A Dissertation on

"RANDOMISED CONTROL STUDY COMPARING THE HAEMODYNAMIC CHANGES TO INTUBATION USING LEVITAN OPTICAL STYLET ALONE VERSUS INTUBATION USING LEVITAN OPTICAL STYLET ALONG WITH MACINTOSH LARYNGOSCOPE"

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DECLARATION BY THE CANDIDATE

I, **Dr.D.PREETHI** , solemnly declare that the dissertation, titled **"RANDOMISED CONTROL STUDY COMPARING THE HAEMODYNAMIC CHANGES TO INTUBATION USING LEVITAN OPTICAL STYLET ALONE VERSUS INTUBATION USING LEVITAN OPTICAL STYLET ALONG WITH MACINTOSH LARYNGOSCOPE"** is a bonafide work done by me during the period of NOVEMBER 2013 to AUGUST 2014 at Government Stanley Medical College and Hospital, Chennai under the expert guidance of **Dr.MATHAN KUMAR , M.D ,D.A ,** Professor and Head, Department Of Anaesthesiology, Government Stanley Medical College, Chennai.

This thesis is submitted to The Tamil Nadu Dr. M.G.R. Medical University in partial fulfilment of the rules and regulations for the M.D. degree examinations in Anaesthesiology to be held in April 2015.

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ABBREVIATIONS

HR-Heart rate

SBP-Systolic blood pressure

DBP-Diastolic blood pressure

MAP-Mean Arterial pressure

mm hg-millimeters of mercury

SPO_2-Oxygen saturation

HPA-Hypothalamopituitary adrenal axis

SAM-Sympathethic adrenomedullary system

ECG-Electrocardiogram

Levitan FPS-First Pass Stylet

ASA-American Society of Anaesthesiologist

SD-Standard Deviation

$ETCO_2$-End Tidal Carbon dioxide

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CHAPTER 1

INTRODUCTION

Airway management is the fundamental aspect of anaesthetic practice and emergency and critical care medicine . Endotracheal intubation is a rapid, simple, safe and non surgical technique that achieves all the goals of airway management, maintains airway patency, protects the lungs from aspiration and permits leak free ventilation during mechanical ventilation, and so remains the gold standard procedure for airway management[1].Since the upper airway is highly innervated by glossopharyngeal and vagus nerves, airway instrumentation results in significant haemodynamic responses.

The circulatory response to laryngeal and tracheal stimulation following intubation manifested as reflex sympathoadrenal stimulation and was described early in 1940 by Reid and Bruce[2].

Sympathoadrenal responses such as increase in heart rate,blood pressure though short lived ,have detrimental effects in high risk patients especially those with cardiovascular diseases,increased intracranial pressure or anomalies of cerebral vessels[3].

Laryngoscopy and tracheal intubation induced pressor response have been associated with increase in catecholamine levels such as norepinephrine and epinephrine[4].Rise of these catecholamines are associated with the elevation of blood pressure and heart rate.

Intubation period is considered as one of the greatest risk in surgical patients with coronary diseases. Although the response may be transient,it is significant and is of great concern[5,6].

Cardiovascular responses to intubation and laryngscopy have been extensively studied over past three decades.Many factors affect these responses such as technique of laryngoscopy and intubation and use of airway gadgets such as optical stylets,light wand,fiberoptic bronchoscopy[5].

Haemodynamic responses during intubation to secure the airway posses a leading cause of morbidity and mortality in the operative and emergency settings. Failure to attenuate these responses can lead to catastrophic outcomes[7].Problems with tracheal intubation and pressor responses remains the major cause of death and disability due to anaesthesia in analysis of records of UK medical defense socities and in the American Society of Anaesthesiology closed claim database.Though these hemodynamic responses are inevitable they can be reduced to a certain extent by pharmacological and mechanical methods.These issues have stimulated the development of the novel techniques of intubation with optical stylet with the aim of reducing the pressor response to intubation.

In 1979 Katz and Benz coined the term optical stylet. In 1994,Dr.Richard Levitan ,deviced the optical stylet for difficult and emergency intubations for securing the airway.

Whether this optical stylet can bypass the haemodynamic responses in routine normal intubations are yet to be confirmed in our Indian population.

So a prospective randomised study evaluating the haemodynamic responses using both the Levitan optical stylet and Macintosh laryngoscope in adult patients in elective general anaesthesia cases was undertaken in our Stanley medical college.

AIMS AND OBJECTIVE

CHAPTER 2

AIM

A randomised control study comparing the haemodynamic changes to intubation using Levitan optical stylet alone versus intubation using Levitan optical stylet along with Macintosh laryngoscope.

OBJECTIVE

PRIMARY OUTCOME MEASURES:

To compare the haemodynamic changes to intubation using Levitan optical stylet alone versus intubation using Levitan optical stylet along with Macintosh laryngoscope.

SECONDARY OUTCOME MEASURES:

1. Ease of intubation
2. Intubation time with two techniques
3. Complications
4. Failure rate

HISTORY OF LARYNGOSCOPY AND INTUBATION

Visual examination of the larynx has a history rich in personalities and anecdotes. Before 1800 physicians could only appreciate the larynx anatomy from autopsy specimens.

For more than a hundred years ago tracheotomy was considered a reliable method of intubation. By the end of the late nineteenth century advances in anatomical and physiological sciences and appreciation of germ theory of disease reduced the morbidity and mortality in this procedure.

It was in twentieth century when there was a transformation of the practices of tracheotomy, endoscopy and non surgical tracheal intubation to the essential components of the practices of various fields like anaesthesia, critical care, gastroenterology, surgery and pulmonology.

The first man to visualise the glottis apparatus and the uppermost part of trachea and to present his observations at royal society London was a Spanish vocal was Manuel Garcia.

On 23rd April 1895 Alfred Kirsten of Germany visualised the vocal cord directly using an oesophagoscope.

In 1913 Chevalier Jackson reported highest success rate for direct laryngoscopy and introduction of new laryngoscope blade with light source at the distal tip.

Janeway popularised the use of direct laryngoscopy in the practice of anaesthesiology.

In 1943 Sir Robert Reynolds Machintosh achieved significant advances in tracheal intubation by using a curved laryngoscope blade which remains to this date the most widely used blade for orotracheal intubation.

Besides the conventional laryngoscopy many alternatives to direct laryngoscopies have been developed. They are Indirect Fibroptic viewing laryngoscopes like flexible fibroptic bronchoscope which is also known as Rhinoscope, which is indispensible in Otorhinolaryngology.Other fibroptic laryngoscopy devices are Bullard scope, Upsher

scope, Wu scope. In case of difficult intubation these instruments are used extensively.

In 1966 Schigato Ikeda proposed his idea for flexible fibroptic bronchoscope which is a very flexible instrument inserted into rigid bronchoscope.

Conventional direct laryngoscopy is now replaced by video laryngoscopy, due to frequent failure in direct laryngoscopy procedure. The fibroptic viewing laryngoscope has a limitation of fogging of lens.In an attempt to overcome these problems Mr. John Berall from New York City designed straight video laryngoscope in 1988.

In 1979 Katz and Berci coined the term optical stylet.

Since 1995 more than ten optical stylet devices have been deviced.Murphy's successful nasal intubation with cholidochoscope placed through a tracheal tube lead to the invention of fibroptic technology for intubation.

In 2001 general surgeon John Allen Pacey deigned the first commercially available video laryngoscope.

In 1994 Dr Richard Levitan, an emergency medicine resident at Bellevue hospital felt the lack of modality in difficult airway lead to the invention of shikani optical stylet in 1999. Its shorter version FPS was invented.

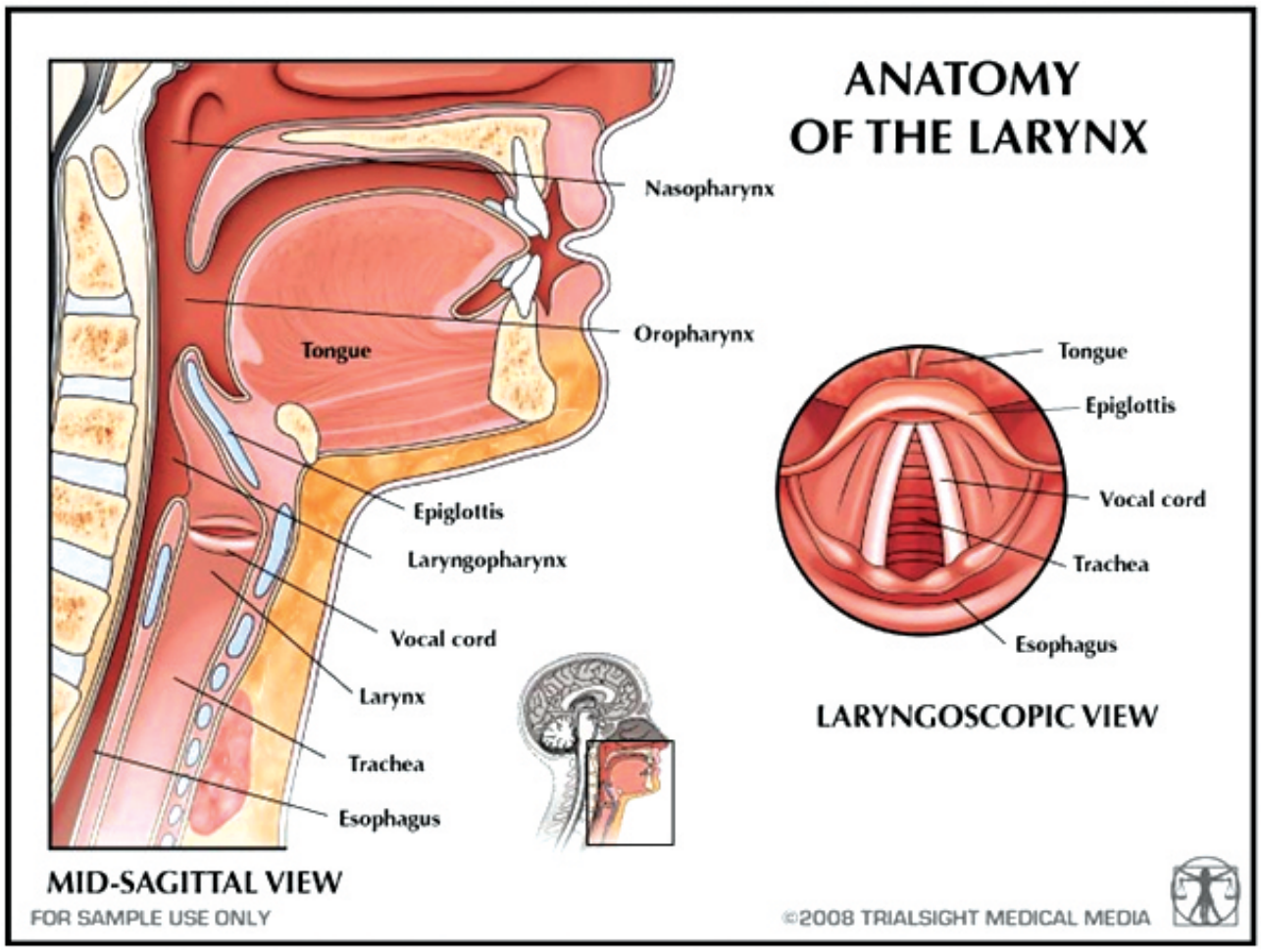
ANATOMY

Laryngoscopy and tracheal intubation involves manipulation of the upper airway. Larynx is located within the anterior aspect of neck opposite the third to sixth cervical vertebra. Its primary function is to allow the passage of air and preventing others secretions and foreign bodies.

Larynx consists of framework of articulating cartilages linked together by ligaments which moves in relationship to each other Mainly sensory part of the airway is of concern during cardiovascular response to laryngoscopy and intubation.

