sore Throat Caused by Suspension Laryngoscopic Surgery: A Prospective Randomized Trial. Front Surg. 2022 Feb 15;9

The parameter considered in the calculation is HR at 5 minutes.

$\overline{X}_1$ is the mean of the first group (98.6) and $\overline{X}_2$ is the mean of the second group (90.0).

s_1 is the standard deviation of the first group (14.7) and s_2 is the standard deviation of the second group (12.3).

With these values the sample size obtained is 39.

To get confirmative results the sample size will be increased to 50

There will be two groups with 50 cases in each group.

SAMPLING TECHNIQUE:

Randomization was done by using www.randomizer.org which uses "Math.random" method within the JavaScript programming language as core method for generating its random number.

INCLUSION CRITERIA:

- Age 18-60years
- ASA Grade I and II
- Duration of surgery less than 3 hours

EXCLUSION CRITERIA:

- Emergency Surgeries
- Difficult Airway
- Head and Neck Surgeries
- Cervical spine abnormalities
- Airway anomalies

- Patient with risk for aspiration

ETHICAL CLEARANCE:

The approval by the institutional Ethical and Research Committee, Jawaharlal Nehru Medical College, Belagavi, was taken before starting the study.

INFORMED CONSENT:

All the patients who fulfilled the selection criteria were explained about the nature of the study and intervention being done. A written informed consent was obtained from all patients before enrolment in their vernacular language.

METHOD OF DATA COLLECTION:

After obtaining clearance & informed consent, the randomized controlled trail was carried out on patients posted for elective surgery under general anaesthesia, of the age group between 18 & 60 years, of either gender, with ASA I and II.

The day before surgery, after thorough pre-operative assessment patients were advised to be in overnight fasting and oral clear fluids were allowed till 6 hours prior to surgery. On the day of the procedure in the pre-op room, the nil per mouth status was confirmed, vital parameters (pulse oximeter, NIBP & ECG) were measured and intravenous cannula was secured on the upper limb.

All patients were administered with aspiration prophylaxis, intravenous Pantoprazole 40 mg and intravenous Metoclopramide 10 mg as premedication. Baseline blood pressure and heart rate were noted as pre-operative readings.

After shifting the patient to operation theatre, standard monitoring was performed by continuously recording noninvasive blood pressure, electrocardiogram, saturation level, and end-tidal carbon dioxide (ETCO2) level. In all patients, pre-medication with intravenous Glycopyrrolate 0.005 mg/kg, Midazolam 0.05 mg/kg, Fentanyl 2 µg/kg was administered, and general anesthesia was induced with intravenous Propofol 2 mg/kg along with Succinylcholine 2 mg/kg to facilitate tracheal intubation. Anesthesia was maintained with oxygen, nitrous oxide (with the ratio of 50:50), isoflurane (0.6%-1.0%), and Atracurium 0.5 mg/kg with positive pressure ventilation. Analgesia was provided in all patients with intravenous Paracetamol 15 mg/kg.

Patients were divided into two groups based on the randomization technique mentioned above:

- Group B – USG guided bilateral Superior Laryngeal Nerve block of the internal branch was performed.
- Group N – In-line nebulization with Lignocaine.

Towards the end of surgery, when skin closure began, the patients under Group N, underwent In-line nebulization with 5 ml of lignocaine 4%. After the reversal of neuromuscular blockade, and once all the extubation criteria was met patient being fully awake, extubation was performed following proper suctioning of the oropharynx

In Group B, patients underwent Bilateral Superior Laryngeal nerve block on each side under ultrasound guidance, with 2 ml of 1% Lignocaine injected on each side. After the reversal of neuromuscular blockade, and once all the extubation criteria was met patient being fully awake, extubation was performed following proper suctioning of the oropharynx

The hemodynamic parameters such as heart rate and blood pressure (systolic blood pressure, diastolic blood pressure and mean arterial blood pressure) were noted at intervals of pre-extubation, 1st minute, 5th minute and 10th minute. Post-extubation patient was assessed for postoperative sore throat and cough at immediately, 10th minute, 1st hour, 6th hour and 24th hour after extubation

STATISTICAL ANALYSIS:

In this study, both descriptive and inferential statistical analyses were conducted. Continuous data are shown as Mean ± SD (Min-Max), while categorical data are presented as Number (%). Statistical significance was evaluated at the 5% level. The following assumptions were made:

1) Dependent variables are normally distributed

2) Samples drawn from the population are random, and

3) Cases within the samples are independent

The Student's t-test (two-tailed, independent) was employed to determine the significance of study parameters on a continuous scale between two groups (inter-group analysis). Levene's test for homogeneity of variance was conducted to evaluate the consistency of variance. The t-test, a statistical method used to compare the means of two groups, is commonly applied in hypothesis testing. It helps determine whether a process or treatment has a significant effect on the population or if there is a difference between two groups. The null hypothesis (H0) posits that the true difference between the group means is zero, while the alternative hypothesis (Ha) suggests that the true difference is not zero.

The Chi-square test or Fisher Exact test was utilized to determine the significance of study parameters on a categorical scale between two or more groups, suitable for non-parametric qualitative data analysis. The Fisher Exact test was specifically employed when sample sizes were very small.

Significant figures

+ Suggestive significance (P value: $0.05<P<0.10$)

* Moderately significant (P value: $0.01<P \le 0.05$)

** Strongly significant (P value : $P\le0.01$)

Statistical software: The Statistical software namely SPSS 22.0, and R environment ver.3.2.2 were used for the analysis of the data and Microsoft word and Excel have been used to generate graphs, tables etc**.**

RESULTS

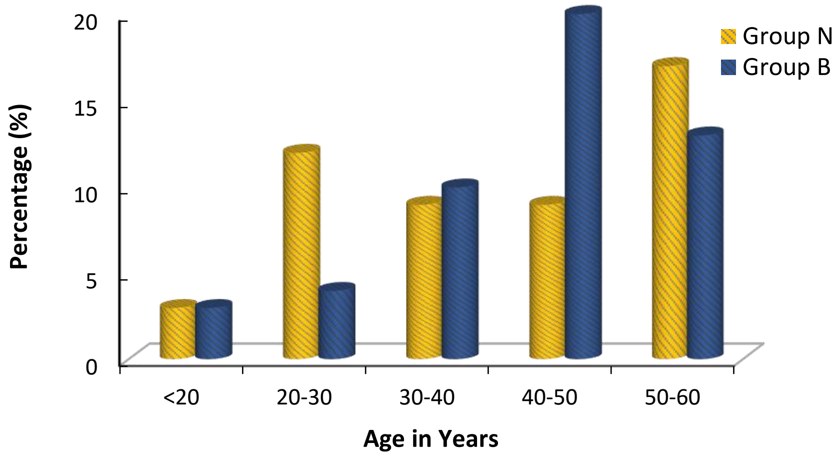
This study titled "Awake Extubation Response: Comparison of Superior Laryngeal Nerve Block and In Line Nebulisation with Lignocaine- A Randomised Controlled Trial" was conducted in the Department of Anaesthesiology, Jawaharlal Nehru Medical College, KAHER, Belagavi from June 2022 to May 2023. 100 patients were enrolled in the study after having met inclusion criteria. Written informed consent in the vernacular language was taken from the patients. Patients were randomized into two groups consisting of 50 patients in each group using computer generated randomization table.

The data was tabulated on Microsoft Excel which was represented as Mean and Standard for all sets of data. Students' "t" test has been used to find the significance of study parameters on continuous scale between two groups (Inter group analysis) on metric parameter. "Chi-square/ Fisher Exact test" has been used to find the significance of study parameters on categorical scale between two or more groups. Software: The statistical software namely "SPSS 22.0, and R environment ver.3.2.2" was used for data analysis and graphs and tables were generated using Microsoft Excel and Word.

Table 1: Age in Years- Frequency distribution in two groups of patients studied

Age in years	Group N	Group B	Total
<20	3	3	6(6%)
20-30	12	4	16(16%)
30-40	9	10	19(19%)
40-50	9	20	29(29%)
50-60	17	13	30(30%)
Total	50	50	100(100%)

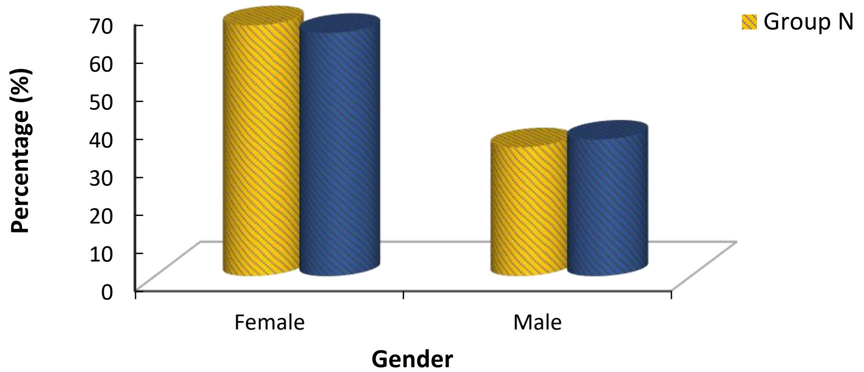
Samples are age matched with P=0.5, student t test



GRAPH 1: Age distribution (P=0.5, student t test)

Table 2: Gender- Frequency distribution in two groups of patients studied

Gender	Group N	Group B	Total
Female	39(78%)	29(58%)	68(68%)
Male	11(22%)	21(42%)	32(32%)
Total	50(100%)	50(100%)	100(100%)

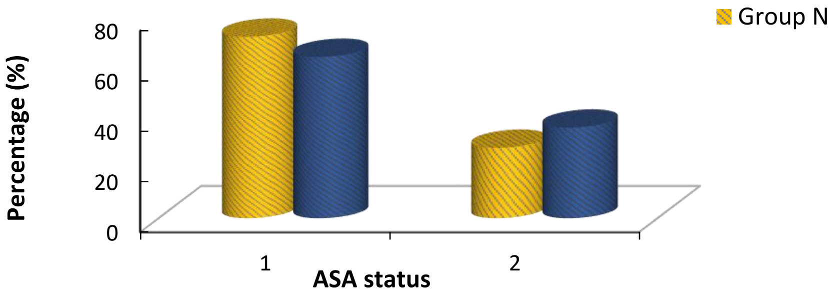


GRAPH 2: Gender distribution (P=0.501, Insignificant, Chi-Square Test)

Table 3: ASA status- Frequency distribution in two groups of patients studied

ASA status	Group N	Group B	Total
1	36(72%)	32(64%)	68(68%)
2	14(28%)	18(36%)	32(32%)
Total	50(100%)	50(100%)	100(100%)