The airway involves nasal cavity, oral cavity, pharynx, larynx, trachea and bronchial divisions

Fig1. Anatomy of larynx - midsagittal and laryngoscopic view

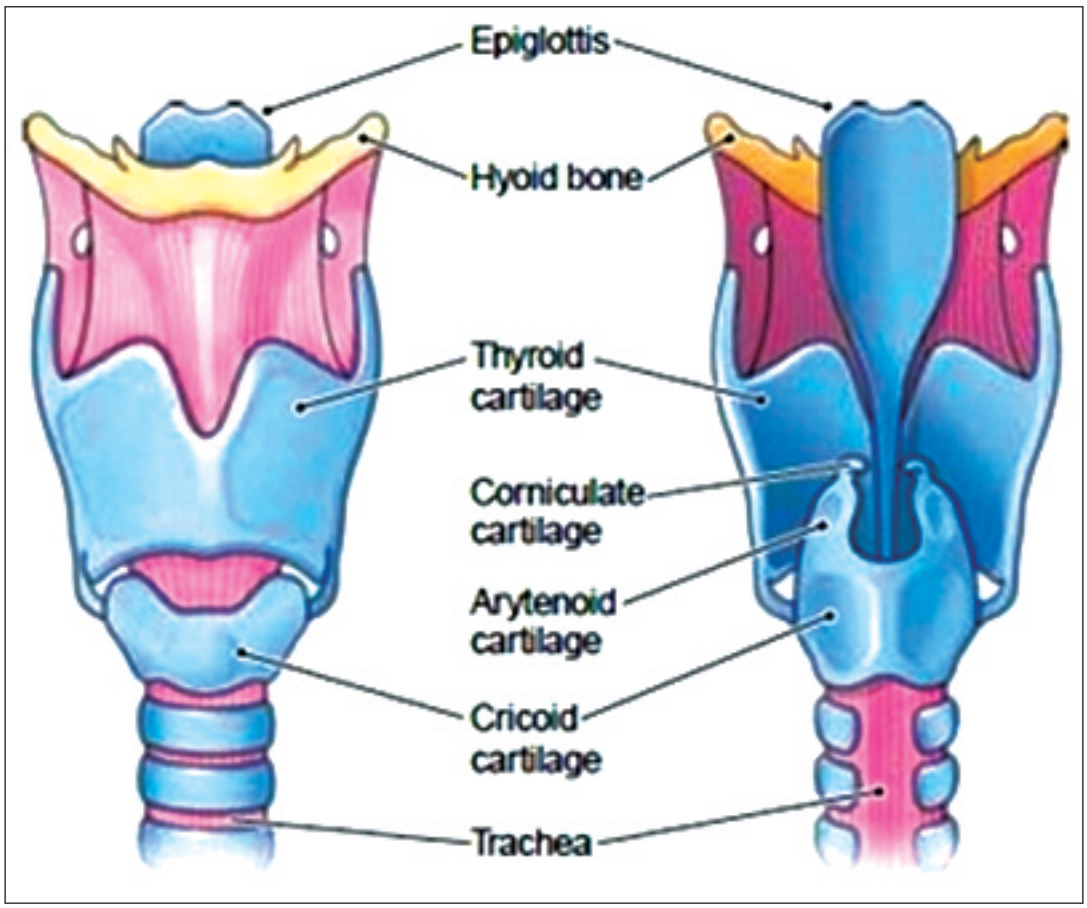


CARTILAGES:

Three unpaired : Thyroid ;Cricoid ;Epiglottis

Three paired : Arytenoid ; Corniculate ; Cuneiform

Fig2. Cartilages of larynx



CRICOID CARTILAGE:

Its a complete ring of hyaline cartilage around trachea which has a shape of signet ring. It attaches to thyroid by cricothyroid membrane. Superior thyroid artery traversing the upper part of the membrane. Hence incision in the lower part of the membrane is recommended.

THYROID CARTILAGE: It is the largest cartilage of larynx.

EPIGLOTTIS: It is the leaf shaped structure between base of the tongue and larynx. The tip of Macintosh laryngoscope blade rest in valleculla which is the common site of impaction of foreign body in the upper airway.

ARYTENOID: Three sided pyramid shape lateral extension of base is muscular process. medial extension is vocal process.

SENSORY INNERVATION OF THE AIRWAY:

NASAL CAVITY:

Innervated by ophthalmic and maxillary divisions of trigeminal nerve.

- Anterior and upper part of the septum, anterior roof, anterior parts of middle and inferior conchae with lateral walls in front of it are supplied by anterior ethmoidal nerve ,branch of nasociliary nerve
- Vestibule supplied by infraorbital nerve
- Floor near anterior spine, part of septum ,anterior part of the lateral wall receives branches from superior alveolar nerve
- Posterior three quarters of lateral wall, roof ,floor and septum are innervated by branches of pterygopalatine ganglion and anterior palatine nerves.

All nerves except nasociliary nerve supplied by maxillary nerve. Nasociliary nerve is a branch of ophthalmic nerve

ORAL CAVITY

Oral cavity innervated by trigeminal and glossopharyngeal nerves

TONGUE:

In presulcal area of the tongue general sensation is carried by the lingual branch of the manidular nerve. Taste sensation by the chorda tympani nerve, a branch of facial nerve.

In postsulcal area (posterior 1/3)of tongue both general and taste sensation carried by glossopharyngeal nerves

PALATE

Greater,lesser and nasopalatine branches of maxillary nerve and glossopharyngeal nerve provides sensory supply to the palate

JAW

Upper jaw-receives anterior and posterior alveolar nerves while lower jaw receives inferior alveolar nerve along with contribution from buccal and lingual nerves

PHARYNX:

Pharynx is supplied by pharyngeal plexus which is formed by glossopharyngeal nerve and sympathetic postganglionic fibres from superior cervical ganglion and parasympathetic fibres through glossopharyngeal nerve.

EPIGLOTTIS:

Pharyngeal surface of the epiglottis by the glossopharyngeal nerve

Laryngeal surface by the vagus nerve

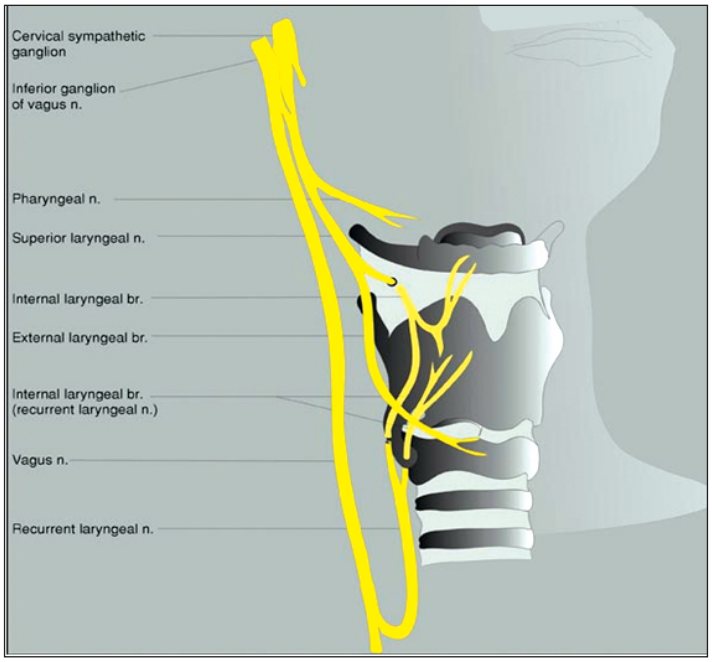
LARYNX

The main nerves of the larynx are the recurrent laryngeal nerve, internal and external laryngeal branches of the superior laryngeal nerve

External branch of superior laryngeal nerve gives motor innervations to cricothyroid muscle.

Recurrent laryngeal nerve gives motor supply to all other muscles of the larynx.

Fig3. Nerve supply of larynx



It also provides sensory supply to the mucosa of the larynx below the level of vocal cords

TRACHEA:

Vagus , recurrent laryngeal branch of vagus and sympathetic nerves from superior cervical ganglion carry sensory impulses from the trachea.

BRONCHIAL TREE:

Vagus as parasympathetic and post ganglionic fibers from inferior cervical ganglion and middle cervical ganglion as sympathetic parts of the autonomic system supply the bronchial tree.

Sympathetic supply to the airway is derived from thoracic 1-5 segments of the spinal cord.

PHYSIOLOGY OF SYMPATHETIC RESPONSE TO LARYNGOSCOPY AND TRACHEAL INTUBATION

Laryngoscopy and tracheal intubation are frequently associated with sympathetic response. Diagnostic laryngoscopy under anaesthesia and tracheal suctioning are also associated with adverse circulatory changes[12]. Severe hypertension, tachycardia, increase in intracranial pressure can also be seen[13,6] . This haemodynamic response has two components, initially to laryngoscopy and then to the tracheal intubation. Stress response is primarily regulated by two neuroendocrine systems-hypothalamopituitary adrenal axis (HPA) and sympathetic adrenomedullary system(SAM)

The predominant response is tachycardia and arterial hypertension.The latter is due to increased cardiac output and is associated with transient rise in central venous pressure.

Sympathetic innervation via the cardioaccelerator fibres from the upper five thoracic segments increase the rhythmicity of the sinoatrial node and enhances the rate and force of contraction .Sympathetic system plays a little role at rest

Supraglottic traction during laryngoscopy[15] or superficial stimulation of airway or passage of tracheal tube into trachea may be associated with reflex sympathetic changes[16]. Other contributory factors to hypertension and tachycardia like anxiety, baroreceptor mediated reflex after induction etc are less important than laryngotracheal stimulation. The tracheal intubation following laryngoscopy is not only accompanied by increased sympathetic activity but also increased sympathoadrenal activity.

Increased hypothalamic activity and increased traffic in sympathetic efferent tracts are observed. Release of trophic hormones from hypothalamus stimulate release of ACTH, TSH, GH, FSH, lutenizing hormone and prolactin in addition to ADH from the pituitary[14].

Afferent impulses are carried through trigeminal, glossopharyngeal, vagus and sympathetic nerves from the airway. These impulses are relayed in cranial nerve nuclei,

vasomotor and autonomic regulatory areas. Key areas that integrate cardiovascular responses and maintain cardiovascular system homeostasis are nucleus solitarius, dorsal vagal nucleus, nucleus ambiguous and parabrachial nucleus[13].

The nucleus solitarius is the area of primary central synapse for baroreceptor mediated reflexes and relay station for peripheral information to hypothalamic sympathetic control centers. It projects directly to intermediolateral nucleus of the spinal cord, the common pathway for preganglionic sympathetic outflow. This along with nucleus ambiguous play an important role in control of secretion of vasopressin[17].

Increase in sympathetic and hypothalamo pituitary adrenal activity is responsible for cardiovascular changes seen with laryngoscopy and tracheal intubation.

Different studies have shown rise of mean blood pressure of 20-40 mm hg when compared with awake control levels and 35-60 mm hg when compared with preintubation values [18] and elevation of plasma noradrenaline and adrenaline by 45% and 40% respectively [19].A correlation between changes in mean arterial pressure and noradrenaline and pulse pressure or heart rate and adrenaline is found.

Norepinephrine levels may double from 160 to 300 pg/ml and continue for 4 to 8 minutes. Epinephrine levels may quadruple from 70 to 280 pg/ml.

Surprisingly increase in plasma noradrenaline concentration and mean arterial pressures of upto 100% and 50% respectively can be correlated whereas noradrenaline concentration can increase upto 200% of the basal value[14].

SUGGESTED MECHANISM OF HAEMODYNAMIC RESPONSE[20,21]

LARYNGOSCOPY AND ENDOTRACHEAL INTUBATION

↓

STIMULATION OF MECHANORECEPTORS IN LARYNX

↓

AFFERENT STIMULI THROUGH IX AND X CRANIAL NERVES TO MEDULLA

↓

REFLEX ACTIVATION OF VASOMOTOR CENTER

↓

SYMPATHETIC NEURAL OUTPUT

↓

ADRENAL MEDULLA HEART

↓

RELEASE OF CATECHOLAMINE BLOOD VESSELS

↓

PRESSOR RESPONSE

TACHYCARDIA

HYPERTENSION

RAISED INTRACRANIAL PRESSURE

RAISED INTRAOCULAR PRESSURE

PATHOLOGICAL RESPONSE TO INTUBATION

- Significant neuro endocrine responses such as tachycardia and hypertension occur during airway manipulation in patients with cardiac disease, particularly myocardial ischemia which is evident by ST segment depression in ECG and increased pulmonary artery diastolic blood pressure[22]. So it is essential to maintain heart rate and blood pressure of these patients within 20 % of the normal awake value.[23]
- Myocardial ischemia occurs when there is a mismatch between oxygen supply and demand
- Laryngospasm reflex initiated during intubation, wherein the afferent being the glossopharyngeal nerve and efferent is vagus. It is a monosynaptic response, occurs when the patient is in the lighter plane of anaesthesia Intracranial aneurysms and AV malformations can even rupture during laryngoscopy. Autoregulation will be impaired in patients with intracranial mass lesions, brain edema or acute hydrocephalus, so during endotracheal intubation there is a increase in arterial blood pressure with marked increase in cerebral blood flow and blood volume causing a dangerous increase in intracranial pressure leading to cerebral catastrophy (brainstem herniation and death).

METHODS ACCENTUATING THE STRESS RESPONSE

- Improper alignment of the three axes (oropharyngeal and laryngeal axes)
- Laryngoscopy blade which impinges on the vallecula and epiglottis
- More stimulation of cardioaccelatory fibres by the mechanical laryngoscopy blades
- More force on the glottis structures during intubation
- Poor head extension and neck flexion
- Lighter plane of anesthesia
- Prolonged intubation time
- Less expertise in laryngoscopy

METHODS OF ATTENUATING HAEMODYNAMIC RESPONSE TO INTUBATION

Stress response to intubation can be attenuated by the following methods

- Mechanical factors
- Pharmacological methods

PHARMACOLOGICAL METHODS: aimed at different levels of the reflex arc.

➢ Block of the peripheral sensory receptors and afferent input - topical application and infiltration of superior laryngeal nerve.

➢ Block of the central mechanisms of integration of sensory input - fentanyl, morphine, droperidol etc.

➢ Block of the efferent pathway and effector sites - IV lignocaine, ß-blockers, calcium channel blockers, hydralazine etc. [24]

PHARMACOLOGICAL METHODS:

1. Local Anesthetics: Lignocaine

a)It is given as a viscous gargle for oropharyngeal anaesthesia

b)aerosol for intratracheal anaesthesia

c)intravenous

d)local instillation or local spray around the vocal cord

e)regional nerve blocks

2. **)** Vasodilators –Nitroglycerine

Sodium Nitroprusside

Hydralazine

3) Magnesium sulphate

4) Narcotics –Fentanyl, Sufentanil, Remifentanil, Morphine, Pethidine.

Fentanyl is the most commonly used narcotic.It is a potent analgesic, has a short duration of action, does not increase intracranial tension and has minimal circulatory changes.

5) Calcium channel blockers- Nifedipine, Nicardipine, Verapamil, Diltiazem

6) Adrenergic blockers –Beta blocker-Metoprolol, Esmolol

-Alpha blocker-Phentolamine

Alpha and beta blocker-Labetalol

7) Central sympatholytics- Clonidine and Dexmedetomidine. They act by decreasing central sympathetic outflow.

8) Sedatives and anxiolytics.

MECHANICAL METHODS to attenuate the stress response:

It has been observed that amount of forces exerted during laryngoscopy and intubation is the key determinant for mechanical stimulation of stretch receptors present in the respiratory tract[25]. Over more than ten decades intubation was done with conventional Macintosh laryngoscope and it is associated with significant haemodynamic changes mainly due to the forces exerted by the laryngoscopy blade on the vallecula and it is more vunerable in high risk patients such as ischemic heart disease ,cerebrovascular disease patients. This need to be prevented.

- In early 90 s **McCoy laryngoscopic blade** was introduced and there is hinge on the distal part of the blade to avoid lifting force on the vallecula
- Intubating devices such as **airway scope and glidescope (videolaryngoscope**) introduced by Japanese associated with less haemodynamic response.Video laryngoscope do not require alignment of oral, pharyngeal and laryngeal axes for visualization of glottic structures and endotracheal intubation. Airway scope designed in such a manner to confirm to the contour of the pharynx and mouth and reduced movement of the neck is necessary for intubation. Glidescope with its unique 60° curvature functions independent of line of sight and reduces upward lifting force
- **Intubation using an intubating laryngeal mask airway**: The laryngeal mask airway offers a much less invasive way of maintaining the airway as it does not pass through the glottis but is placed over the glottis. It does not require instrumentation i.e. use of the laryngoscope. It acts as an intermediate between the endotracheal tube and the oropharyngeal airway
- **Intubation using Fibreoptic bronchoscopy**:Fiber optic bronchoscope is the gold standard for difficult intubation.it consists of the fiberoptic system which transmits images from the tip of the instrument to the eyepiece or the video available in different sizes 2.5 mm,3.5mm and 5.5 mm .Intubation using

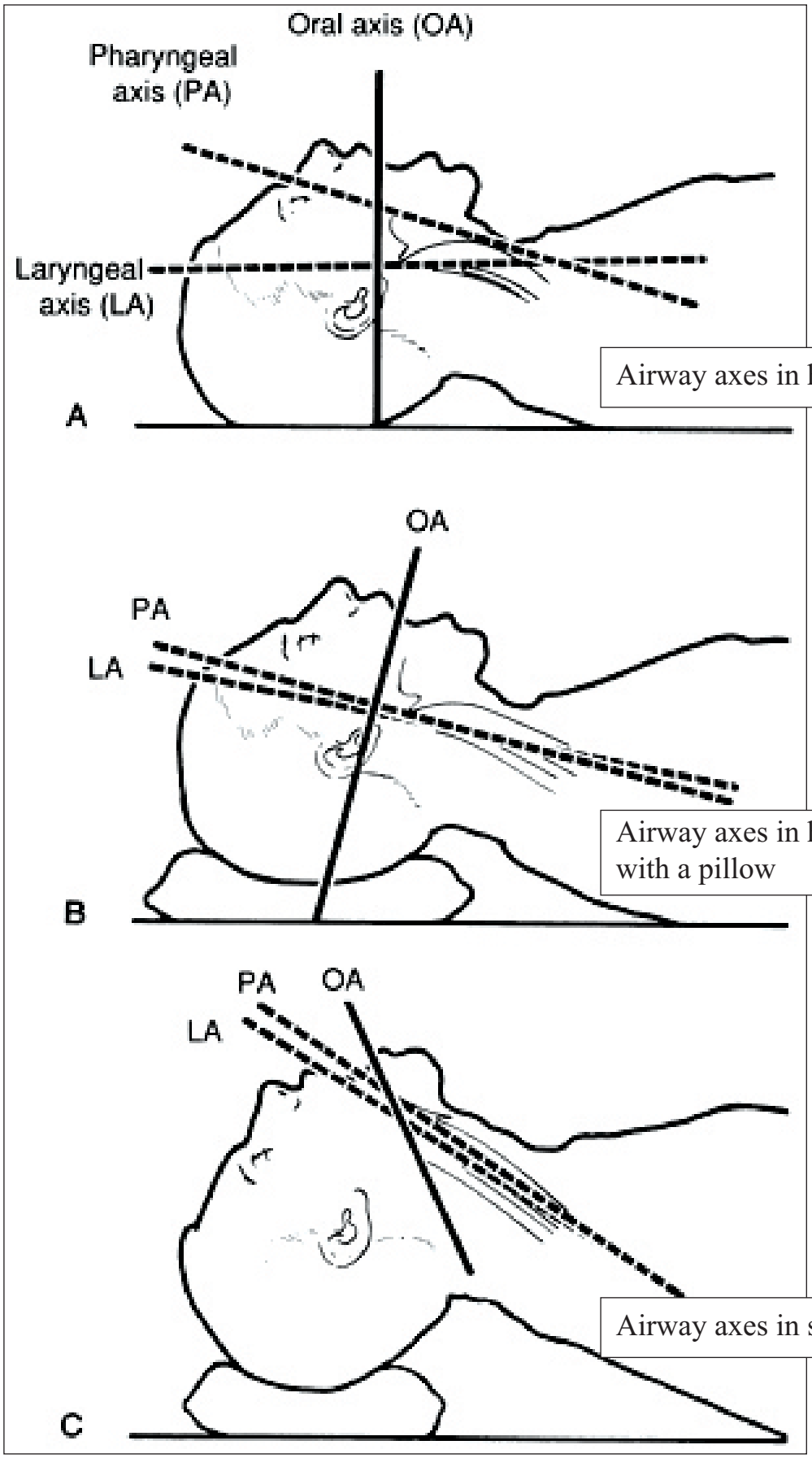
fiberoptic bronchoscopy requires higher expertise for securing the airway and it is not portable, can't be used in emergency difficult airway situations.

- **Intubation using light wand:** Light wand relies on the principle of transillumination of the tissues of neck. The light serves to guide the tube into the larynx. Direct visualization of larynx is not required for successful use.

Airway axes[26]

- To maximize the potential exposure of the glotting opening, it is essential that oral axis,pharyngeal axis and laryngeal axis approximate a straight line thereby affording the shortest distance from the teeth to the glottis opening
- This is best done by placing the patient in a position called as "sniffing" position.
- Elevating (using a blanket,folded towels,foam rest,etc) the occiput approximately 10 cm higher than the shoulder blades provide the necessary cervical flexion to better align the laryngeal and pharyngeal axes.
- Extension of the head on the atlanto occipital joint by the practioner's free hand (or by an assistant) will serve to maximally align the oral axis with the laryngeal and pharyngeal axes.
- Sniffing position is considered the optimal "classical" position of the head and neck for facilitating intubation proposed by MAGILL IN 1936.
- This sniffing position is essential for both direct laryngoscopy and fiberoptic stylet intubation
- Improper alignment can lead to difficult and failed intubation.

Fig4. Airway Axes



Conventional Macintosh laryngoscope[10]:

Laryngoscopes are used to view the larynx and adjacent structures, most commonly for the purpose of inserting a tube into the tracheobronchial tree.Other purposes including placing a gastric tube or transesophageal echocardiac probe, foreign body removal and visualizing and assessing the upper airway[27].

Parts of laryngoscopes are

1.Blade

2.Handle

Fig5. Picture of conventional Macintosh Laryngoscope

Blade:

The blade is the component that is inserted into the mouth. Blades are in available in more than one size, the blades are numbered ,with the number increasing with size. The blade is composed of several parts, including the base, heel, tongue,flange,web,tip,and light source.

Fig6. Parts of Macintosh Laryngoscope

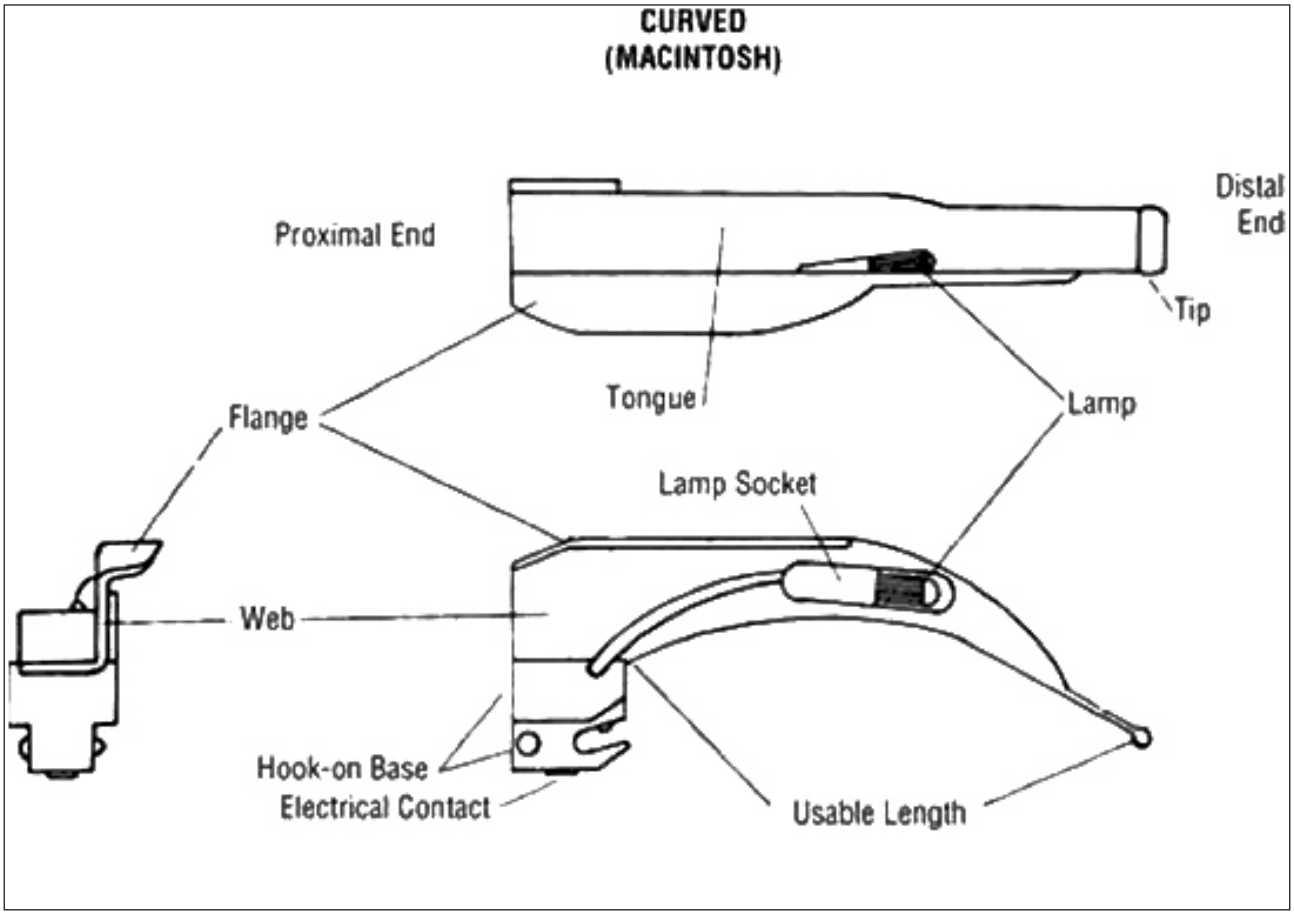


Table 1: Different sizes of Macintosh Laryngoscope blades[28]

Markings	**Intended use**
0	Neonate
1	Small child
2	Child
3	Adult
4	Large adult

BASE is the part that attaches to the handle. It has a slot for engaging the hinge pin of the handle. The end of the base is called the **Heel.**

Tongue(Spatula) is the main shaft. It serves to compress and manipulate the soft tissues(especially the tongue) and lower jaw. The long axis of the tongue may be straight or curved in part or all of its length. Blades are commonly referred to as curved or straight ,depending on the predominant shape of the tongue.

Hook-on(hinged,folding) connection between the handle and blade is most commonly used. The handle is fitted with a hinge pin that fits into a slot on the base of the blade. This allows the blade to be quickly and easily attached or detached. A single-piece laryngoscope has a switch on the handle that controls power to the lamp.

The light source is a bulb attached to the blade. For a detachable handle and blade, the light source is energised when the blade and handle are locked in the operating position[25].

The Flange projects off the side of the tongue and connected to it by the web. It serves to guide instrumentation and deflect tissues from the line of vision.

The Tip(beak) contacts either the epiglottis or the vallecula and directly or indirectly elevates the epiglottis. It is usually blunt and thickened to decrease trauma.

Lamp(bulb) that transmits light from a source in the handle. The lamp screws into a socket that has a metallic contact. On most blades, the socket is located near the tip. When the blade is in the working position, electrical contact with the power source in the handle is made. The socket is subject to soiling by fluids that can affect the electrical contacts, causing the light to fail.