P=0.521, Not Significant, Chi-Square Test

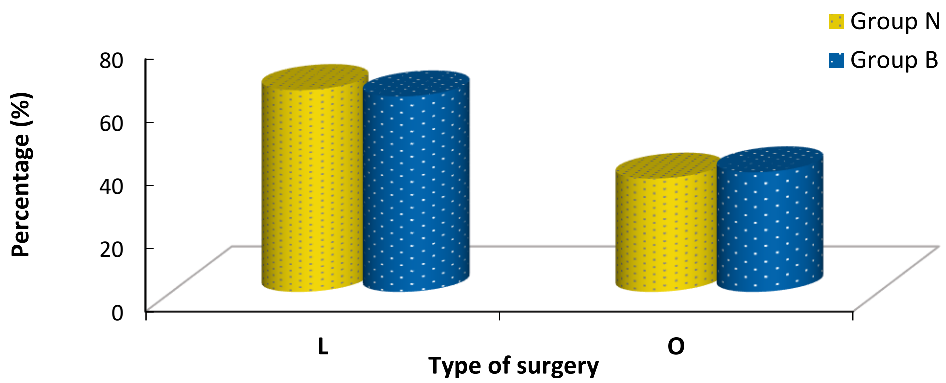


GRAPH 3: ASA distribution (P=0.521, Not Significant, Chi-Square Test)

Table 4: Type of surgery

Type of surgery	Group N	Group B	Total
L	32(64%)	31(62%)	63(63%)
O	18(36%)	19(38%)	37(37%)
Total	50(100%)	50(100%)	100(100%)

P=1.000, Not Significant, Chi-Square Test

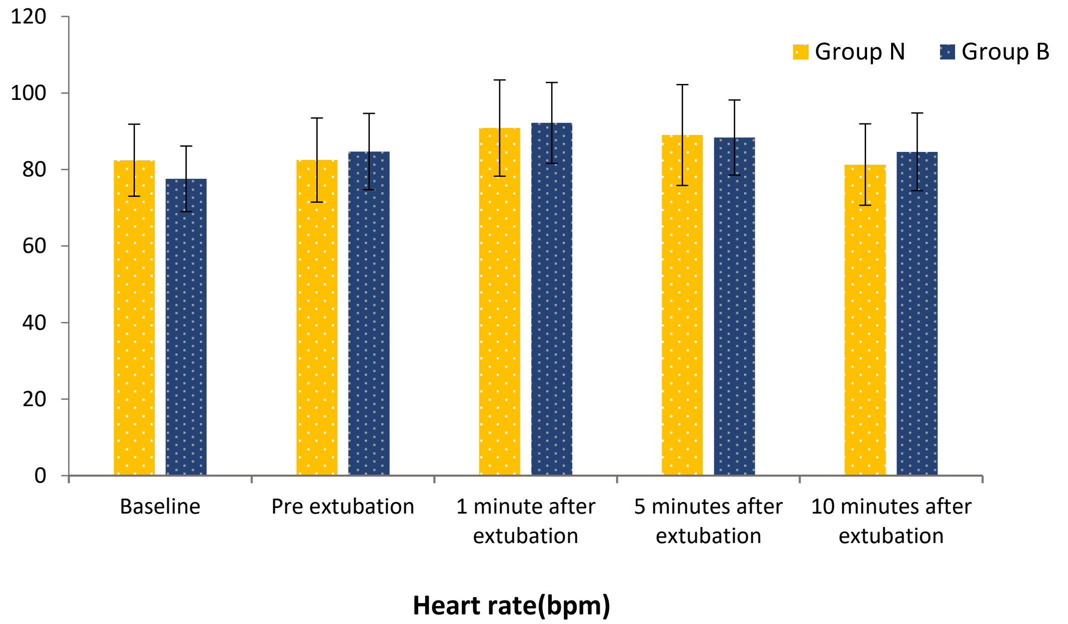


GRAPH 4: Type of surgery (P=1.000, Not Significant, Chi-Square Test)

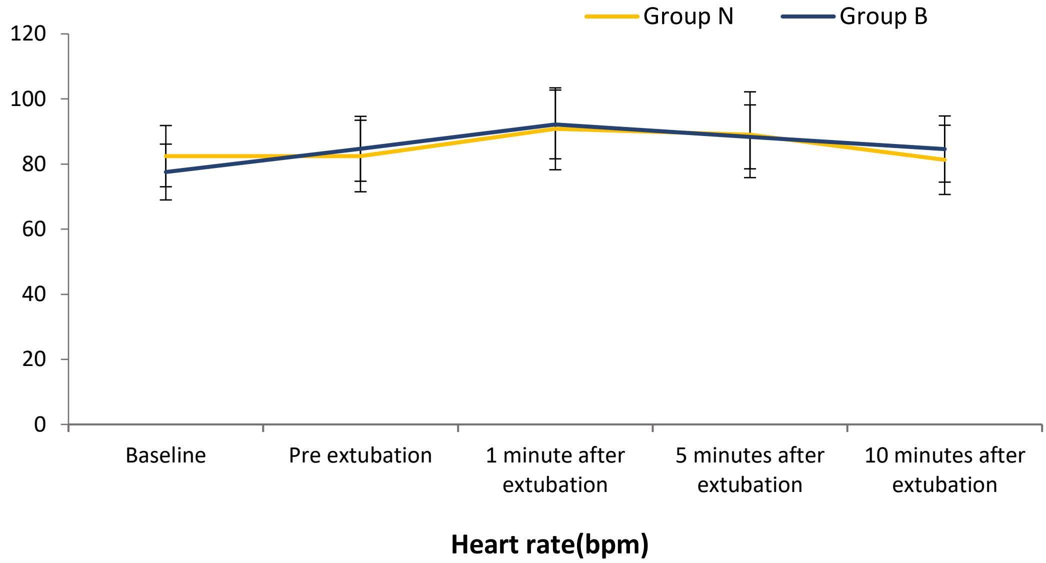
Demographic data were similar between the two groups, there no significant difference with respect to age, gender, type of surgery, ASA status and type of surgery.

Table 5: Heart rate(bpm)- Comparison in two groups of patients studied prospectively

Heart rate(bpm)	Group N (Mean±SD)	Group B (Mean±SD)	Total (Mean±SD)	P Value
Baseline	82.44±11.8	77.56±10.34	80±11.31	0.030*
Pre extubation	82.48±13.04	84.7±13.66	83.59±13.33	0.408
1 minute after extubation	90.84±16.7	92.18±14.45	91.51±15.55	0.669
5 minutes after extubation	89.02±14.78	88.36±13.05	88.69±13.88	0.813
10 minutes after extubation	81.3±10.24	84.62±11.11	82.96±10.76	0.124



GRAPH 5A: Analysis of Heart rate with time interval



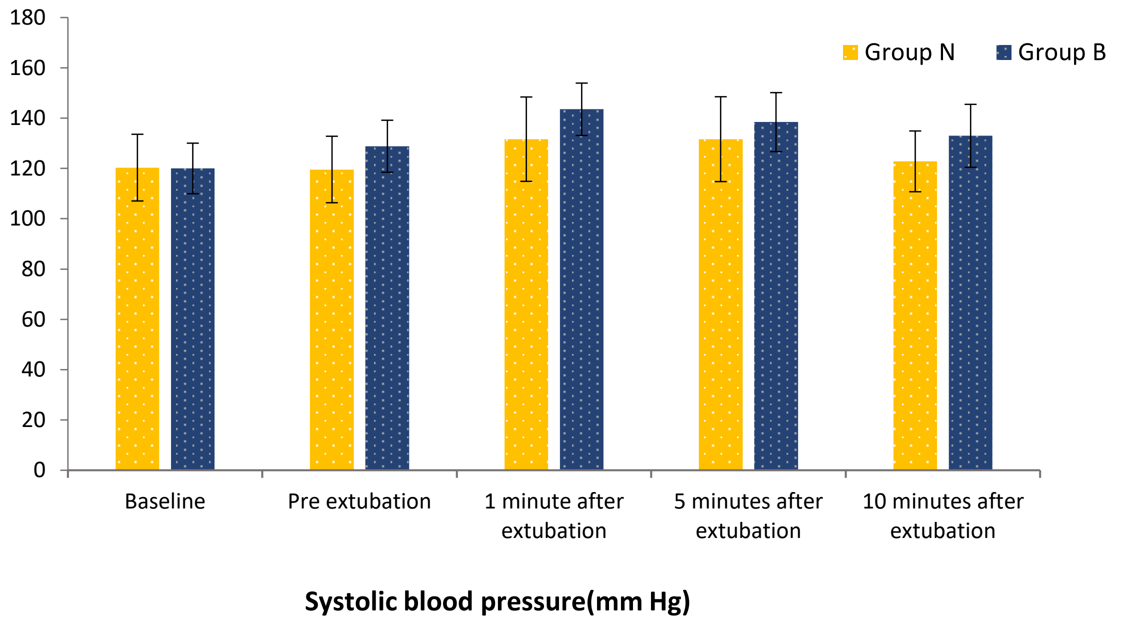
GRAPH 5B: Analysis of Heart rate with time interval

Mean values of heart rate were not significant during any time interval as shown in the above table. On comparing the heart rate between the two groups following inference were made.

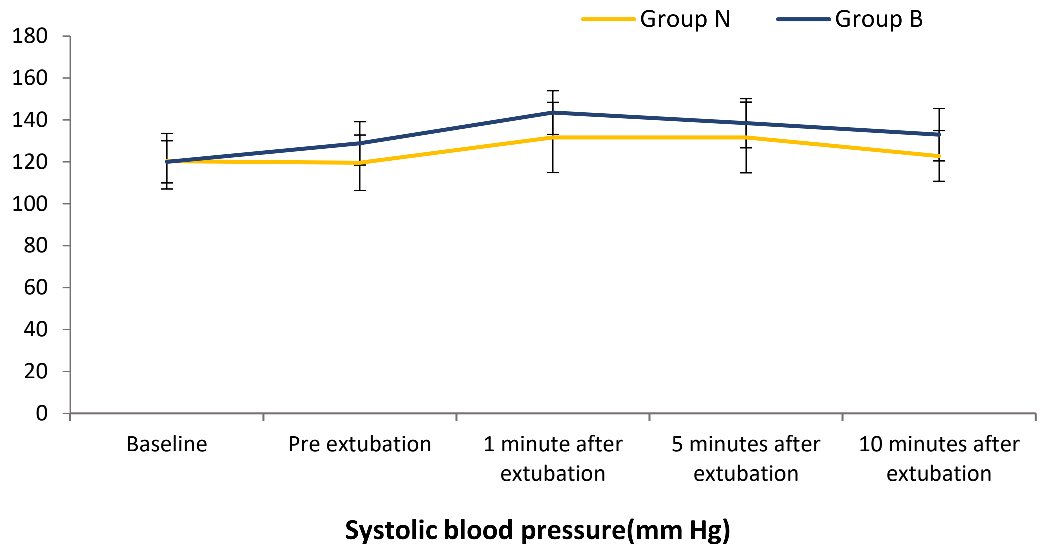
- Pre-extubation heart rate in Group N (82.48±13.04) and Group B (84.7±13.66) were insignificant with p=0.408
- After 1 minute of extubation in Group N was 90.84±16.7 and Group B was 92.18±14.45 with p=0.669
- 5th minute after extubation in Group N was 89.02±14.78 and Group B was 88.36±13.05 with p=0.813
- 10th minute after extubation in Group N was 81.3±10.24 and Group B 84.62±11.11 was with p=0.124

Table 6: Systolic blood pressure- Comparison in two groups of patients studied prospectively

Systolic blood pressure (mm Hg)	**Group N (Mean±SD)**	**Group B (Mean±SD)**	**Total (Mean±SD)**	**P Value**
Baseline	120.32±13.26	120±10.05	120.16±11.71	0.892
Pre extubation	119.58±13.22	128.82±10.34	124.2±12.69	<0.001**
1 minute after extubation	131.64±16.77	143.52±10.41	137.58±15.12	<0.001**
5 minutes after extubation	131.64±16.87	138.42±11.73	135.03±14.85	0.022*
10 minutes after extubation	122.82±12.08	132.96±12.52	127.89±13.26	<0.001**



GRAPH 6A: Analysis of Systolic blood pressure with time interval

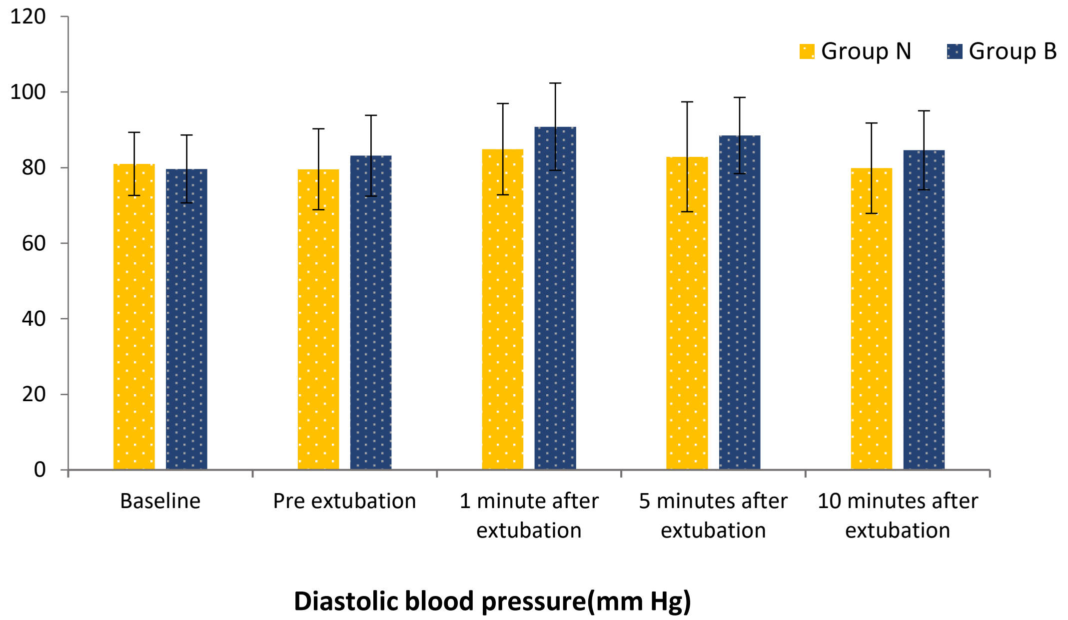


GRAPH 6B: Analysis of Systolic blood pressure with time interval

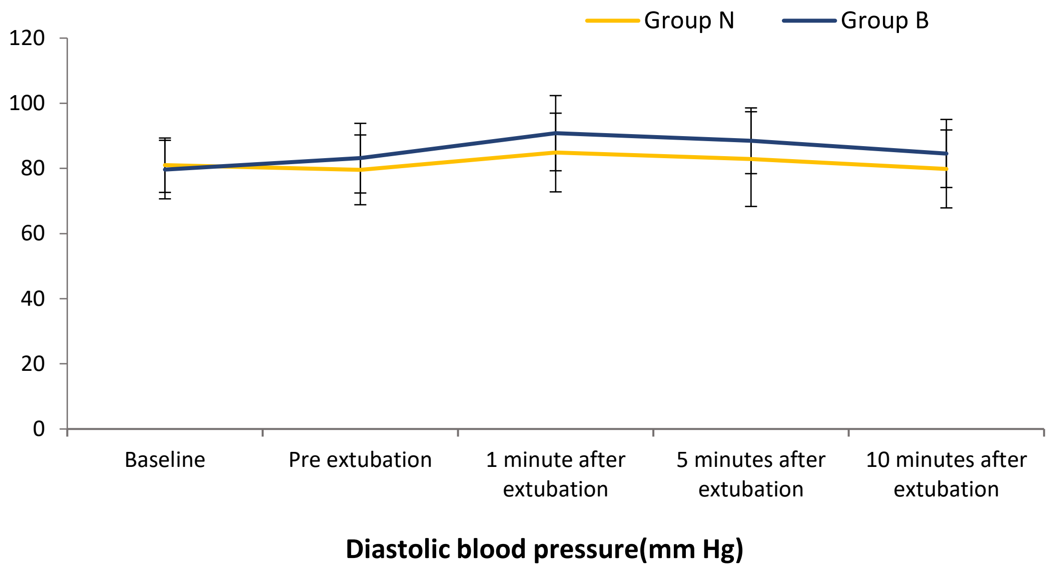
- Comparing the systolic blood pressure between the Group N and Group B baseline was insignificant with Group N (120.32±13.26) and Group B (120±10.05) (p=0.892)
- While values were significantly lower in Group N when compared with Group B during
    - Pre-extubation Group N (119.58±13.22) and Group B (128.82±10.34) with p<0.001**
    - 1st minute after extubation Group N (131.64±16.77) and Group B (143.52±10.41) with p<0.001**
    - 5th minute after extubation Group N (131.64±16.87) and Group B (138.42±11.73) with p<0.022*
    - 10th minute after extubation Group N (122.82±12.08) and Group B (132.96±12.52) with p<0.001**

Table 7: Diastolic blood pressure- Comparison in two groups of patients studied prospectively

Diastolic blood pressure (mm Hg)	Group N (Mean±SD)	Group B (Mean±SD)	Total (Mean±SD)	P Value
Baseline	80.98±8.35	79.64±8.98	80.31±8.65	0.441
Pre extubation	79.56±10.71	83.14±10.69	81.35±10.8	0.098+
1 minute after extubation	84.88±12.08	90.82±11.54	87.85±12.13	0.014*
5 minutes after extubation	82.86±14.54	88.48±10.09	85.67±12.77	0.027*
10 minutes after extubation	79.84±11.96	84.58±10.45	82.21±11.42	0.037*



GRAPH 7A: Analysis of Diastolic blood pressure with time interval

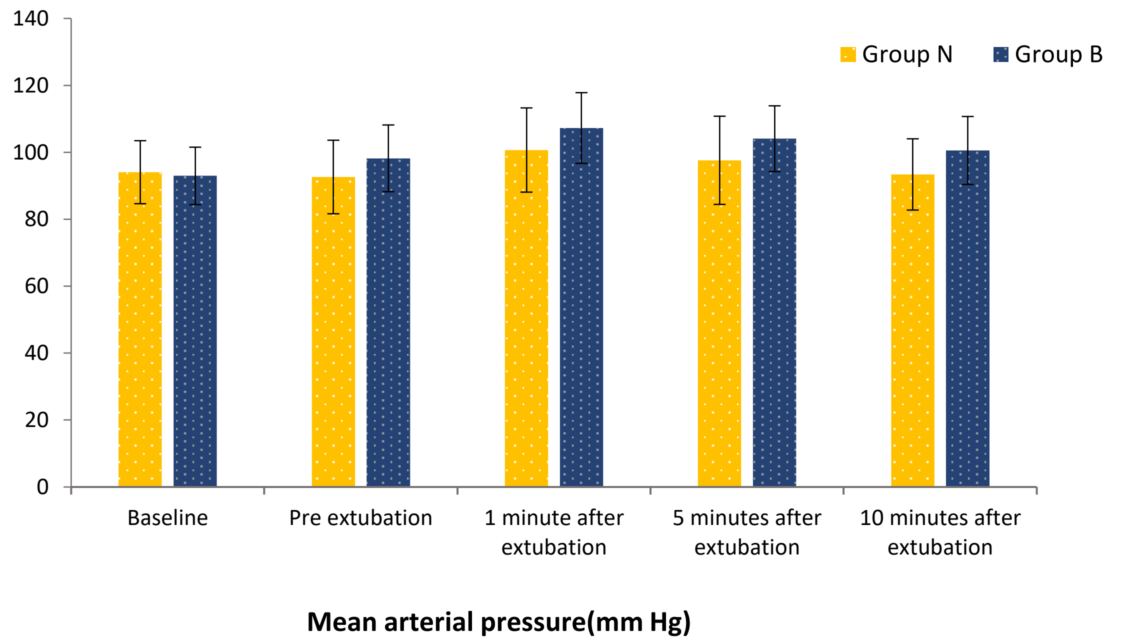


GRAPH 7B: Analysis of Diastolic blood pressure with time interval

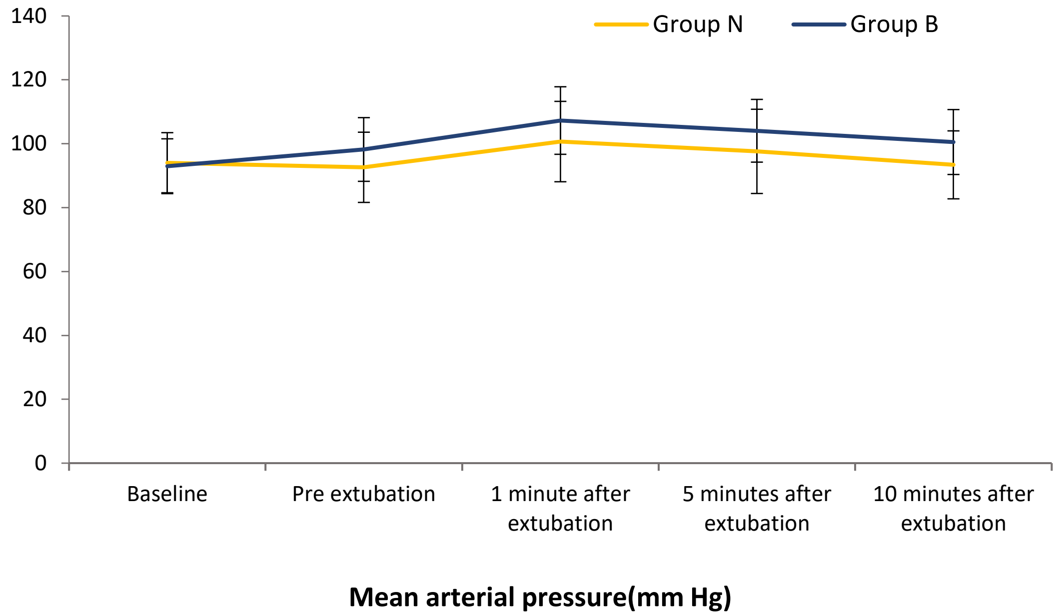
- In case of diastolic blood pressure between the Group N and Group B baseline with Group N (80.98±8.35) and Group B (79.64±8.98) (p=0.441)
- Pre-extubation Group N (79.56±10.71) and Group B (83.14±10.69) were insignificant
- While values were significantly lower in Group N during 1st minute after extubation (84.88±12.08) when compared with Group B during 1st minute after extubation (90.82±11.54) with p value 0.014*
- 5th minute after extubation Group N (82.86±14.54) and Group B (88.48±10.09) with p<0.027*
- 10th minute after extubation Group N (79.84±11.96) and Group B (84.58±10.45) with p<0.037*

Table 8: Mean arterial pressure- Comparison in two groups of patients studied prospectively