Handle: The handle is the part held in the hand during use. It provided the power for the light .Most often, disposable batteries are the power source. Handles with rechargeable batteries are available. Handle designed to accept blades that have a light bulb have a

metallic contact, which completes an electric circuit when the handle and blade are in the working position. Handles containing batteries and using fibreoptic illumination contain a halogen lamp bulb. When the handle and blade are locked in the working position, an activator switch is depressed. This provides a connection between the bulb and batteries. A halogen lamp bulb has longer life than other light bulbs.

LEVITAN OPTICAL STYLET

Dr. Richard Levitan was instrumental in designing optical stylet Levitan in 1999 which revolutionised the management of emergency and difficult airways by the anaesthesiologists, otolaryngologist and emergency physicians all over the world[26].

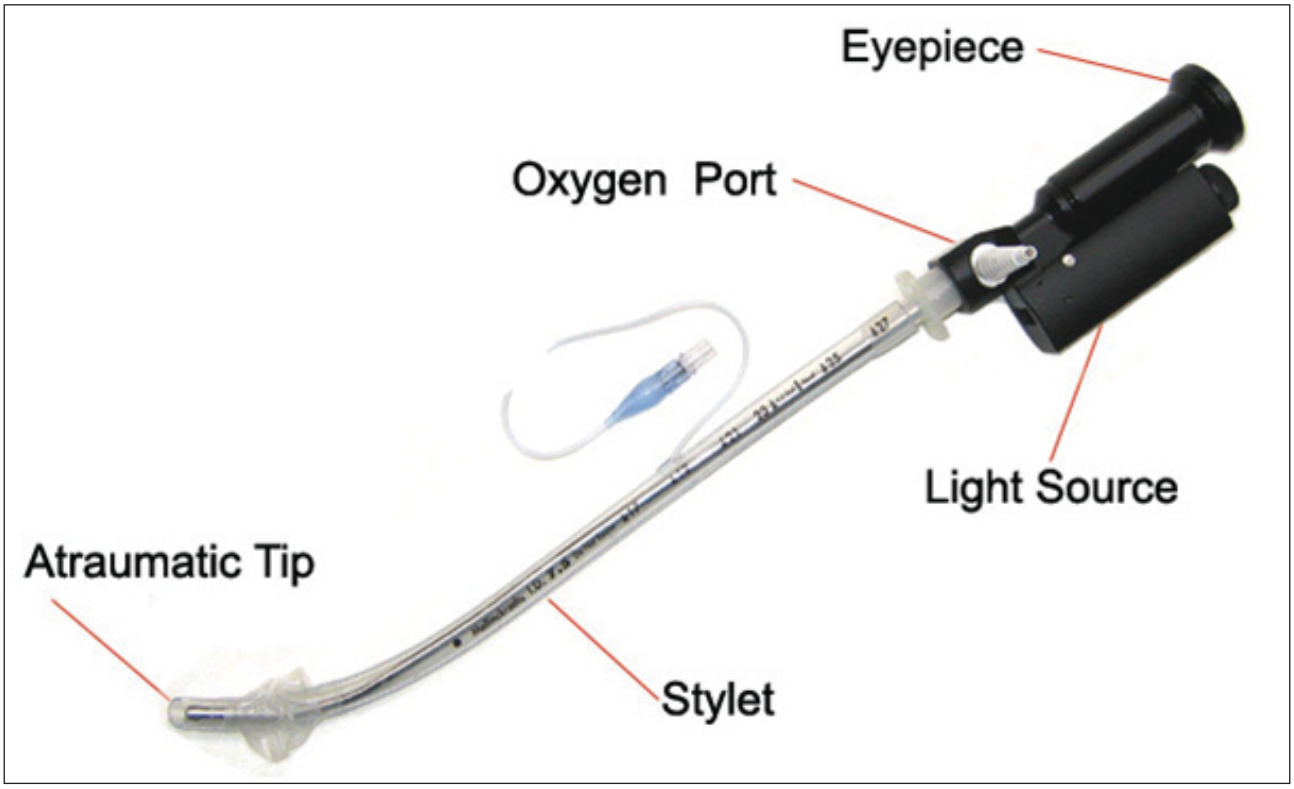
DESIGN OF LEVITAN[27]

It serves dual purpose of direct laryngoscopy and fibreoptic intubation.

Parts of the Levitan are

- Battery operated light source
- High resolution eye piece
- Port for oxygen insufflations
- Malleable stylet
- Atraumatic airway tip

Fig7. Picture of Levitan Optical Stylet



Levitan optical stylet has a narrow stylet diameter of 5 mm allowing it to pass through nose or mouth.It is highly flexible and malleable instrument allowing it to conform to the anatomy of the patient.Navigation of the Endotracheal into trachea under visualisation is possible with high resolution eyepiece with fibreoptics. Levitan optical stylet is 29 cm in length[29]. It is used as an independent device for difficult intubation and for correct placement of endotracheal tubes. It has a port for oxygen. Working channel can be used to instill local anaesthetics to anesthetise the airway. It is portable and reusable. It can be connected to CCTV system which aids in teaching and training. Endotracheal tube is trimmed at 28 cm .Distal end of the optical stylet is bend at 35 degrees[28].The Levitan optical stylet is holded in a piston grip for easy fiberoptic intubation.

Fig8. Picture depicting holding of the Levitan Optical Stylet with Piston Grip

APPLICATIONS

1. The laryngeal structures can be visualised clearly along with associated abnormalities.
2. In difficult endotracheal intubation like mandibular hypoplasia ,obstructed airway,post radiotherapy patients ,fixed cervical spine.
3. For confirming the correct placement of endotracheal tubes
4. For insertion of Ryles tube.
5. Better views can be obtained with fiberoptic imaging

REVIEW OF LITERATURE

CHAPTER 3

REVIEW OF LITERATURE:

Yao yun –tai et al [33]in 2008 compared the endotracheal intubation with optical stylet using left molar approach and direct laryngoscopy. After getting informed consent from patients and ethical committee clearance.40 normotensive [ASA PS 1] and 40 hypertensive patients [ASA PS 2,blood pressure .140/90 known hypertensive on antihypertensive medication] scheduled for elective surgery under general anaesthesia were included in the study.They were randomised into four groups according to computer generated randomisation table.Group 1: Direct laryngoscopy in normotensive patients. Group2:Shikani optical stylet in normotensive patients. Group 3:Direct laryngoscopy in hypertensive patients. Group 4:Shikani optical stylet in hypertensive patients. Exclusion criteria were as follows : MPC 3-4,upper airway abnormalities such as oropharyngeal abscess, vocal cord polyp etc and respiratory illness such as asthma,tobacco,infection etc.neck surgery patients were also excluded.Premedication was spared. All antihypertensive drugs were continued by hypertensive patients. In addition they were given tab nifedipine 5 mg .Diastolic BP ,saturation,Heart rate were monitored.Midazolam 2mg and Fentanyl 100 microgram were administered.After preoxygenation for five minutes Propofol 2 mg/kg was given.After the loss of eye lash reflex patient ventilated manually.Patient in group 1 and group 3 intubated with conventional laryngoscopy.Group 2 and Group 4 intubated with optical stylet .Statistical analysis: Haemodynamic changes were analysed by ANOVA and unpaired t test. Using chi square test male female ratio ,airway classification were studied.The significance was set at $p<0.05$ .RESULTS :The groups were compared based on gender, age, weight, height and airway classification. There was no difference in intubation duration among the four groups and all were completed in first attempt. The baseline blood pressure was significantly higher in hypertensive group than those in the normotensive group.

Remarkable reduction in systolic blood pressure and diastolic blood pressure after anaesthesia induction was seen in all four groups. No change was noticed in heart rate following induction but increased at one minute after intubation. Significant increase over baseline values of systolic blood pressure and diastolic blood pressure was seen at one minute following direct laryngoscopy in both groups, while in the other group no change in blood pressure was recorded within five minutes following intubation when compared with their baseline values. Major finding in this study is that the haemodynamic response when using optical stylet by means of left molar approach was less significant than those by direct laryngoscopy in both normotensive and hypertensive patients.

Islam A.Eliwa et al [34]compared the efficacy and safety of each of levitan and shikani optical stylet used alone or with direct laryngoscopy for tracheal intubation from April 2011 to January 2013. n= 200.This study was carried out on two hundred ASA physical status I and II of both sex adult patients scheduled for elective surgery, under general anaesthesia.They were divided into four groups. Group I:Levitan optical stylet was used alone for tracheal intubation with manual chin lift. Group II:Levitan optical stylet used with Macintosh laryngoscope to retract the base of the tongue. Group III: Shikani optical stylet used alone. Group IV: Shikani optical stylet along with Macintosh laryngoscope. The intubation successs rate, time and complications related to intubation were recorded in each group. Statistically the patients of the four groups were comparable in age ,sex ,weight ,height ,mallampatti grade ,thyromental distance and inter-incisor gap .The overall intubation success rate of the four groups were statistically similar. With Levitan alone the intubation success rate was 90% and which reached 96% with aid of laryngoscope. The shikani optical stylet intubation rate was 86% and 90% with aid of laryngoscope. The intubation time and degree of difficulty in group 1 were

significantly lesser than in group 3. Similarly group 2 were significantly lesser in group 4.group 2 lesser than group 1.group 4 lesser than group 3.The incidence of the various intubation related complications were statistically similar in all groups. Levitan optical stylet with or without the aid of direct laryngoscopy is more effective than Shikani optical stylet for tracheal intubation with similar results of intubation related complication.

Christopher .F .young et al [35]compared the Shikani optical stylet to direct laryngoscopy for orotracheal intubation in 1996. 90 consecutive patients requiring general anaesthesia were the study group. A single resident intubated the first 45 patients with Shikani optical stylet next 45 patients with laryngoscope and macintosh blade.Intubations were timed and graded as easy,intermediate or challenging.SOS GROUP :The mean time to intubate was 25.3 seconds(range 10-93 seconds).42 patients were graded as easy to intubate and 3 were intermediate.DL GROUP :The mean time to intubate was 29.5 seconds(range 12 -120 seconds).39 intubations were graded easy,4 intermediate. STATISTICAL ANALYSIS :SOS AND DL GROUPS were not statistically different in age, airway indices, body mass index or time taken to intubate.It was found that first year resident could use the SOS as efficaciously and with as few complications as DL.

Butcher et al[36] compared Shikani optical stylet and bougie in difficult intubation .Direct laryngoscopy remains the gold standard method for tracheal intubation.In this study they compared Shikani optical stylet and bougie in a simulated Cormack and Lehane grade 3 laryngoscopy in patients.The study included 25 patients undergoing elective surgery(equal male and females).Anaesthesia was induced with propofol and paralysis achieved with muscle relaxation.To avoid unanticipated airway abnormality

direct laryngoscopy was used. The epiglottis in order to simulate a grade 3 view was allowed to fall back. The patients were then intubated with bougie and then followed with shikani optical stylet. Time from layngoscopy to confirmation of position by capnography was recorded in seconds and also any esophageal intubation was recorded. The median time for successful tracheal intubation was analyzed using Wilcoxin signed rank test. Time taken for stylet was significantly longer than bougie ,41 and 37 seconds.p=0.001).6 esophageal intubations occurred with stylet and 2 with bougie .The Shikani optical stylet has the advantage of visualising the vocal cords.Tracheal intubation was achieved quicker using a bougie.

M Aziz et al [37] conducted the clinical evaluation of levitan optical stylet in the year 2011.A retrospective study with review of anaesthesia and personal records was done .Review of records of 315 adult patients requiring a tracheal tube for elective or emergency surgical procedures was done.It included all clinical records of tracheal intubation with levitan optical stylet and excluded those that were performed by a trainee. In all patients the tracheal tubes were cut at 27 cm and threaded over the stylus portion of a modified optical stylet. Antifog was applied to the stylet. Of the 315 consecutive intubations reviewed,13 were intubated successfully by trainees with levitan stylet.41 were intubated with rapid sequence induction and cricoid pressure.5 were difficult to intubate,subsequently successfully intubated with levitan stylet after release of cricoid pressure. removal of the pillow or application of two handed jaw lift by an assistant.one failed intubation which was intubated successfully with fibreoptic intubation.49 patients at predictors of difficult laryngoscopy.1 intubated with modified levitan scope.1 patient was immobilised with cervical spine collar.4 had neck movement limitation.remaining 44 had mallampatti class 3 or 4 airway.The mean time for intubation was 23 seconds.Median intubation time was 19 seconds.3 documented

traumatic laryngoscopies.No patient suffered from dental damage,there were no oesophageal intubations.

In conclusion this study demonstrated that levitan optical stylet may be used as an effective rapid and safe tool for intubation in an opearation theatre even in patients considered having difficult airway.It may be appropriate as a alternative when direct laryngoscopy fails rather than primary device for intubation.

D.S .Phua et al[50] studied the optical stylet as an alternative to the glidescope in simulated difficult intubations by randomised controlled trial in 2012. 60 patients of ASA PS III scheduled for elective surgery requiring tracheal intubation where recruited and randomly assigned to 2 groups of 30.Group 1 had their trachea intubated with glidescope videolaryngoscope whereas 2 nd group intubation was done with optical stylet. Inclusion criteria-age between 21 and 65 yrs, valid informed consent and uncomplicated airway. Exclusion criteria-includes known difficult airway, requirement for rapid sequence induction or emergency surgery. Patient baseline features and airway charecteristics in both the groups were similar.Intubation success rate was 100 percent in both the groups. In glidescope group ,successful intubation were seen on first attempt in 29 patients and one requiring 2 nd attempt.In optical stylet group 28 patient was intubated successfully on the first attempt with 2 patients requiring 2 nd attempt. However it appeared subjectively easier to intubate the simulated difficult airway using optical stylet with 27 intubation graded easy compared with 23 in the glidescope group. This was not statistically different.