Mean arterial pressure (mm Hg)	Group N (Mean±SD)	Group B (Mean±SD)	Total (Mean±SD)	P Value
Baseline	94.06±9.41	92.96±8.58	93.51±8.98	0.543
Pre extubation	92.62±10.99	98.2±9.97	95.41±10.81	0.009**
1 minute after extubation	100.68±12.58	107.26±10.57	103.97±12.02	0.006**
5 minutes after extubation	97.61±13.18	104.06±9.82	100.87±11.99	0.007**
10 minutes after extubation	93.39±10.64	100.54±10.16	97±10.95	<0.001**



GRAPH 8A: Analysis of Mean arterial pressure with time interval



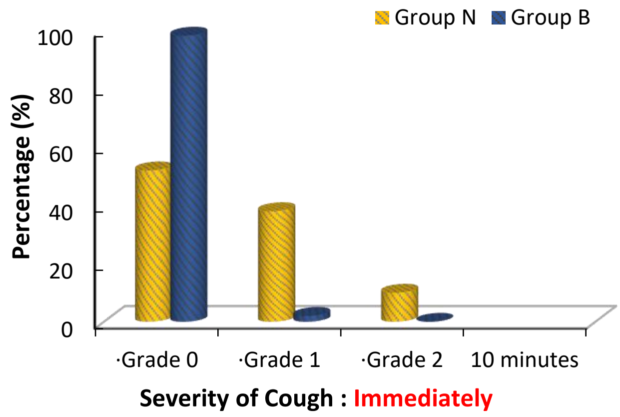
GRAPH 8B: Analysis of Mean arterial pressure with time interval

- Comparing Mean arterial pressure Group N and Group B baseline was insignificant with Group N (94.06±9.41) and Group B (92.96±8.58) ($p=0.543$)
- While values were significantly lower in Group N during pre-extubation (92.62±10.99) when compared with Group B (98.2±9.97) with $p>0.009$**
- 1st minute after extubation Group N (100.68±12.58) and Group B (107.06±10.57) with $p<0.006$**
- 5th minute after extubation Group N (97.61±13.18) and Group B (104.06±9.82) with $p<0.007$**
- 10th minute after extubation Group N (93.39±10.64) and Group B (100.54±10.16) with $p<0.001$**

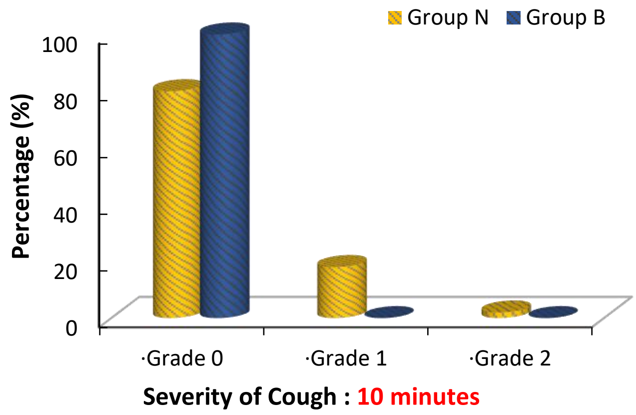
Table 9: Severity of Cough- Comparison in two groups of patients studied prospectively

Severity of Cough	Group N	Group B	Total	P Value
Immediately				
• Grade 0	26(52%)	49(98%)	75(75%)	<0.001**
• Grade 1	19(38%)	1(2%)	20(20%)	
• Grade 2	5(10%)	0(0%)	5(5%)	
10 minutes				
• Grade 0	40(80%)	50(100%)	90(90%)	<0.001**
• Grade 1	9(18%)	0(0%)	9(9%)	
• Grade 2	1(2%)	0(0%)	1(1%)	
1hour				
• Grade 0	49(98%)	50(100%)	99(99%)	1.000
• Grade 1	1(2%)	0(0%)	1(1%)	
• Grade 2	0(0%)	0(0%)	0(0%)	
6 hours				
• Grade 0	50(100%)	50(100%)	100(100%)	1.000
• Grade 1	0(0%)	0(0%)	0(0%)	
• Grade 2	0(0%)	0(0%)	0(0%)	
24hours				
• Grade 0	50(100%)	50(100%)	100(100%)	1.000
• Grade 1	0(0%)	0(0%)	0(0%)	
• Grade 2	0(0%)	0(0%)	0(0%)	
Total	50(100%)	50(100%)	100(100%)	

Chi-Square Test/Fisher Exact Test



A



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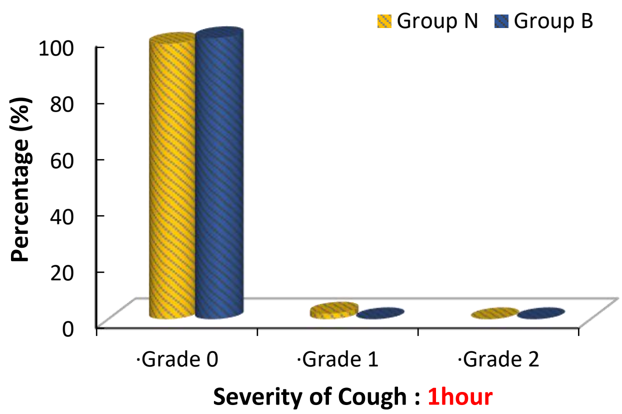

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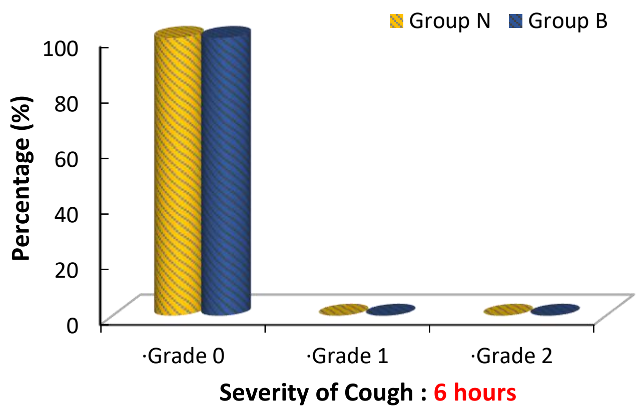

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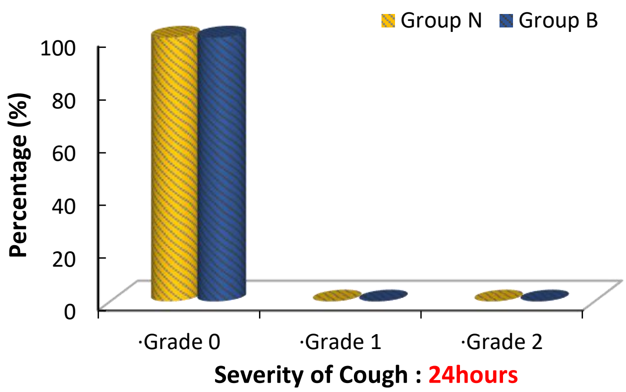


E

GRAPH 9 A-E: Grades of severity of cough postextubation at different intervals

- Immediate post-extubation

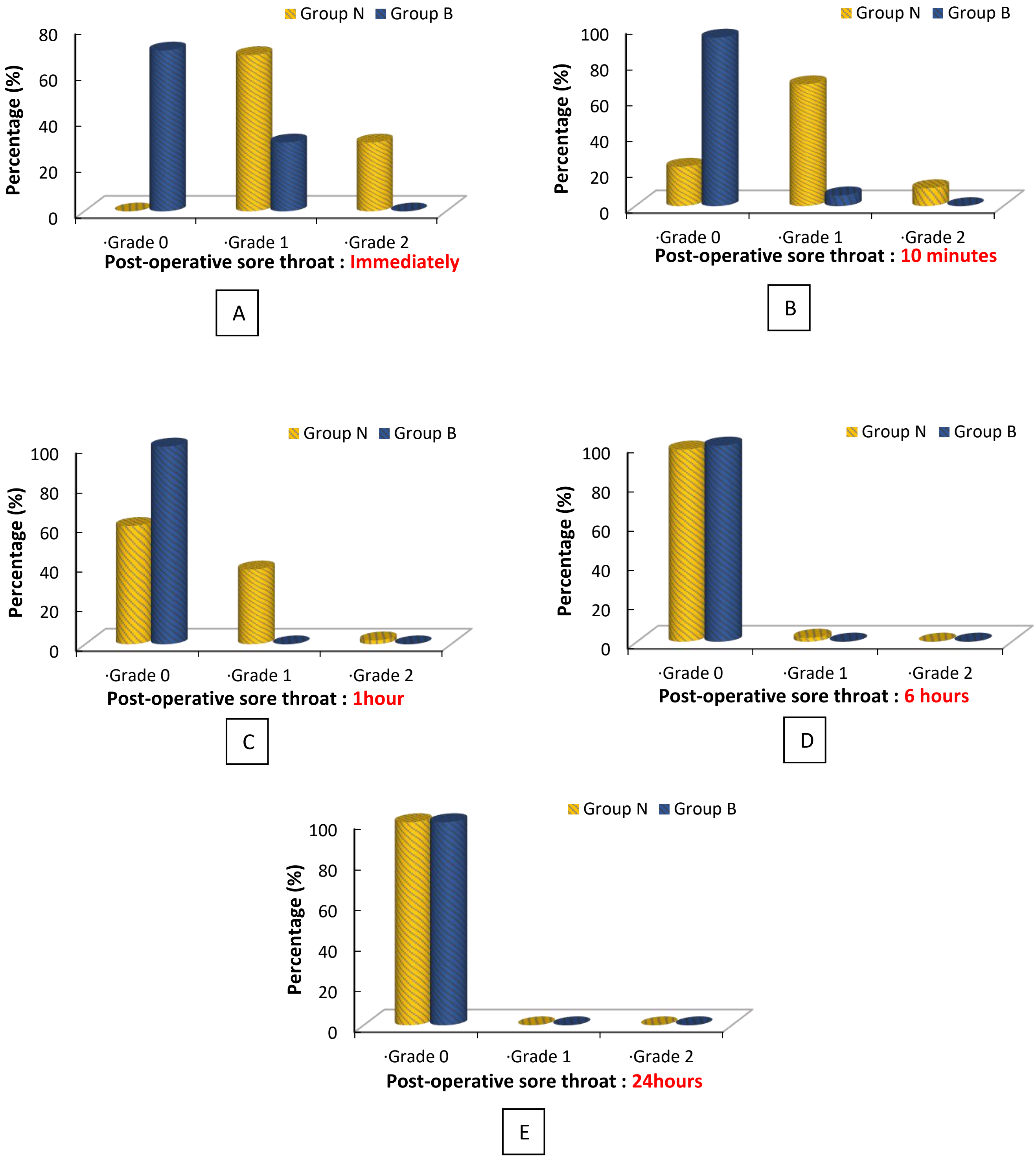
- In Group N 52% of patients had no cough, 38% had grade 1 cough and 10% had grade 2 cough.
- Whereas in Group B 98% had no cough and 2% had grade 1 cough

- 10th Minute after extubation
  - In Group N 80% of patients had no cough, 18% had grade 1 cough and 2% had grade 2 cough.
  - In Group B all patients were recorded with no cough
- 1st hour after extubation
  - In Group N 98% of patients had no cough and 2% had grade 1 cough
  - In Group B all patients were recorded with no cough
- During 6th hour and 24th hour after extubation patients from both the groups recorded no cough
- The difference between the groups were significant at intervals of immediately and 10th minute post-extubation with $p<0.001$**

Table 10: Post-operative sore throat- Comparison in two groups of patients studied prospectively

Post-operative sore throat	Group N	Group B	Total	P Value
Immediately				
• Grade 0	0(0%)	35(70%)	35(70%)	<0.001**
• Grade 1	34(68%)	15(30%)	49(49%)	
• Grade 2	15(30%)	0(0%)	15(15%)	
10 minutes				
• Grade 0	11(22%)	47(94%)	58(58%)	<0.001**
• Grade 1	34(68%)	3(6%)	37(37%)	
• Grade 2	5(10%)	0(0%)	5(5%)	
1hour				
• Grade 0	30(60%)	50(100%)	80(80%)	<0.001**
• Grade 1	19(38%)	0(0%)	19(19%)	
• Grade 2	1(2%)	0(0%)	1(1%)	
6 hours				
• Grade 0	49(98%)	50(100%)	99(99%)	1.000
• Grade 1	1(2%)	0(0%)	1(1%)	
• Grade 2	0(0%)	0(0%)	0(0%)	
24hours				
• Grade 0	50(100%)	50(100%)	100(100%)	1.000
• Grade 1	0(0%)	0(0%)	0(0%)	
• Grade 2	0(0%)	0(0%)	0(0%)	
Total	50(100%)	50(100%)	100(100%)	

Chi-Square Test/Fisher Exact Test



GRAPH 10 A-E: Grades of severity of postoperative sore throat at different intervals

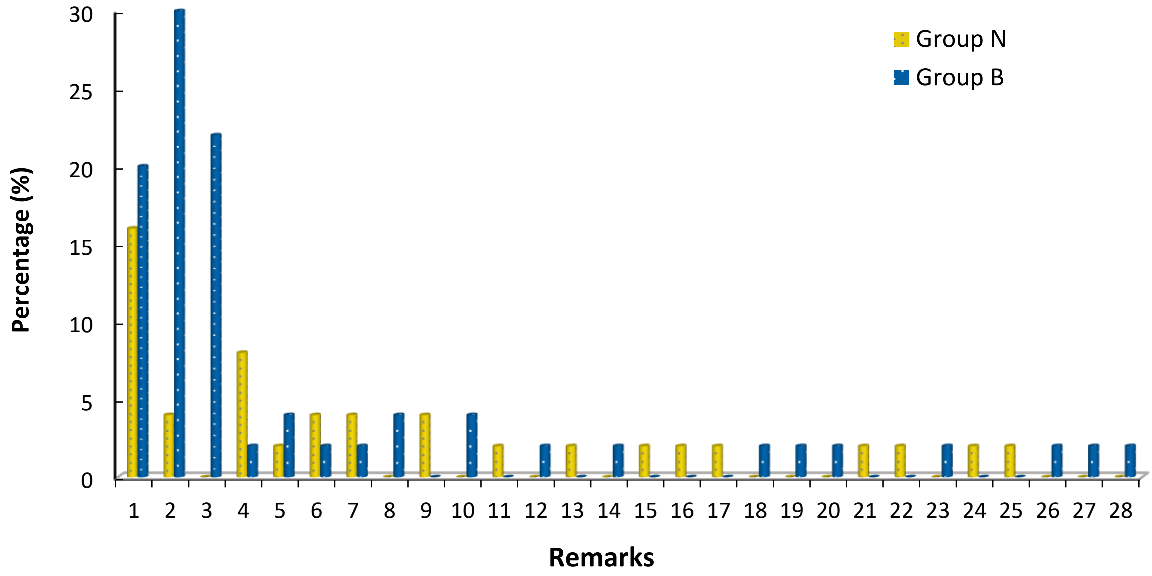
- Immediate post-extubation
  - In Group N 68% of patients were grade 1, 30% were grade 2 and 2% were grade 3 of sore throat
  - Whereas in Group B grade 0 was recorded in 70% and grade 1 was in 30% for sore throat
- 10th Minute after extubation
  - In Group N 22% of patients had no sore throat, 68% had grade 1 sore throat and 10% had grade 2 sore throat.
  - In Group B 94% of patients had no sore throat and 6% had grade 1 sore throat.
- 1st hour after extubation
  - In Group N 60% of patients had no sore throat, 38% had grade 1 and 2% had grade 2 sore throat
  - In Group B all patients were recorded with no sore throat
- 6th hour after extubation
  - In Group N 98% of patients had no sore throat and 2% had grade 1 sore throat
  - In Group B all patients were recorded with no sore throat
- During 24th hour after extubation patients from both the groups recorded no sore throat

- The difference between the groups were significant at intervals of immediately, 10th minute and 1st hour post-extubation with p<0.001**

Table 11: Remarks- Comparison in two groups of patients studied prospectively

Remarks	Group N	Group B	Total
EXCISION OF SWELLING (LIPOMA/SEBACEOUS CYST/LYMPH NODE)	8(16%)	10(20%)	18(18%)
DIAGNOSTIC LAPROSCOPY	2(4%)	15(30%)	17(17%)
LAPROSCPIC CHOLECYSTECTOMY	0(0%)	11(22%)	11(11%)
EXPLORATORY LAPROTOMY	4(8%)	1(2%)	5(5%)
BREAST LUMP	1(2%)	2(4%)	3(3%)
FIBROADENOMA	2(4%)	1(2%)	3(3%)
UMBILICAL HERNIA	2(4%)	1(2%)	3(3%)
HERNIS REPAIR	0(0%)	2(4%)	2(2%)
PAIN IN ABDOMEN	2(4%)	0(0%)	2(2%)
SEBACEOUS CYST ON BACK	0(0%)	2(4%)	2(2%)
ACROMIO-CLAVICULAR JOINT DISLOCATION	1(2%)	0(0%)	1(1%)
CARCINOMA ANAL CANAL	0(0%)	1(2%)	1(1%)
HYSTERECTOMY	1(2%)	0(0%)	1(1%)
DUCT ECTASIA	0(0%)	1(2%)	1(1%)
LEFT ADNEXAL CYST	1(2%)	0(0%)	1(1%)
LUMPECTOMY	1(2%)	0(0%)	1(1%)
MULTIPLE LIPOMA	1(2%)	0(0%)	1(1%)

PANCREATIC PSUEDOCYST WITH CHRONIC CALCIFIED PANCREATITIS	0(0%)	1(2%)	1(1%)
PAROTID SWELLING	0(0%)	1(2%)	1(1%)
BREAST FOLLICULLITIS	0(0%)	1(2%)	1(1%)
CARCINOMA BREAST	1(2%)	0(0%)	1(1%)
MODIFIED RADCAL MASTECTOMY	1(2%)	0(0%)	1(1%)
RIGHT DUCTAL CARCINOMA OF BREAST	0(0%)	1(2%)	1(1%)
RIGHT SUPRASPINATUS TEAR	1(2%)	0(0%)	1(1%)
ARTHROSCOPY	1(2%)	0(0%)	1(1%)
RUPTURED APPENDICITIS LAPROSCOPY	0(0%)	1(2%)	1(1%)
PARAUMBILICAL HERNIA	0(0%)	1(2%)	1(1%)
SWELLING OVER RIGHT SHOULDER	0(0%)	1(2%)	1(1%)
Total	50(100%)	50(100%)	100(100%)



GRAPH 11: Distribution based on surgical procedures

The above table and graph show the distribution of cases between the two groups

DISCUSSION

This study demonstrates the efficiency of superior laryngeal nerve bock and in-line nebulisation with lignocaine to ameliorate the stress response and incidence of post-operative cough and sore throat

Tracheal extubation is a critical phase in general anesthesia, often provoking significant physiological responses, such as sympathetic discharge, leading to hemodynamic issues like hypertension, tachycardia, and arrhythmias. [1]

In our study with parallelly distributed demography among the study groups, we had inferred comparing systolic, diastolic, and mean arterial pressures between Group N and Group B, baseline values were insignificant: systolic (Group N: 120.32±13.26, Group B: 120±10.05, p=0.892), diastolic (Group N: 80.98±8.35, Group B: 79.64±8.98, p=0.441), and mean arterial pressure (Group N: 94.06±9.41, Group B: 92.96±8.58, p=0.543).

However, during pre-extubation and at 1, 5, and 10 minutes post-extubation, Group N showed significantly lower values compared to Group B:

- systolic (pre-extubation: 119.58±13.22 vs. 128.82±10.34; 1st minute: 131.64±16.77 vs. 143.52±10.41; 5th minute: 131.64±16.87 vs. 138.42±11.73; 10th minute: 122.82±12.08 vs. 132.96±12.52),

- diastolic (1st minute: 84.88±12.08 vs. 90.82±11.54; 5th minute: 82.86±14.54 vs. 88.48±10.09; 10th minute: 79.84±11.96 vs. 84.58±10.45), and
- mean arterial pressure (pre-extubation: 92.62±10.99 vs. 98.2±9.97; 1st minute: 100.68±12.58 vs. 107.26±10.57; 5th minute: 97.61±13.18 vs. 104.06±9.82; 10th minute: 93.39±10.64 vs. 100.54±10.16).

Though the difference in SBP, DBP and MAP of blood pressure were ≤20% between the two groups, there was significant varying degree exhibited across different points of time, in case of

- systolic blood pressures during pre-extubation, Group B showed a 7.73% higher systolic pressure compared to Group N, followed by a further 9.02% increase one minute after extubation. However, at 5 minutes post-extubation, the percentage difference reduced to 5.15%, then slightly increased again to 8.26% by the 10-minute mark.
- In case of diastolic pressures that demonstrated pre-extubation, Group B had a 4.31% higher diastolic pressure compared to Group N, which escalated to 6.54% one minute after extubation. Subsequently, at 5 minutes post-extubation, the percentage difference remained relatively high at 6.35%, before slightly decreasing to 5.60% by the 10-minute mark.

- Meanwhile, mean arterial pressures showed consistent increments between Group B and Group N across the time points. Pre-extubation, there was a 6.03% difference between the two groups, which slightly increased to 6.53% one minute after extubation. At 5 minutes post-extubation, the percentage difference remained stable at 6.62%, then slightly heightened to 7.65% by the 10-minute mark. These fluctuations in systolic, diastolic, and mean arterial pressures reflect the dynamic physiological responses between the two groups during and after extubation.

On comparing the heart rate variability between the groups between Group B and Group N revealed subtle differences in their values at different time points following extubation. Pre-extubation, Group B exhibited a slightly higher value, with a percentage difference of 2.69%. One minute after extubation, this difference reduced to 1.47%, indicating a closer alignment between the two groups. At 5 minutes post-extubation, Group N showed a slightly higher value, albeit with a minimal percentage difference of 0.74%.

However, at the 10-minute mark, Group B displayed a more pronounced difference of 4.09%, suggesting a divergence in responses between the two groups over time but these differences were not statistically significant.