In 1951 King et al[39] studied the effects of laryngoscopy and tracheal intubation on cardiovascular system which is easily over looked during clinical anaesthesia .They concluded that light general anaesthesia ,direct laryngoscopy and tracheal intubation

uncomplicated by coughing ,anoxia or hypercarbia is capable of producing effects characterised by rise in BP and heart rate. They observed that cardiovascular changes were initiated by laryngoscope pressing on base of tongue or lifting of epiglottis and independent of type of laryngoscope blade used .Deeper anaesthesia obtunded the response.

Stoelting R.K et al [40]studied the effects on blood pressure and heart rate during short duration of laryngoscopy and showed that duration of laryngoscopy less than 15 secs is extremely important in minimising the magnitude and duration of circulatory stimulation with laryngoscopy.

P Tsai, B Chen. et al[41] compared the hemodynamic responses to endotracheal intubation with the Airwayscope,Glidescope and Macintosh Laryngoscopes . Hemodynamic responses to laryngoscopy and tracheal intubation are concerning, as adverse cardiovascular events may result. Two novel video laryngoscopes that may attenuate this stress response in comparison to direct laryngoscopy with the standard Macintosh (MAC) blade are the Airway Scope® (AWS) and the Glidescope® (GS). We performed a randomized prospective study to investigate this hypothesis. 60 normotensive adult ASA I or II patients were enrolled, and randomized to intubation using either AWS (n=20), GS (n=20), or MAC (n=20). A standard induction was performed. All intubations were performed by a single anesthesiologist. Hemodynamic values were recorded at baseline, after induction, at intubation, and at every minute for five minutes after intubation. Intubation time was highly significantly longer in the AWS group and GS group compared to the MAC group ($P < 0.01$, $P < 0.01$, respectively). A significant increase was noted in the GS group in both mean arterial pressure (MAP) and heart rate (HR) at 1 minute post-intubation ($P < 0.05$), although statistical differences became non-significant by 2 minutes post-intubation. Significant decreases in MAP

were observed in the AWS group when compared to the MAC group at 3 minutes post-intubation, remaining statistically significant for the duration of the study ($P < 0.05$). Although intubation times in the AWS and GS groups were prolonged compared to the MAC group, our study suggests that the AWS may be preferable to the GS and MAC when attenuation of the hemodynamic stress response to endotracheal intubation is desired.

MD Harun , Rashid et al[42] compared the haemodynamic changes between Laryngeal mask airway insertion and Endotracheal intubation.60 patients were included in the study.30 were allocated in each group.They were allotted randomly by lot method. According to the card the patient was grouped as group A and group B. Group A: Airway maintained by LMA. Group B : Airway maintained by endotracheal tube. Haemodynamic parameters such as pulse rate, systolic blood pressure, diastolic blood pressure and presence of dysarrythmia were monitored at 1,3,5 and 10 min after LMA insertion or Endotracheal tube insertion. It was found that there was statistically significant changes as $p<0.05$ in heart rate, systolic blood pressure and diastolic blood pressure in group intubated by endotracheal tube and less changes in heart rate, systolic blood pressure and diastolic blood pressure in group intubated by Laryngeal mask airway.

Barak M, Zister A et al[43] compared the haemodynamic and catecholamine responses to tracheal intubation to direct laryngoscopy compared with fiberoptic intubation.It is a randomised prospective study.50 patients of ASA PS 1 and 2 scheduled for elective surgery with general anesthesia were selected.Patient was allotted to either direct laryngoscopy group or fiberoptic intubation group.Uniform protocol of anesthetic medications were given.Baseline parameters such as heart rate,blood pressure were

measured .HR,BP measured before endotracheal intubation and 1,2,3 and 5 minutes .Catecholamine(Epinephrine and norepinephrine) blood samples were drawn before induction and 1 and 5 minutes after intubaton. Results concluded that duration of intubation in the direct laryngoscopy (16.9(16.9+/-7.0 sec,range 8 to 40) was shorter compared with the fiberoptic intubation group(55.0 +/-22.5 sec,range 29 to 120),p<0.0001.In both the groups ,blood pressure and heart rate were significantly increased at 1,2 and 3 minutes after intubation.Catecholamine did not raise in both the groups.The results concluded that there was haemodynamic responses in both the groups.

Mehtab A Haidry et al[44] compared the hemodyanamic response to tracheal intubation with Macintosh and McCoy laryngoscope by randomisation controlled observational study.60 patients scheduled for elective surgery were included in this group and divided randomly based on ASA 1 and 2 with patients of both gender and age groups 18 and 60.Exclusion criteria were patients with history of anticipated difficult intubation, ailments such as diabetes ,hypertensive patients ,ischemic heart disease and chronic obstructive airway disease and body mass index more than 30.The patients were given midazolam 7.5 mg orally as premedication .Preoxygenation with 8 L/min of oxygen via circle system. Fentanyl 2 mcg/kg Thiopentone 5mg/kg Atracurium 0.5 mg/kg were administered to facilitate intubation. Tracheal tube of size 7.5 mm ID and 8.5 mm ID were used for intubation. Non invasive BP ,Heart rate ,oxygen saturation and end tidal carbon dioxide were monitored. Data analysis using SPSS version 17.0 .Repeated measure using ANOVA was used for comparision of baseline parameters.Significant P values were considered if less than 5 %.Paired t test were done for intergroup comparision.The maximum change in heart rate was 18.7 % in the Macintosh and 7.7 % in McCoy group.The difference was significant(p<0.001).The

change in systolic blood pressure was 22.9 % in the Macintosh group and 10.3 % Mccoy group. Haemodynamic changes were lesser with Mccoy laryngoscopes shorter duration and lesser magnitude.

S.Singhal et al [25]compared the hemodynamic response to laryngoscopy and intubation with Mccoy and Macintosh laryngoscope by randomisation method with hundred patients of either sex between 20-50 years and ASA grade I or II. The groups were comparable in mallampatti grading ,laryngoscopy ,intubation time , visualisation grades of layngoscopy and baseline hemodynamic parameters.Spo2 and ECG lead II monitoring was monitored. Chi square test was used for analysis .Paired t test and Unpaired t test was used for analysing laryngoscopy time ,intubation time and hemodynamic parameters. Significance was fixed at p value <0.05.With Macintosh laryngoscope the hemodynamic parameters were increased and statistically significant.The study has its conclusion as less hemodynamic response with Mc coy laryngoscope.

Takahashi et al[45] compared the hemodynamic responses to tracheal intubation with laryngoscope versus lightwand intubating device in adults with normal airway by randomisation method. Sixty adult healthy patients were according to intubating procedure into three groups. Sevoflurane /nitrous oxide was used for anaesthesia. The three groups were first lightwand group intubated with Trachlight. The second group received tracheal intubation with direct laryngoscope. Third group with laryngoscope alone .Exclusion criteria are patients with hypertension ,cardiovascular disease ,or arteriosclerosis ,history of gastroesophageal reflux ,previous history of difficult tracheal intubation. Statistical analysis was done with Bonferroni correction and further compared with paired students test .A p value of <0.05 was considered the level of

statistical significance. No significant difference was observed in terms of age ,weight ,or height. Heart rate and Blood pressure showed no significant difference before anaesthetic induction and insertion of the device .The three groups responded with significant increase in Heart rate and Blood pressure from baseline values to both laryngoscopy and lightwand insertion. The maximum increase was observed in the LWI and LSI groups with heart rate and blood pressure than in LSA group. The result of the study clearly shows greater cardiovascular responses than stimulation by laryngoscopy.

Xue et al [46]compared the haemodynamic response to orotracheal intubation with glidescope videolaryngoscope and Macintosh direct laryngoscope by randomisation method.57 adult patients of ASA I scheduled for elective surgery were included in the study. Patients were induced with IV fentanyl ,propofol and vecuronium , was maintained with 1% isoflurane and 60 % nitrous oxide in oxygen. During the study the two groups were observed for differences in Blood pressure ,heart rate at any point .The product of HR and Systolic BP was measured. The glidescope group showed maximal diastolic BP ,otherwise the difference in BP did not significantly exceed the baseline values($p > 0.05$).When heart rate was compared the glidescope group showed an increase which lasted for 4 minutes whereas the Macintosh group showed increase in heart rate lasting for one minute.To conclude the two groups in BP ,HR at any point or in their maximal values.Hence the hemodynamic response to orotracheal intubation were similar in both the groups.

Kitamura et al[47] studied the attenuation of hemodynamic responses to tracheal intubation by the styletscope.24 patients after obtaining informed consent were included in this group. Exclusion criteria include age group less than 20 and greater than 85 ,ASA IV and risk of regurgitation. Monitoring was done with Electrocardiography

,capnography ,pulse oximetry ,and non invasive arterial pressure.Group 1 was intubated with Macintosh laryngoscope and Group 2 intubated using Styletscope.The maximum hemodynamic response and the time for intubation were recorded. Paired and unpaired t test and chi square were used and statistical analysis using StatView was done. P value <0.05 was statistically insignificant. After intubation there was a significant rise in heart rate in group intubated with macintosh laryngoscopy. Heart rate is a major determinant of myocardial oxygen balance. There was no significant difference in the time taken for intubation. Styletscope is highly efficient as the success rate for tracheal intubation is high. In conclusion Styletscope showed less hemodynamic response to tracheal intubation

MATERIALS AND METHODS

CHAPTER 4

MATERIALS AND METHODS

Eighty patients of ASA physical status one and two undergoing elective ENT surgeries under general anaesthesia with endotracheal intubation were included in the study.

It is a randomised prospective control study. Patients in the age group of 18 -60 years were included in the study. The study was conducted in Stanley medical college in ENT surgery operating room.

The study was approved by our institutional ethical committee. After obtaining informed consent from the patients the study was conducted. This study was done for a period of nine months.

INCLUSION CRITERIA :

- Age : 18 – 60 yrs
- ASA : one and two
- Weight : 50-80 kgs
- Surgery : elective ENT surgery
- Mallampatti score : one and two
- Thyromental distance : > 6.5 cm
- Inter incisor gap :>4cms

EXCLUSION CRITERIA

- Coagulopathies
- Difficult airway
- Paediatric population
- Hypertensive population
- Cardiovascular disease patient

MATERIALS REQUIRED

- Laryngoscope blades of various sizes, bougie, oropharyngeal airway
- Levitan optical stylet
- Drugs

–glycopyrrolate,midazolam,fentanyl,thiopentone,atracurium,succinylcholine,neostigmine

- Monitors- ECG/NIBP/pulse oximetry
- 2 cc,5cc and 10 cc syringes
- 18 G iv cannula
- Iv fluids

SAMPLE SIZE AND RANDOMISATION

The sample size was calculated as 80 based on pilot study and on previous studies statistical analysis.

Sample size: The formula used to compute the sample size is as follows**:**

$$n = \frac{(z_\alpha + z_\beta)^2 (s_1^2 + s_2^2)}{(m_2 - m_1)^2}$$

Za = Type I error i.e significance level taken as 5% 2- tail test value 1.960

Zb = Type II error i.e Power of the test taken as 90% - value 1.282.

S1 = the standard deviation SBP of the group 1

S2 = the standard deviation SBP of the group 2

m1 = the mean SBP of group1

m2 = the mean SBP of group2

n= the sample size

It is assumed the mean SBP in both the groups are same before the experiment and the effect of the instrument after the application on subjects , the mean and SD of SPB observed in the previous study were 133mm/Hg ± 11 mm/Hg. Assuming the significance level of 5% with power of 90% the required sample size for the study is 79 . i.e for each group 40 subjects is needed . For 80% power the required sample size for the study is 59. i.e for each group 30 subjects is needed .

They were randomly allocated to 40 in each group and were named as Group A(intubation using levitan optical stylet) and Group B(intubation using Levitan along with Macintosh laryngoscope).Randomisation is done by computerized randomized table .

CONDUCT OF ANAESTHESIA:

GROUPS:

GROUP A:Intubation carried with Levitan optical stylet

GROUP B:Laryngoscopy done with Macintosh laryngoscope and intubation with Levitan Optical stylet

MONITORING:

A. NIBP(Systolic blood pressure, Diastolic blood pressure, Mean arterial blood pressure)

B. HEART RATE

C. SPO2

D. ECG

METHODOLOGY:

The consented patients of ASA1 and ASA 2 of age 18-60 yrs of both genders scheduled for elective surgery in ENT operating theatres were selected.

PRE ANAESTHETIC PREPERATION :

Patients were admitted in the ward as inpatients and routine investigations such as complete blood count, blood urea ,serum creatinine ,random blood sugar ,coagulation profile ,chest x ray and ECG were done.

PREMEDICATION:

All patients are premedicated with antisialogogue inj glycopyrrolate 10µg/kg intramuscularly half an hour before the procedure .On arrival into the operating room patient's baseline parameters such as heart rate, systolic blood pressure, diastolic blood pressure and mean arterial blood pressure and Spo2 are recorded. Patient monitored with pulse oximetry, NIBP and ECG.

I.V Line secured with 18 g venflon cannula.

Inj.Midazolam 0.02µg/kg and Inj.Fentanyl 2µg/kg was given to both the groups.