In case of post-operative cough and sore throat assessment the difference between the two groups were significant during the intervals of immediately and 10th minute after extubation for post-operative cough and intervals of immediately, 10th minute and 1st hour after extubation for post-operative sore throat but the action mitigating the undesired effect was high, which was equivalent to the findings by Bao et al. and Nabil et al., [4][5][30]

The data from our study were synonymous to finding by Jadhav et al., but the difference was that they had combined the two interventions (USG guided superior laryngeal nerve block and in-line nebulisation with lignocaine) one group and compared with control (nil intervention). [3] Our study was focused on determine the individual effect of these intervention.

Our study outcomes echoed those of trials employing vasodilator drugs like labetalol, [8] nifedipine, esmolol, [7] and nitroglycerine, [25] alongside sedative agents such as dexmedetomidine, clonidine, [35] and propofol, [7] as well as analgesics like remifentanil [19] and fentanyl [18]. These findings collectively demonstrate the efficacy of these interventions in managing the stressor response during extubation. Though these drugs were parallel in containing the stressor responses they either had side effects such as sedation or did not address the problem of postoperative sore throat and analgesia.

On contrary to our study there was an unparallel inference made by Zhipeng et al., where they have concluded superior laryngeal nerve block was superior in maintaining hemodynamic stressor than nebulisation with lignocaine. [20]

The larynx, rich in sensory nerves, triggers reflexes upon mechanical stimulation. Endotracheal intubation and extubation that requires manipulation of laryngeal mucosa may cause transient yet potentially dangerous hemodynamic reactions, especially in patients with cardiovascular or cerebrovascular conditions. [32] Blocking the nerve impulse transmission using local anaesthetics can mitigate hemodynamic responses and catecholamine release during direct laryngoscopy. [34] Additionally, superior laryngeal nerve blocks are effective in treating neurogenic cough, highlighting the nerve's key role in laryngeal sensory innervation. [33] Paltura et al. showed that aerosolized lidocaine can inhibit the sympathetic reflex and block the superior laryngeal nerve, thereby effectively improving hemodynamics. [35]

Limitations of our study includes, firstly even though the superior laryngeal nerve block being safe, just anaesthetising the supraglottic area there can risk of aspiration and it is mandatory to pre-medicate patients with anti-emetics and strict nil by mouth period of 8 hours pre-operatively and 2 hours post-operatively for the effect of drug to come down and excludes patients with risk of aspiration. Secondly the concentration and volume of drug administered to the patients were fixed rather than being tailored for individual patients. Thirdly the comparison was not done with a control group. Fourthly further evaluation with patients under ASA grade III and IV were not assessed, were in the need for controlling stressor response is mandate.

CONCLUSION

Our study was conducted to identify efficiency of USG guided Superior laryngeal nerve block and in-line nebulization with Lignocaine for extubation stressor response, post-operative sore throat and cough. We concluded that

1. Hemodynamic stability (SBP.DBP and MAP) during extubation was significantly better in case of patients who received in-line nebulization with lignocaine than USG guided superior laryngeal nerve block
2. Post-operative sore throat and cough curbing efficiency was equal in both patients who received in-line nebulization with lignocaine and USG guided superior laryngeal nerve block

SUMMARY

The present study entitled **"AWAKE EXTUBATION RESPONSE: COMPARISON OF SUPERIOR LARYNGEAL NERVE BLOCK AND IN LINE NEBULISATION WITH LIGNOCAINE- A RANDOMISED CONTROLLED STUDY."**

After obtaining clearance from hospital's ethical committee, 100 patients of ASA I and II between age group 18-60 years were randomized to two groups having 50 patients in each Group.

Group N- Patients underwent In-line nebulization with 5 ml of lignocaine 4%.

Group B- Patients underwent ultrasonography guided superior laryngeal nerve block with 2 ml of 1% Lignocaine injected on each side

General anaesthesia was induced as per standard technique. Patients in each group were intervened with the procedure during the skin closure. HR, SBP, DBP and MAP were recorded in both the groups at intervals of pre-extubation, 1st minute, 5th minute and 10th minute. Patients were extubated once criteria for extubation were achieved. Post-extubation patient was assessed for postoperative cough and sore throat at immediately, 10th minute, 1st hour, 6th hour and 24th hour after extubation. The demographics were identical in both the groups.

We observed that SBP, DBP and MAP significantly reduced in Group N on comparison with Group B, while blood pressure parameters were ≤20% in both the groups. There were no significant changes observed between the groups in case of HR. In terms of post-operative cough and sore throat both groups were comparable and efficient.

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CONSENT STATEMENT

I am making a voluntary decision to participate in the study "COMPARING EFFECT OF SUPERIOR LARYNGEAL NERVE BLOCK AND IN-LINE LIGNOCAINE NEBULISATION ON AWAKE EXTUBATION RESPONSE- A RANDOMISED CONTROLLED TRIAL". My signature below indicates that I have decided to participate and I have read the information provided above or the information provided above has been read to me in the language that I understand best. I was given the opportunity to ask questions and that they have been answered to my satisfaction.

Name of the participant:

Signature or left thumb
impression of the participant

Name of the witness:

Signature or left thumb
impression of the witness

Name of the investigator   Signature of the investigator

PROFORMA

"AWAKE EXTUBATION RESPONSE: COMPARISON OF SUPERIOR LARYNGEAL NERVE BLOCK AND IN LINE NEBULISATION WITH LIGNOCAINE- A RANDOMISED CONTROLLED STUDY"

Group allotted :

Name :   Age:

Gender: Weight:

Height :   Date of Examination:

Addres: Occupation :

Pre examination evaluation

Past History

- HTN ☐ DM ☐ IHD ☐
  Thyroid Disorder ☐ Respiratory Disorders ☐
  Others (Specify) ☐

- H/o previous surgery/(s) where airway difficulty will be encountered.
  Yes ☐ No ☐

General physical examination

Weight (Kg) :   Temperature (^{0}F) :   Pallor :

Cyanosis :   Pedal edema :   Clubbing :

PR :   BP :   RR :

Musculoskeletal disorders:

Teeth : Jaw movements:

Airway assessment: Spine:

Investigations

Hb%: Platelet Count :

TLC: INR:

FBS:

Systemic examination:

CNS: RS:

CVS: GIT:

Preoperative physical status American society of anesthesiologist

I ☐ II ☐

Diagnosis:

Proposed surgery:

Monitors attached:

Pulse oximetry: NIBP:

1. Hemodynamic Changes

Hemodynamic Parameters	Pre-extubation recordings	1 Min after extubation T1	5 Min after extubation T2	10 Min after extubation T3
SBP (mmHg)				
DBP (mmHg)				
MAP (mmHg)				
HR				

2. Post-operative sore throat and Severity of Cough

Time	Immediately	10mins	1hour	6 hours	24 hours
Post-operative sore throat					
Severity of Cough					

Signature of Guide

Signature of Consultant

Signature of Witness

SUPERIOR LARYNGEAL NERVE BLOCK

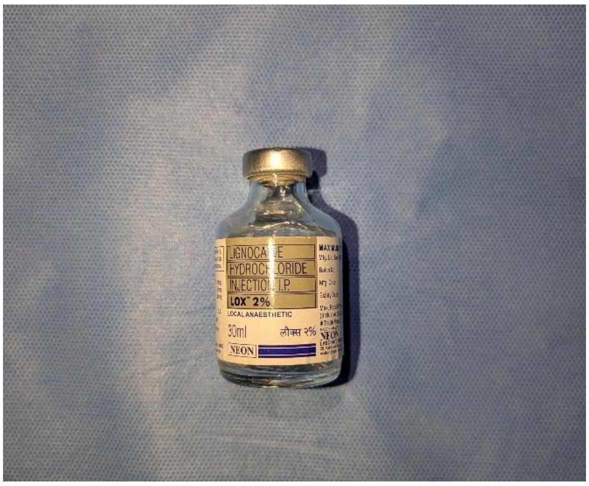

PHOTO 1: 2% LIGNOCAINE

PHOTO 2: 2% LIGNOCAINE, 100ML NS USED FOR DILUTION, 5CCC SYRINGE

PHOTO 3: USG IMAGE SHOWING HYOID BONE AND GREATER CORNUA OF HYOID

PHOTO 4: PATIENT RECEIVING SUPERIOR LARYNGEAL NERVE BLOCK

IN LINE NEBULISATION

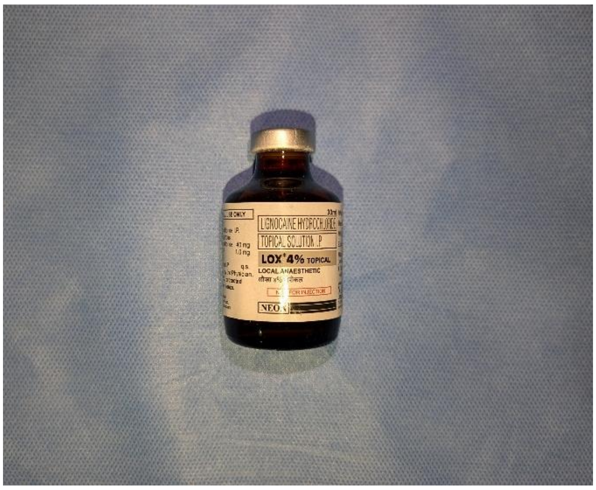

PHOTO 5: 4% LIGNOCAINE

PHOTO 6: 4% LIGNOCAINE, 5CC SYRINGE, IN LINE NEBULISER

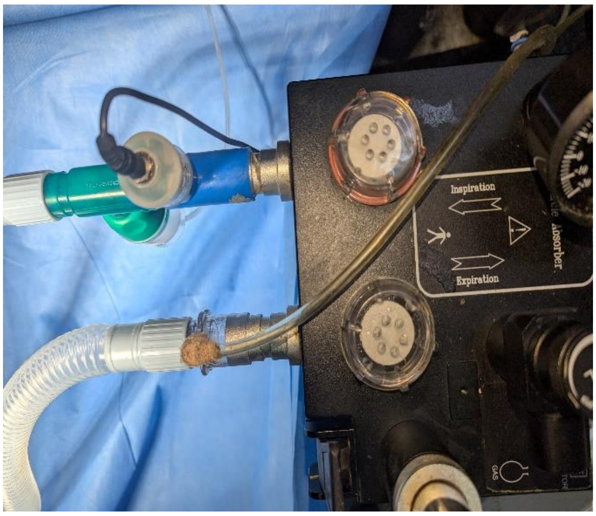

PHOTO 7: IN LINE NEBULISER ATTACHED TO INSPIRATORY LIMB OF VENTILATOR

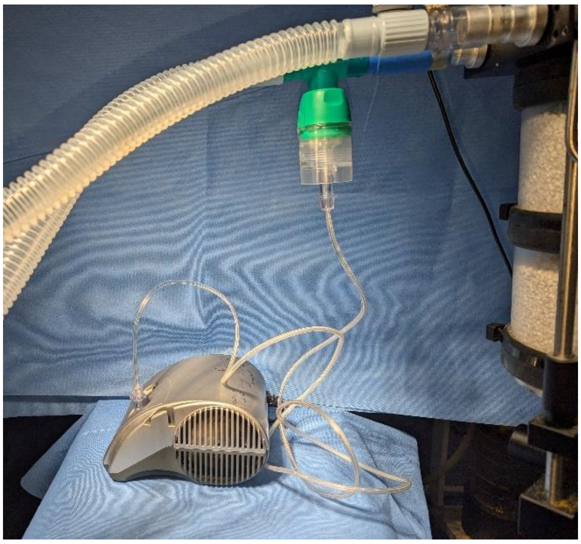

PHOTO 8: PATIENT RECEIVING IN LINE NEBULISATION

Serial No.	Patient name	Age	Gender	GROUP	ASA status	Baseline				Pre extubation				1 minute after extubation				5 minutes after extubation				10 minutes after extubation				Post-operative sore throat					Severity of Cough					MPG	Type of Surgery
						Systole	Diastole	Mean arterial pressure	Heart rate	Systole	Diastole	Mean arterial pressure	Heart rate	Systole	Diastole	Mean arterial pressure	Heart rate	Systole	Diastole	Mean arterial pressure	Heart rate	Systole	Diastole	Mean arterial pressure	Heart rate	Immediately	10 minutes	1hour	6 hours	24hours	Immediately	10 minutes	1hour	6 hours	24hours		Open/Lap
1	Sindhu	50	F	B	2	130	90	103	62	164	112	129	106	160	110	127	103	157	107	124	98	141	96	111	90	grade 0	grade 0	grade 0	grade 0	grade 0	grade 0	grade 0	grade 0	grade 0	grade 0	2	O
2	Akshatha	19	F	B	1	110	70	83	92	112	67	82	116	155	103	120	124	121	64	83	89	115	67	83	91	0	0	0	0	0	0	0	0	0	0	2	O
3	Savitri	36	F	B	2	140	90	107	82	141	96	111	90	160	110	127	103	150	107	121	75	157	107	124	97	0	0	0	0	0	0	0	0	0	0	1	L
4	Suvarna	46	F	B	1	120	70	87	76	123	86	98	85	131	79	96	87	113	77	89	87	118	68	85	84	0	0	0	0	0	0	0	0	0	0	1	O
5	Meenakshi	26	F	B	1	130	90	103	92	127	95	106	75	135	93	107	64	131	94	106	95	129	90	103	78	1	0	0	0	0	0	0	0	0	0	2	L
6	Shivaji Patil	55	M	B	2	110	80	90	74	129	95	106	81	138	102	114	80	131	98	109	74	125	98	107	82	0	0	0	0	0	0	0	0	0	0	1	L
7	Madiwali	28	M	B	2	130	80	97	84	135	97	110	105	149	95	113	89	123	81	95	66	116	83	94	89	0	0	0	0	0	0	0	0	0	0	2	L
8	Parvati	66	F	B	1	110	70	83	85	119	59	79	85	121	74	90	105	120	70	87	78	109	61	77	60	0	0	0	0	0	0	0	0	0	0	2	O
9	Bharathi	37	F	B	1	118	78	91	92	123	86	98	85	132	87	102	86	129	86	100	85	127	84	98	85	0	0	0	0	0	0	0	0	0	0	3	L
10	Vivek	18	M	B	1	100	70	80	82	122	82	95	68	138	66	90	78	125	83	97	68	123	82	96	78	0	0	0	0	0	0	0	0	0	0	1	O
11	Latha	40	F	B	1	130	80	97	72	141	96	111	90	150	107	121	89	157	107	124	98	141	64	90	89	0	0	0	0	0	0	0	0	0	0	2	L
12	Shobha	48	F	B	2	110	90	97	78	121	82	95	88	143	102	110	96	135	92	101	87	136	84	101	84	0	0	0	0	0	0	0	0	0	0	2	O
13	Alka Anant	52	F	B	2	120	90	100	64	140	75	97	69	163	93	106	82	156	79	94	70	146	84	105	68	0	0	0	0	0	0	0	0	0	0	3	L
14	Parasharam	55	M	B	1	120	80	93	66	136	84	101	64	148	70	89	76	149	81	95	86	142	82	102	68	0	0	0	0	0	0	0	0	0	0	2	O
15	Basavaraj P	42	M	B	1	120	80	93	88	141	79	100	63	152	78	93	67	147	78	94	64	146	74	98	63	0	0	0	0	0	0	0	0	0	0	3	L
16	Kadappa	46	M	B	1	140	100	113	72	141	96	111	64	152	103	119	79	151	103	119	74	144	98	113	79	0	0	0	0	0	0	0	0	0	0	2	L
17	Prema	44	F	B	1	126	68	87	92	134	90	105	110	152	99	117	112	145	96	112	87	137	92	107	99	0	0	0	0	0	0	0	0	0	0	1	O
18	Yeshwanth	38	M	B	1	132	84	100	76	142	76	90	69	153	71	91	77	161	77	95	83	149	84	106	67	0	0	0	0	0	0	0	0	0	0	1	L
19	Mahadev	43	M	B	2	120	80	93	76	140	93	109	70	152	79	94	69	149	84	97	67	146	74	98	63	0	0	0	0	0	0	0	0	0	0	2	L
20	Vimal	40	F	B	1	110	70	83	87	112	67	82	116	140	100	113	96	136	98	111	102	133	96	108	104	0	0	0	0	0	0	0	0	0	0	1	O
21	Laxmi Nigaj	33	F	B	1	118	74	89	77	120	73	89	110	126	89	101	117	111	76	88	102	109	76	87	101	0	0	0	0	0	0	0	0	0	0	2	L
22	Soubhagya	31	F	B	1	126	86	99	70	121	64	83	89	147	104	118	104	133	95	108	88	132	95	107	96	0	0	0	0	0	0	0	0	0	0	1	O
23	Dayanand	31	M	B	1	124	78	93	68	126	89	101	79	146	99	115	88	130	87	101	96	109	67	81	89	0	0	0	0	0	0	0	0	0	0	3	O
24	Suraj	20	M	B	1	120	80	93	91	134	90	105	86	147	95	112	90	146	96	113	92	144	95	111	90	0	0	0	0	0	0	0	0	0	0	2	L
25	Naziya	25	F	B	1	110	80	90	86	130	90	103	84	136	92	107	88	131	89	103	83	133	89	104	86	0	0	0	0	0	0	0	0	0	0	2	O
26	Veeraprakа	52	M	B	1	112	84	93	68	128	89	102	82	134	90	105	110	133	89	103	80	130	90	103	84	0	0	0	0	0	0	0	0	0	0	3	L
27	Yallur Afree	38	F	B	1	140	90	107	80	134	92	106	76	157	110	126	118	148	99	115	116	138	91	107	89	0	0	0	0	0	0	0	0	0	0	1	L
28	Mallavva	43	F	B	2	110	80	90	72	131	82	98	97	147	97	105	117	135	91	101	95	105	64	72	94	1	1	0	0	0	1	0	0	0	0	2	O
29	Basavaraj	44	M	B	1	122	88	99	82	118	82	94	68	137	83	101	79	141	101	114	82	130	90	103	64	0	0	0	0	0	0	0	0	0	0	2	L
30	Nirmala S	36	F	B	1	132	96	108	79	134	86	102	78	146	99	115	107	141	103	116	98	132	96	108	79	1	0	0	0	0	0	0	0	0	0	2	L
31	Shabila S	47	F	B	2	117	79	92	111	126	78	94	100	145	91	109	117	140	99	113	133	133	85	101	111	1	0	0	0	0	0	0	0	0	0	2	L
32	Shivappa	45	M	B	1	110	80	90	74	110	70	83	85	119	59	79	85	121	74	90	105	120	70	87	78	0	0	0	0	0	0	0	0	0	0	2	L
33	Shobha B	50	M	B	2	112	86	95	68	118	88	98	78	148	92	111	98	147	88	108	103	135	77	96	85	1	0	0	0	0	0	0	0	0	0	2	O
34	Madhukar	18	M	B	1	120	80	93	78	126	78	94	85	152	96	115	102	146	82	103	96	137	82	100	74	1	1	0	0	0	0	0	0	0	0	1	L
35	Yallavva Na	46	F	B	1	110	70	83	84	116	72	87	96	132	92	105	89	128	76	93	88	118	89	99	85	0	0	0	0	0	0	0	0	0	0	1	L
36	Pavitra Nag	39	F	B	1	120	60	80	88	132	86	101	112	158	98	118	108	152	86	108	98	144	92	109	86	1	0	0	0	0	0	0	0	0	0	2	L
37	Rajani	67	F	B	2	130	90	103	69	120	68	85	76	142	86	105	92	138	88	105	86	132	84	100	89	0	0	0	0	0	0	0	0	0	0	1	L
38	Balappa Ba	75	F	B	1	100	60	73	65	138	88	105	85	136	98	111	84	134	92	106	78	128	88	101	86	1	0	0	0	0	0	0	0	0	0	2	O
39	Ningayya	43	M	B	1	110	70	83	73	112	72	85	68	124	78	93	72	126	88	101	78	124	84	97	82	1	0	0	0	0	0	0	0	0	0	2	L
40	Ramesh Na	51	M	B	2	136	86	103	88	124	84	97	88	155	95	115	110	152	94	113	110	148	96	113	102	0	0	0	0	0	0	0	0	0	0	2	O
41	Vandana B	50	F	B	2	128	88	101	56	119	64	82	92	133	85	101	87	137	89	105	84	129	86	100	82	1	0	0	0	0	0	0	0	0	0	2	L
42	Geeta Rajai	50	F	B	2	120	80	93	62	136	85	102	84	148	92	111	92	155	96	116	94	156	92	113	88	1	0	0	0	0	0	0	0	0	0	1	L
43	Jayesh Ajay	23	M	B	1	120	80	93	79	126	69	88	79	142	88	106	75	144	85	105	77	148	89	109	84	0	0	0	0	0	0	0	0	0	0	1	L
44	Fakeerappa	23	M	B	1	110	70	83	83	127	91	103	86	133	79	97	83	138	88	105	85	144	92	109	87	1	0	0	0	0	0	0	0	0	0	1	O
45	Sanmati M	42	F	B	1	110	80	90	80	124	89	101	77	144	95	111	89	141	99	113	92	147	97	114	101	1	1	0	0	0	0	0	0	0	0	2	O
46	Lalita Asho	48	F	B	2	130	90	103	71	142	92	109	75	138	96	110	85	138	88	105	87	136	84	101	74	0	0	0	0	0	0	0	0	0	0	2	L
47	Sunil Babu	42	M	B	2	134	82	99	75	132	88	103	81	143	87	106	92	137	77	97	89	132	68	89	91	0	0	0	0	0	0	0	0	0	0	2	L
48	Sudha Raju	50	F	B	1	112	72	85	80	136	86	103	85	156	82	107	91	143	87	106	85	139	83	102	81	0	0	0	0	0	0	0	0	0	0	1	O
49	Chinappa G	59	M	B	2	115	69	84	65	137	87	104	83	146	94	111	82	142	88	106	93	138	86	103	87	1	0	0	0	0	0	0	0	0	0	1	L
50	Kallavva	56	F	B	2	116	64	81	64	121	72	88	72	135	79	98	96	127	72	90	92	118	84	95	88	1	0	0	0	0	0	0	0	0	0	1	L