Patient preoxygenated with 100 % oxygen for 3 minutes.

INDUCTION:

Patient induced with inj.thiopentone sodium 5mg/kg in both the groups A and B

MUSCLE RELAXANT:

Inj.Suxamethonium 2 mg/kg is given to both the groups. Patient ventilated for 60 seconds.

POSITIONING

Patient positioned in sniffing position in both the groups

INTUBATION IN GROUP A-[30]

Levitan optical stylet can be used alone for endotracheal intubation without a laryngoscope with its fiberoptic viewing.

STEPS:

1.Jaw thrust manoeuvre is given by the assistant while doing intubation with Levitan optical stylet

2.In the initial view with Levitan optical stylet, epiglottis and posterior pharyngeal walls are visualized.

3.Stylet is introduced with rocking movements to view the glottic structure.

4.Levitan optical stylet is advanced and the glottic structures are centered with the scope.

5.Tracheal rings are visualized in the fiberoptic viewing superiorly and inferiorly posterior trachea is visualized.

6.After the tracheal rings are visualized clockwise rotation of the tube is done and scope is withdrawn off the feet.

Fig9. ENT Operating Room - patient mask ventilated before intubation

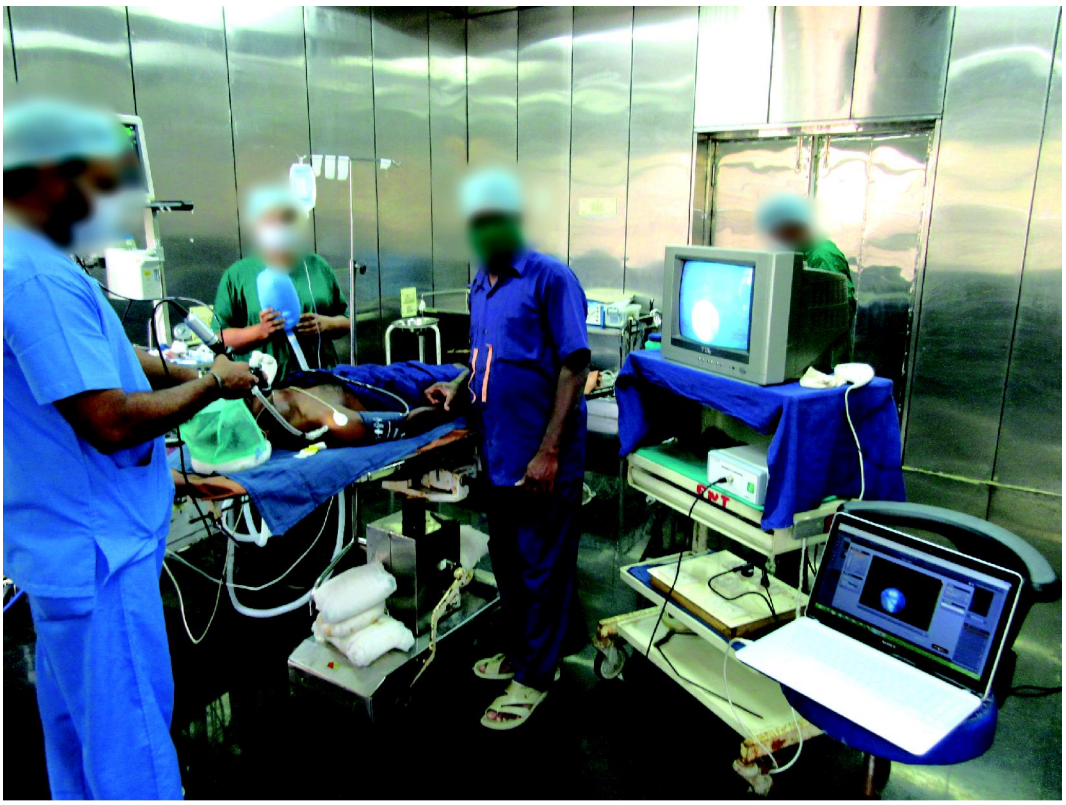


Fig10. Jaw thrust manoeuvre given by the assistant

Fig11. Levitan opticals stylet introduction in to the oral cavity

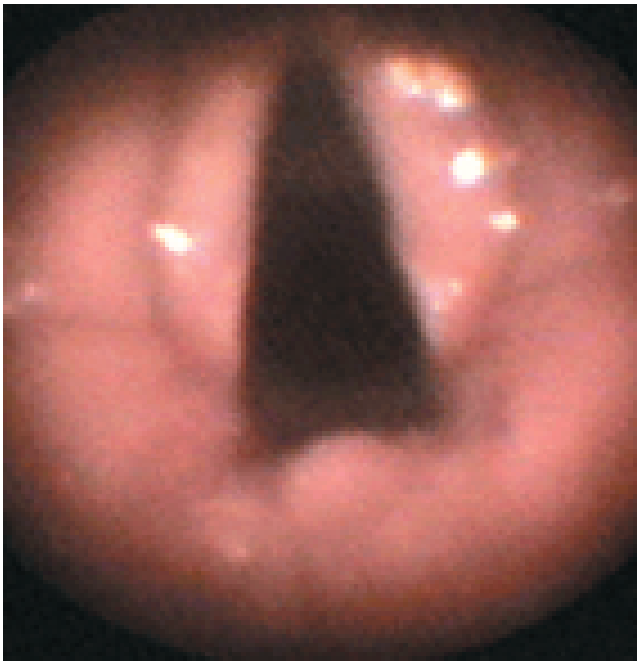
Fig12. Patient intubated with Levitan optical stylet

Fig13. Fibreoptic viewing with Levitan optical stylet

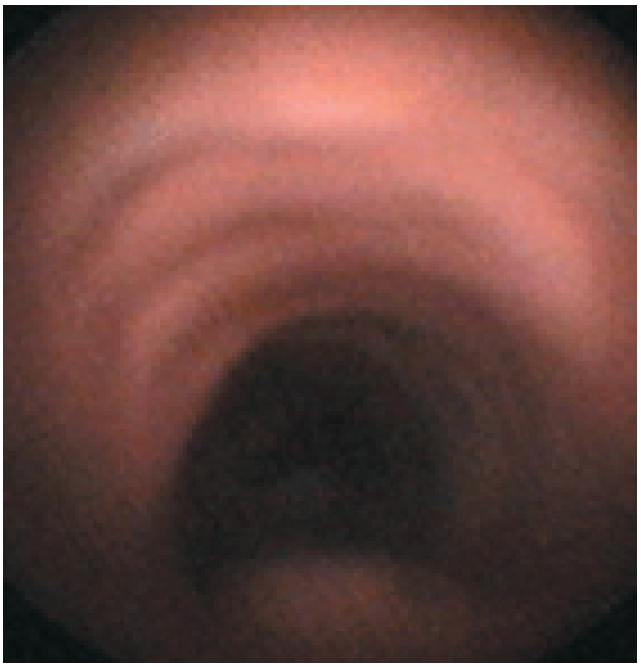
Epiglottis visualized

Arytenoids and Posterior part of the glottic structure visible

Vocal cord visible as a glistening structure



Tracheal rings are visible



INTUBATION IN GROUP B[30,28]:

STEPS:

1. Laryngoscopy done with Macintosh laryngoscope blade.

2. Levitan optical stylet placed in starting position under direct vision and with fiberoptic viewing endotracheal tube is inserted.

3. Navigate the Levitan optical stylet through the cord.

4. Advance the tube off the levitan optical stylet with the left hand.

5. Verify the depth of insertion of endotracheal tube fixed at 21 cm for females and 23 cm for males at incisor level.

After intubation endotracheal tube position checked by bilateral air entry and capnographic waveform. The tube is secured and connected to closed circuit.

POINTS TO BE NOTED WHILE USING FIBEROPTIC INSTRUMENT

1.Always open channel is followed.

2. It is preferable to avoid the mucosa.

3. Target is focused.

4. From the starting position it is proceeded slowly.

Fig14. Laryngoscopy done with Macintosh Laryngoscope and Intubation carried out with levitan stylet

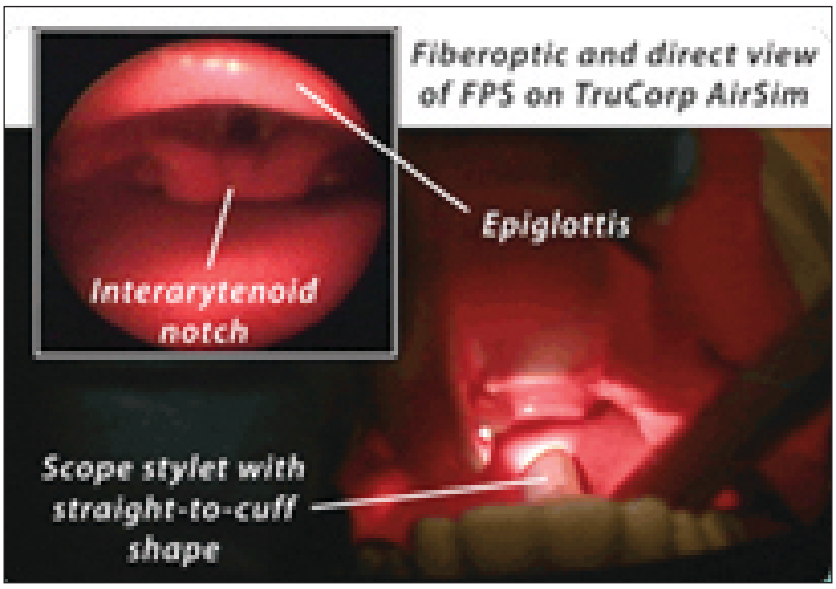


Fig15. Laryngoscopy done with macintosh laryngoscope

Fig16. With Levitan optical stylet patient intubated

In both the groups **HR,SBP,DBP,SPO2** are monitored during **preintubation, postintubation(0 min),1 min,3 min ,5 min and 10 min** after intubation.

MAINTANENCE:

After intubation anaesthesia maintained with nitrous oxide and oxygen in the ratio 4:2, muscle relaxant, inj.atracurium given.Volatile anaesthetic -Sevoflurane is used at a concentration of 1% to all the patients.

Intraoperative HR,SBP,DBP,SPO2 were recorded every 15 min till end of the procedure.

After the procedure is over and after the patient is spontaneously breathing , the patient is reversed with inj.neostigmine 40µg/kg and inj.glycopyrrolate 10µg/kg and after thorough oropharyngeal suctioning ,the patient extubated.

Intubations are done by a single examiner in all the 80 patients to avoid interobserver bias.

Haemodynamic significance: When the heart rate, systolic blood pressure ,diastolic blood pressure and mean arterial blood pressure greater than 20% ,it is found to be haemodynamically significant.

I:TIME TAKEN FOR INTUBATION[34]

GROUP A:From the insertion of the Levitan optical stylet into oral cavity till the confirmation of endotracheal intubation by auscultation and conventional capnography.

GROUP B:From insertion of Macintosh blade into the oral cavity and till the confirmation of endotracheal intubation by auscultation and conventional capnography.

II:GRADING OF INTUBATION[33,34]

ATTEMPT: Inserting Levitan optical stylet/Macintosh laryngoscope into the oral cavity and withdrawing out was considered as one attempt

EASE: able to intubate in one attempt

DIFFICULT: Not able to intubate in one attempt but in two attempts is considered as difficult.

FAILURE:

It was defined as when the patient could not be intubated in more than two attempts by the examiner.

III:POST OPERATIVE : Patients were monitored for complications such as sore throat, cough, bleeding and hoarseness of voice in both the groups.

a)SCORING SYSTEM FOR ASSESSMENT OF SORETHROAT[31]

Grade 0:No sorethroat at any time since operation

Grade 1:The patient answered in the affirmative when asked about sorethroat(minimal sore throat)

Grade 2:The patient complained of sore throat on his/her own(moderate sore throat)

Grade 3:The patient is in obvious distress(severe sore throat)

b)SCORING SYSTEM FOR ASSESSMENT OF HOARSENESS OF VOICE[31]

Grade 0:No complaints of hoarseness at any time since the operation

Grade 1:Minimal change in quality of speech.Patient answers in the affirmative only when enquired about(minimal hoarseness)

Grade 2:Moderate change in quality of speech of which the patient complains on his/her

own(moderate hoarseness)

Grade 3:Gross change in the quality of voice perceived by the observer (severe hoarseness)

c)ESHAK "S -4 POINT RATING SCALE FOR COUGH[32]

Grade 0-no coughing or straining

Grade 1-moderate coughing

Grade 2-marked coughing on straining

Grade 3-poor extubation and laryngospasm

d)SCORING FOR POST OP BLEEDING

Grade 0-no bleeding or streaks of blood on spitting

Grade 1-mild streaks of blood on spitting

Grade 2-frank blood on spitting

All the patients were monitored for these complications 24 hrs postoperatively

OBSERVATION AND RESULTS

CHAPTER 5

OBSERVATION AND RESULTS

After collecting the data, all the variables are examined for outliers and non-normal distributions. The Categorical variables are expressed as Frequency and Percentage. The Quantity variables are expressed as mean and standard deviation. Descriptive statistics are used to evaluate baseline characteristics.

Student's *t*-test was used to analyze the parametric data, and discrete (categorical) variables were analyzed using the chi square test, with a $P < 0.05$ considered statistically significant.

The statistical analysis was carried out using statistical software package SPSS 22.0.

TABLE 2:COMPARISON OF AGE AND WEIGHT BETWEEN THE GROUPS A AND B

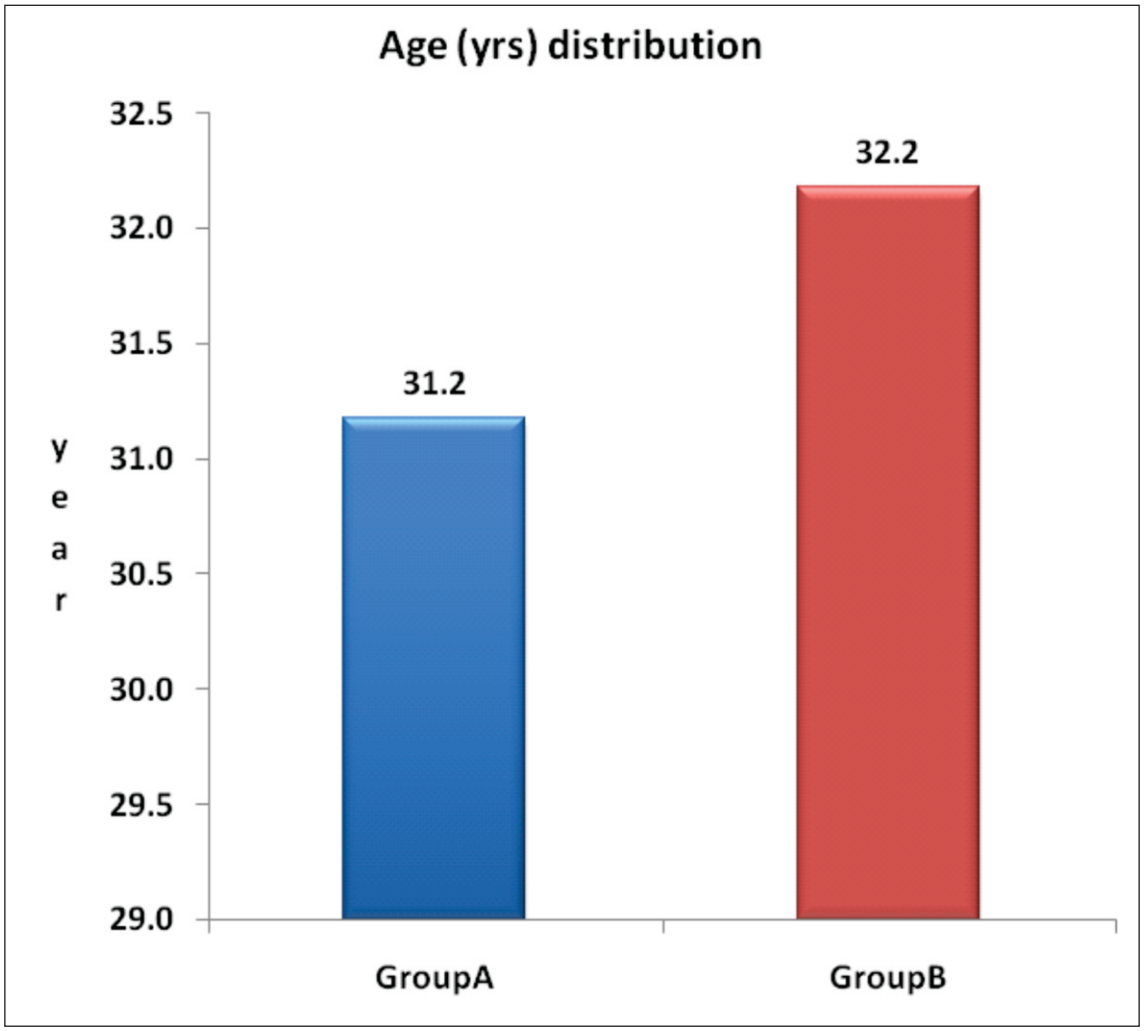
Group	N	Mean	Standard Deviation	P value
Age GROUP A	40	31.8	7.41	0.720
(yrs) GROUP B	40	32.18	14.21	
Weight GROUP A	40	52.25	5.25	0.837
(kgs) GROUP B	40	53.95	8.25	

The mean age of patients in Group A and Group B was 31.8 years and 32.18 years respectively.

The mean weight of patients in Group A and Group B was 52.25 kg and 53.95 kg respectively.

On analyzing the data statistically p value is found to be 0.72 and 0.83 .All these values were >0.05, hence the difference was statistically insignificant between the two groups in terms of age, and weight and the two groups were therefore comparable.

BAR DIAGRAM SHOWING AGE DISTRIBUTION BETWEEN THE TWO GROUPS A AND B



BAR DIAGRAM SHOWING WEIGHT DISTRIBUTION BETWEEN THE TWO GROUPS A AND B

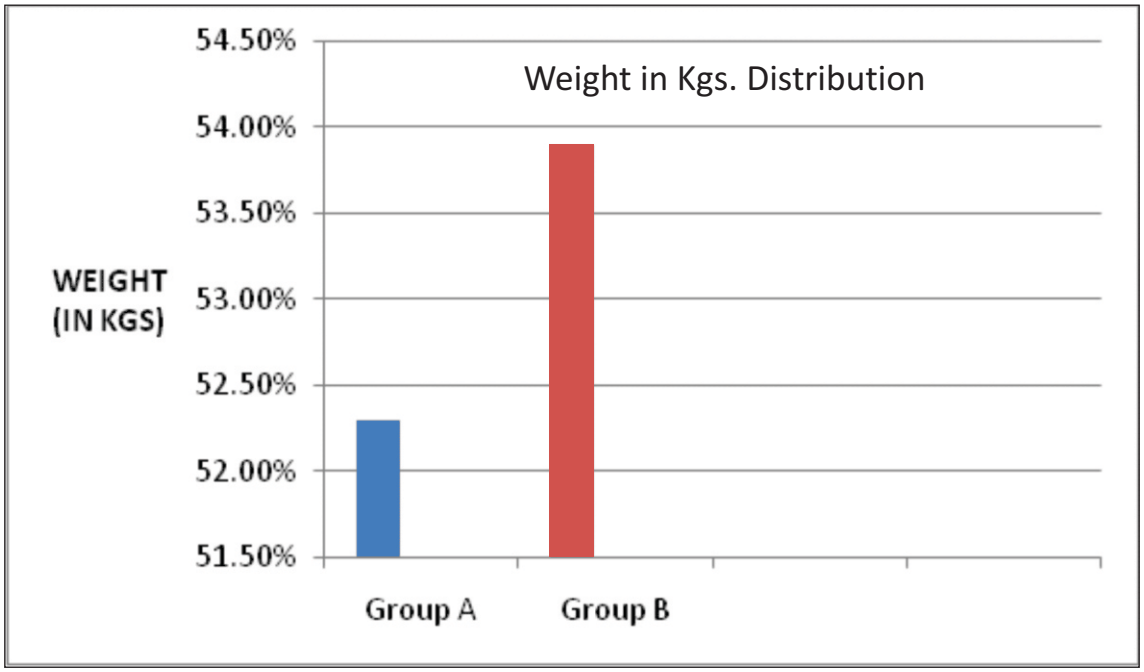
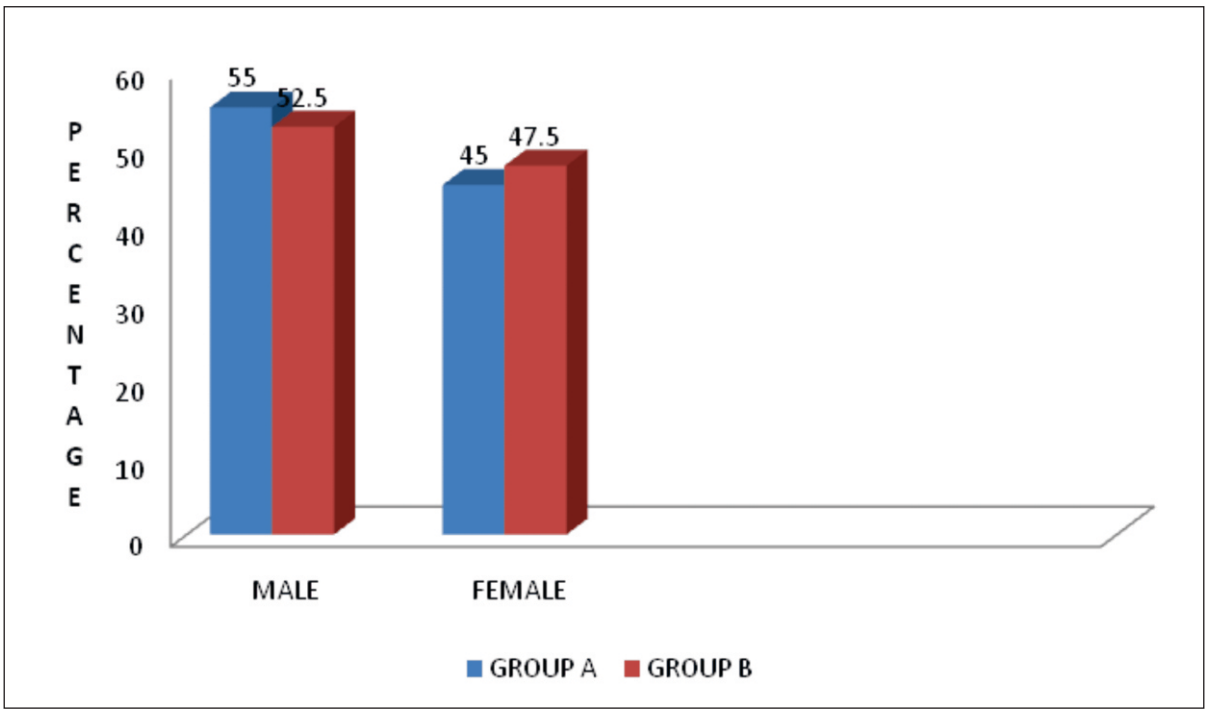


TABLE 3:COMPARISION OF GENDER DIFFERENCES BETWEEN THE TWO GROUPS A AND B

			SEX		Total
			Male	Female	
Group	GroupA	Count	22	18	40
		% within Group	55.0%	45.0%	100.0%
	GroupB	Count	21	19	40
		% within Group	52.5%	47.5%	100.0%
Total		Count	43	37	80
		% within Group	53.8%	46.2%	100.0%

P=1.000.

BAR CHART COMPARING THE GENDER DISTRIBUTION BETWEEN GROUP A AND GROUP B



The proportion of males in group A is 55 % and of females is 45%

The proportion of males in group B is 52.5 % and of females is 47.5%

On analysing this data statistically the p value was calculated as p= 1.000

As the p value is more than 0.05 the data is statistically insignificant in terms of gender between the two groups.The two groups are therefore comparable.

TABLE 4:COMPARISION OF THE MALLAMPATTI CLASSIFICATION(MPC) BETWEEN THE TWO GROUPS

			MPC		
			1	2	Total
Group	GroupA	Count	20	20	40
		% within Group	50.0%	50.0%	100.0%
	GroupB	Count	22	18	40
		% within Group	55.0%	45.0%	100.0%
Total		Count	42	38	80
		% within Group	52.5%	47.5%	100.0%

The percentage of patients in group A with MPC 1 and 2 are 50% .

The percentage of patients in group B with MPC 1 is 55% and MPC 2 is 45 %.

On analyzing the data statistically p value is found to be 0.9 and hence statistically insignificant , and the two groups are therefore comparable.