Serial No.	Patient name	Age	Gender	GROUP	ASA status	Baseline				Pre extubation				1 minute after extubation			
						Systole	Diastole	Mean arterial pressure	Heart rate	Systole	Diastole	Mean arterial pressure	Heart rate	Systole	Diastole	Mean arterial pressure	Heart rate
1	Renuka	47	F	N	1	130	90	103	92	108	88	94	78	124	94	104	84
2	Jaitunbai	60	F	N	2	150	90	110	112	152	108	127	106	159	100	136	105
3	Laxmibayi	52	F	N	1	130	80	97	92	111	71	84	70	98	68	78	106
4	Malavva	45	F	N	1	110	80	90	86	124	80	95	96	113	78	91	61
5	Irravva	42	F	N	1	120	70	87	84	133	95	108	94	144	109	122	123
6	Gangavva	56	F	N	2	130	80	97	98	144	86	105	112	161	88	112	132
7	Shailaja	43	F	N	1	120	80	93	78	125	93	102	90	135	92	101	87
8	Sagar	22	M	N	1	130	80	97	88	123	82	96	68	141	64	90	89
9	Aneesa	28	F	N	1	110	70	83	74	114	74	87	85	148	97	114	92
10	Shilpa	23	F	N	1	110	70	83	86	112	69	83	84	124	78	93	110
11	Sofiya	35	F	N	1	110	80	90	78	104	66	79	89	112	76	88	94
12	Sanjeev Pat	32	M	N	1	110	70	83	78	124	80	95	96	113	78	91	61
13	Gangavva	45	F	N	2	132	88	103	89	144	86	105	112	161	88	112	132
14	Malik Patil	36	M	N	1	114	78	90	68	115	82	93	76	125	91	102	83
15	Irravva	42	F	N	2	120	70	87	86	133	95	108	94	144	109	122	123
16	Laxmibhai	52	F	N	1	130	80	97	90	111	71	84	70	98	68	78	106
17	Sugantha	59	F	N	2	130	90	103	92	140	82	101	75	156	73	101	111
18	Lalitha	38	F	N	1	130	90	103	80	113	77	89	87	131	79	96	87
19	Sagar Shiva	22	M	N	1	130	90	103	88	123	82	96	68	141	64	90	89
20	Madiwali	38	M	N	1	100	70	80	84	119	84	96	93	120	84	96	93
21	Ashwini	43	F	N	1	130	90	103	76	113	76	88	85	133	84	98	89
22	Renuka	47	F	N	1	130	90	103	92	108	88	94	78	124	94	104	84
23	Parashuran	40	M	N	1	110	80	90	62	107	67	80	73	119	75	90	90
24	Maruthi Lai	30	F	N	1	110	80	90	78	136	84	94	64	148	70	89	62
25	Lata Jadhav	48	F	N	2	140	90	107	84	140	109	119	92	156	107	123	85
26	Anil	39	M	N	1	120	74	89	70	126	73	91	79	143	85	104	93
27	Madivali	38	F	N	1	110	70	83	70	98	65	76	83	102	64	77	82
28	Uttar	29	M	N	1	110	90	97	60	102	74	83	94	107	70	82	89
29	Priyanka	18	F	N	1	110	70	83	92	103	72	83	101	112	76	88	93
30	Renuka	30	F	N	1	90	70	77	116	102	55	71	64	115	58	77	76
31	Shivaji Patil	55	M	N	2	140	90	107	96	126	79	95	87	155	89	111	101
32	Kousabhai	40	F	N	2	130	90	103	72	132	75	94	106	137	92	107	108
33	Mahadevi	54	F	N	2	130	90	103	78	129	94	106	76	103	97	109	77
34	Nazeema	23	F	N	1	100	70	80	78	120	74	89	70	143	88	104	93
35	Anandi	28	F	N	1	108	80	89	92	115	86	96	65	123	85	98	66
36	Shainaz	32	F	N	1	140	98	112	87	120	83	95	70	126	84	98	63
37	Santhosh	37	M	N	2	120	90	100	61	120	88	97	108	129	89	102	66
38	Sujata s	39	F	N	2	90	70	77	82	95	67	76	78	113	81	92	78
39	Nirmala	60	F	N	1	140	90	107	70	116	83	94	74	138	91	107	89
40	Bibishima	20	F	N	1	120	90	100	106	108	81	90	74	135	95	108	81
41	Meenabhai	27	F	N	1	100	70	80	76	98	60	67	75	135	91	101	95
42	Savita	27	F	N	1	120	80	93	80	123	85	98	73	135	98	111	88
43	Shreedevi	29	F	N	1	126	82	97	78	120	85	97	68	144	101	115	108
44	Gauravva	55	F	N	2	110	70	83	78	118	82	94	76	149	95	113	89
45	Deepa	44	F	N	1	120	80	93	80	108	80	88	77	134	98	110	87
46	Aishwarya	23	F	N	1	118	80	93	88	111	75	87	70	120	82	95	76
47	Laxmi	20	F	N	1	110	70	83	78	115	67	83	86	132	78	96	98
48	Renuka	35	F	N	2	130	88	102	86	138	77	97	91	144	79	101	98
49	Ramu	46	M	N	1	122	84	97	68	126	65	85	72	138	84	102	86
50	Shoba	50	F	N	2	136	87	103	65	134	78	97	72	142	86	105	84

Serial No.	5 minutes after extubation				10 minutes after extubation				Post-operative sore throat					Severity of Cough					MPG	Type of Surgery
	Systole	Diastole	Mean arterial pressure	Heart rate	Systole	Diastole	Mean arterial pressure	Heart rate	Immediately	10 minutes	1hour	6 hours	24hours	Immediately	10 minutes	1hour	6 hours	24hours		Open/Lap
1	156	104	121	108	112	84	93	99	grade 2	grade 1	grade 1	grade 0	grade 0	grade 0	grade 0	grade 0	grade 0	grade 0	2	L
2	174	97	123	108	150	110	123	102	grade 0	grade 0	grade 0	grade 0	grade 0	grade 0	grade 0	grade 0	grade 0	grade 0	0	L
3	104	52	69	79	106	65	80	64	grade 2	grade 2	grade 1	grade 0	grade 0	grade 0	grade 0	grade 0	grade 0	grade 0	2	O
4	146	106	102	100	134	88	103	74	grade1	grade 0	grade 0	grade 0	grade 0	grade 0	grade 0	grade 0	grade 0	grade 0	1	O
5	151	101		102	142	97		98	grade 1	grade 0	grade 0	grade 0	grade 0	grade 0	grade 0	grade 0	grade 0	grade 0	2	L
6	157	82	107	108	127	71	90	74	grade2	grade 2	grade 2	grade 1	grade 0	grade 0	grade 0	grade 0	grade 0	grade 0	2	O
7	143	102	110	96	121	82	89	88	grade 2	grade 1	grade 0	grade 0	grade 0	grade 0	grade 0	grade 0	grade 0	grade 0	2	L
8	138	66	90	78	130	71	91	83	grade1	grade0	grade 0	grade 0	grade 0	grade 0	grade 0	grade 0	grade 0	grade 0	1	O
9	132	95	105	96	133	95	108	88	2	1	1	0	0	1	0	0	0	0	1	L
10	132	82	99	121	131	74	93	98	1	1	0	0	0	0	0	0	0	0	2	L
11	114	56	75	81	115	58	77	76	1	1	0	0	0	2	0	0	0	0	2	L
12	146	106	102	100	134	88	103	74	1	0	0	0	0	0	0	0	0	0	3	L
13	157	82	107	108	127	71	90	74	2	2	1	0	0	0	0	0	0	0	2	L
14	124	89	101	81	118	85	96	76	1	0	0	0	0	2	1	0	0	0	2	L
15	151	101	118	102	142	97	112	98	1	0	0	0	0	1	1	0	0	0	2	L
16	104	52	69	79	106	65	80	64	2	2	1	0	0	0	0	0	0	0	2	O
17	153	82	106	121	143	85	104	93	2	1	1	0	0	1	1	0	0	0	2	L
18	129	86	100	85	123	81	95	87	1	1	0	0	0	1	0	0	0	0	2	L
19	138	66	90	78	130	71	91	83	1	0	0	0	0	0	0	0	0	0	2	O
20	112	76	88	96	110	71	84	92	2	1	0	0	0	1	0	0	0	0	3	L
21	140	82	99	111	125	83	96	81	1	1	0	0	0	2	0	0	0	0	2	O
22	156	104	121	108	112	84	93	99	2	1	1	0	0	0	0	0	0	0	2	L
23	121	74	90	79	123	73	93	79	2	1	0	0	0	0	0	0	0	0	2	O
24	149	81	95	64	142	82	94	68	1	1	0	0	0	2	1	0	0	0	3	O
25	149	106	120	88	142	103	116	85	1	1	0	0	0	2	2	0	0	0	2	O
26	140	82	101	75	138	84	102	78	2	1	1	0	0	0	0	0	0	0	1	L
27	105	64	78	86	103	64	77	84	1	1	1	0	0	1	0	0	0	0	3	L
28	104	66	79	93	100	64	76	86	2	1	1	0	0	1	0	0	0	0	2	L
29	101	66	78	92	105	64	78	86	2	2	0	0	0	0	0	0	0	0	1	L
30	114	56	75	81	104	79	87	71	1	1	1	0	0	1	0	0	0	0	2	L
31	122	78	93	102	113	57	76	79	1	0	0	0	0	0	0	0	0	0	3	O
32	105	58	77	81	109	53	72	88	1	1	0	0	0	1	0	0	0	0	3	O
33	129	94	106	73	127	95	106	66	1	1	0	0	0	1	0	0	0	0	2	L
34	140	82	101	76	124	73	90	75	1	1	1	0	0	1	0	0	0	0	2	O
35	121	84	96	70	120	85	97	68	1	1	1	0	0	1	1	0	0	0	1	L
36	122	84	97	72	123	95	98	69	1	1	0	0	0	0	0	0	0	0	4	L
37	128	90	103	67	121	85	97	61	1	1	0	0	0	1	0	0	0	0	1	L
38	111	80	90	114	103	71	82	77	1	1	0	0	0	1	1	0	0	0	3	O
39	128	90	102	75	121	85	97	89	1	0	0	0	0	0	0	0	0	0	2	O
40	128	91	103	73	121	87	98	70	1	1	0	0	0	1	1	0	0	0	2	L
41	115	78	87	77	118	74	85	79	1	1	0	0	0	0	0	0	0	0	2	O
42	126	84	98	77	125	89	101	74	1	1	1	0	0	0	0	0	0	0	3	L
43	135	92	106	91	133	86	102	84	1	1	1	0	0	0	0	0	0	0	2	O
44	135	97	110	105	128	81	95	89	1	1	0	0	0	0	0	0	0	0	2	L
45	130	94	106	79	117	92	100	80	1	0	0	0	0	0	0	0	0	0	1	L
46	134	76	95	88	118	74	89	93	1	1	1	0	0	0	0	0	0	0	2	L
47	127	81	96	84	112	78	89	81	1	1	1	0	0	1	1	0	0	0	1	O
48	136	78	97	95	128	85	99	88	2	1	1	0	0	1	1	1	0	0	2	L
49	132	86	101	72	124	76	92	74	1	1	1	0	0	1	0	0	0	0	1	L
50	138	82	101	76	128	82	97	79	1	1	0	0	0	1	0	0	0	0	2	L

***All values of systolic blood pressure, diastolic blood pressure and mean arterial pressure in millimeters of mercury (mmHg)*

***All values of heart rate are beats per minute (/bpm)*

L- Laproscopic surgery

O- Open type surgery

F- Female

M- Male

MPG- Mallampati Grading