BAR CHART COMPARING MPC BETWEEN TWO GROUPS A AND B

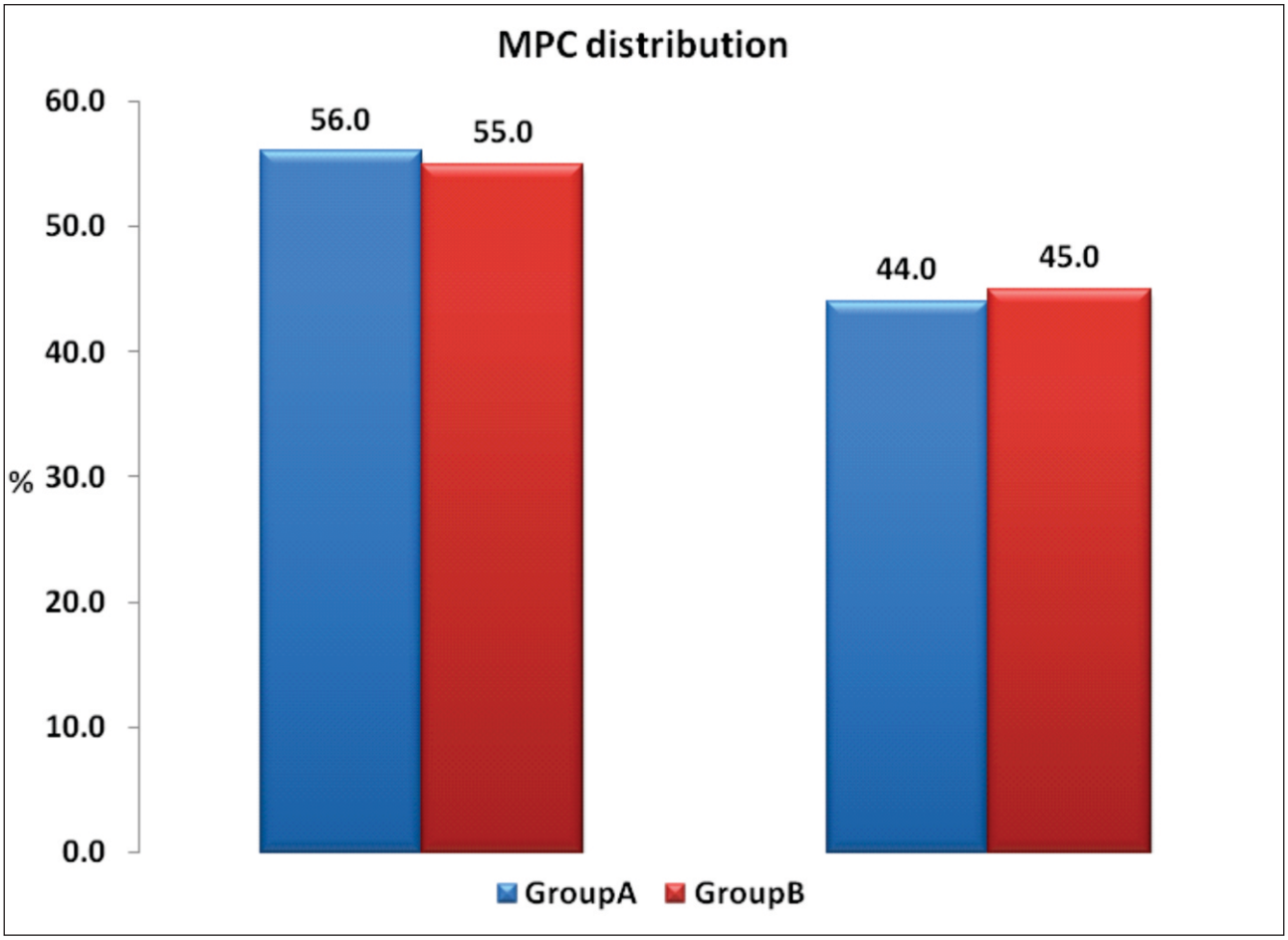


TABLE 5:COMPARISON OF INTERINCISOR GAP AND THYROMENTAL DISTANCE BETWEEN THE TWO GROUPS

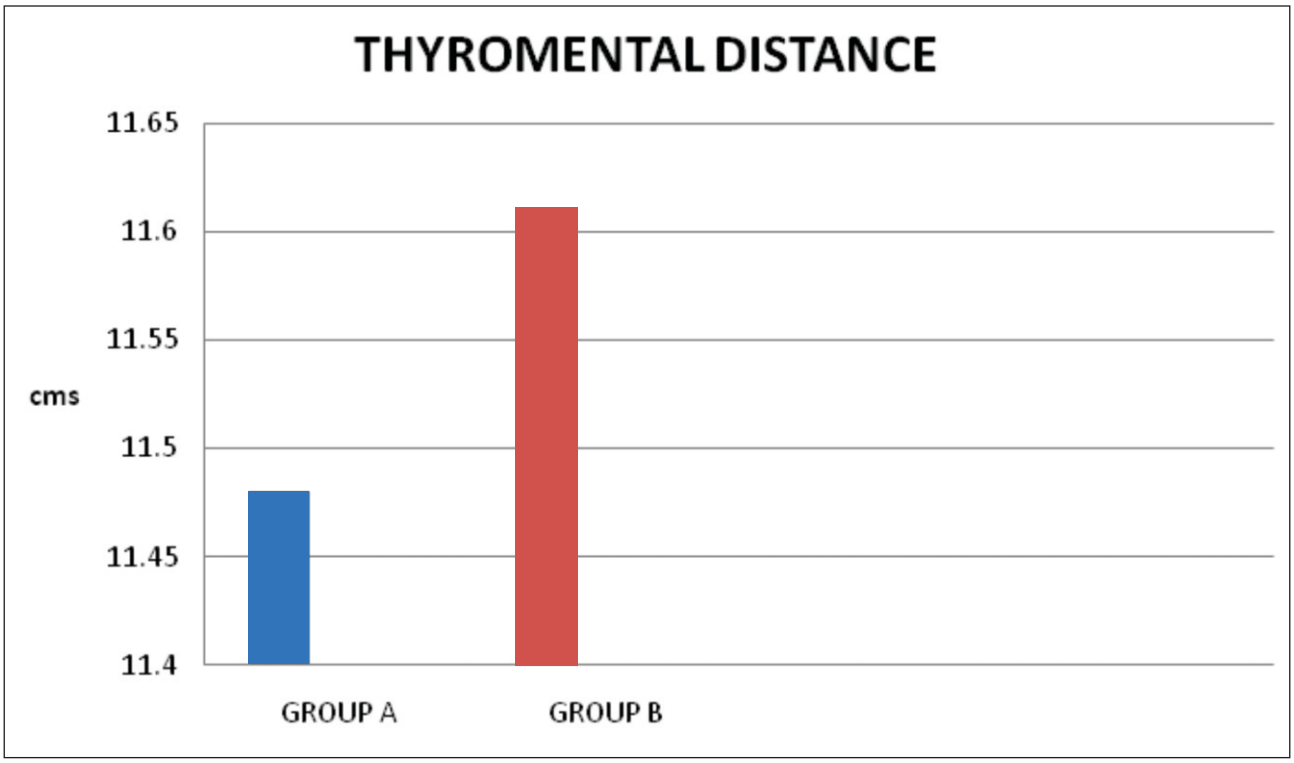
GROUP		N	Mean	Standard Deviation	P value
Thyromental Distance (cm)	Group A	40	11.48	0.7359	0.443
	Group B	40	11.61	0.8317	
Interincisor Gap (cm)	Group A	40	4.871	0.4299	0.140
	Group B	40	4.945	0.3827	

The Mean Thyromental distance for Group A is 11.48 and for Group B is 11.61 cm and the p value for Thyromental distance is 0.443

The Mean for Interincisor gap for Group A is 0.42 and for Group B is 0.38 and the p value for Interincisor gap is 0.140

On analyzing the data statistically p value is found to be >0.05 and the two Groups are found to be comparable.

BAR CHART COMPARING THE THYROMENTAL DISTANCE IN GROUPS A AND B



BAR CHART COMPARING THE INTERINCISOR GAP IN GROUPS A AND B

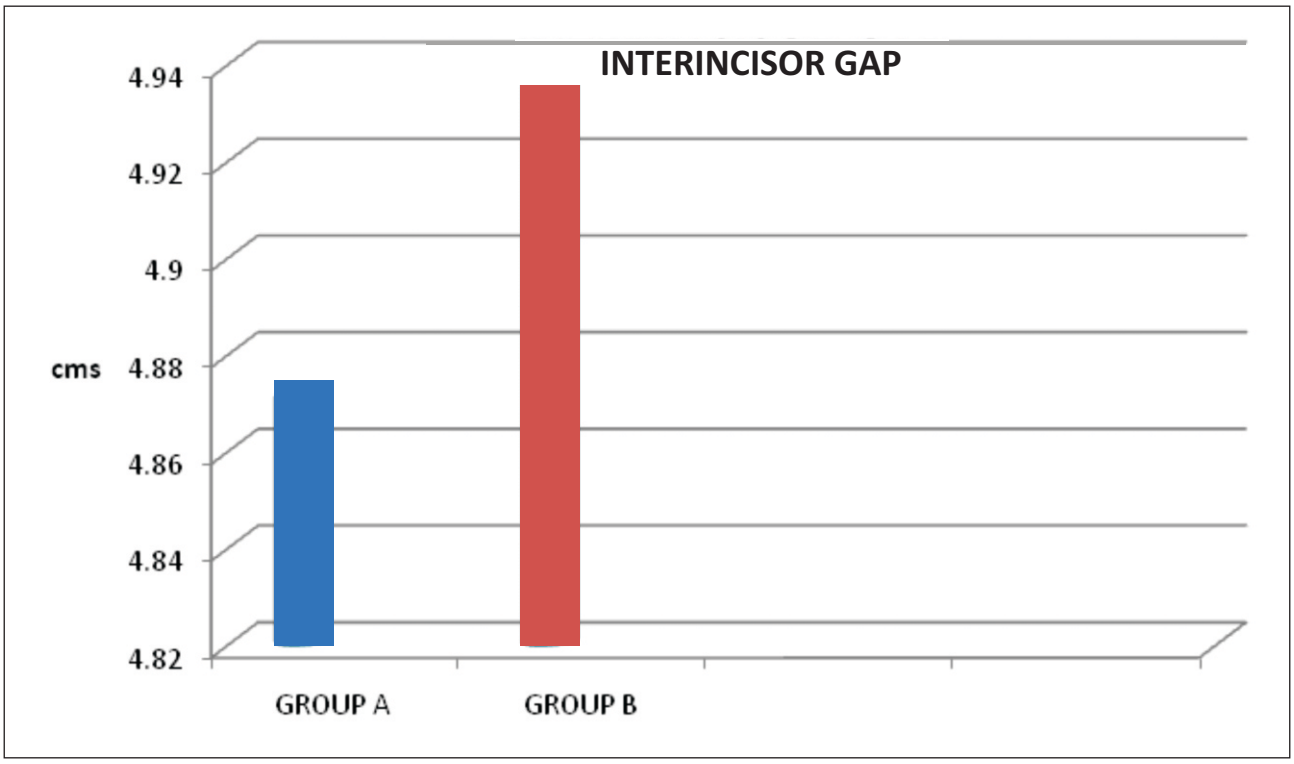
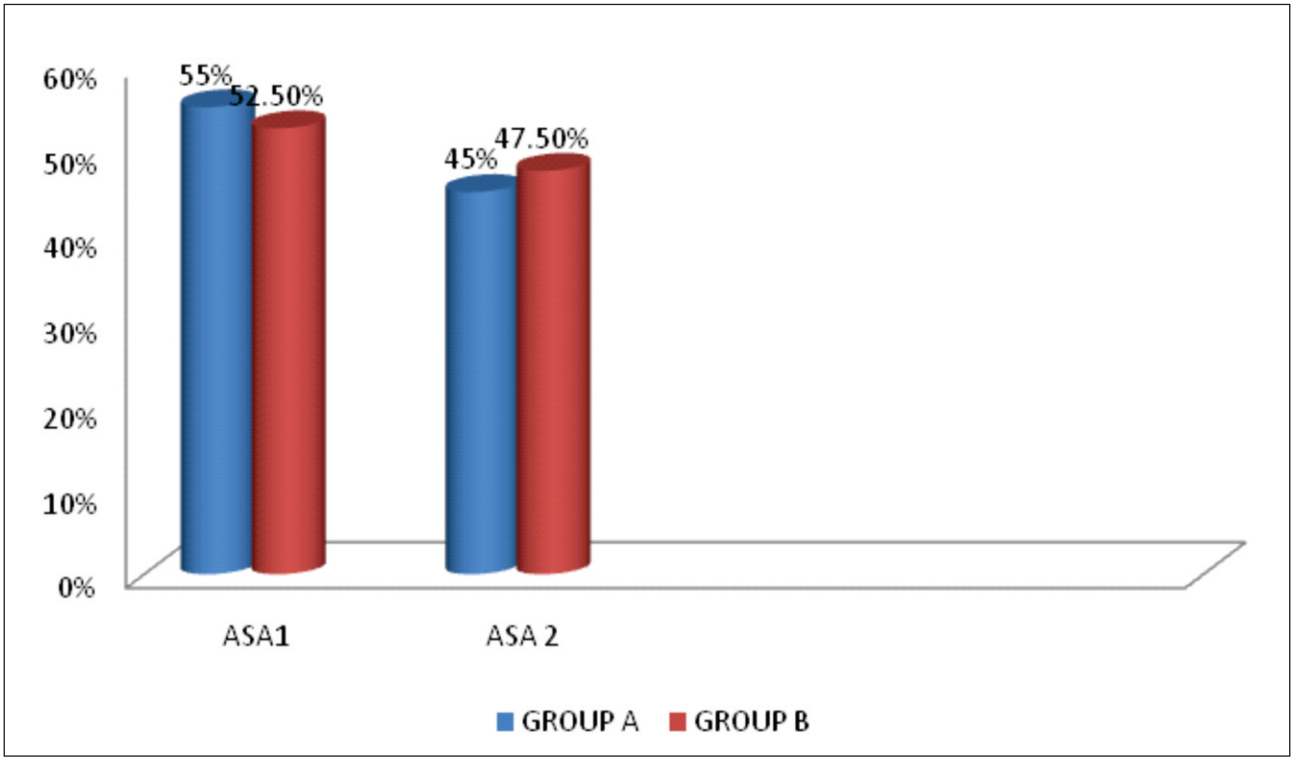


TABLE 6:COMPARISION OF ASA STATUS BETWEEN THE TWO GROUPS

			ASA		
			I	II	Total
Group	GroupA	Count	22	18	40
		% within Group	55.0%	45.0%	100.0%
	GroupB	Count	21	19	40
		% within Group	52.5%	47.5%	100.0%
Total		Count	43	37	80
		% within Group	53.8%	46.2%	100.0%

P=1.000

BAR CHART COMPARING THE ASA DISTRIBUTION BETWEEN THE TWO GROUPS



The percentage of patients in group A with ASA I is 55 % and ASA II is 45 %.

The percentage of patients in Group B with ASA I is 52.5% and ASA II is 47.5 %

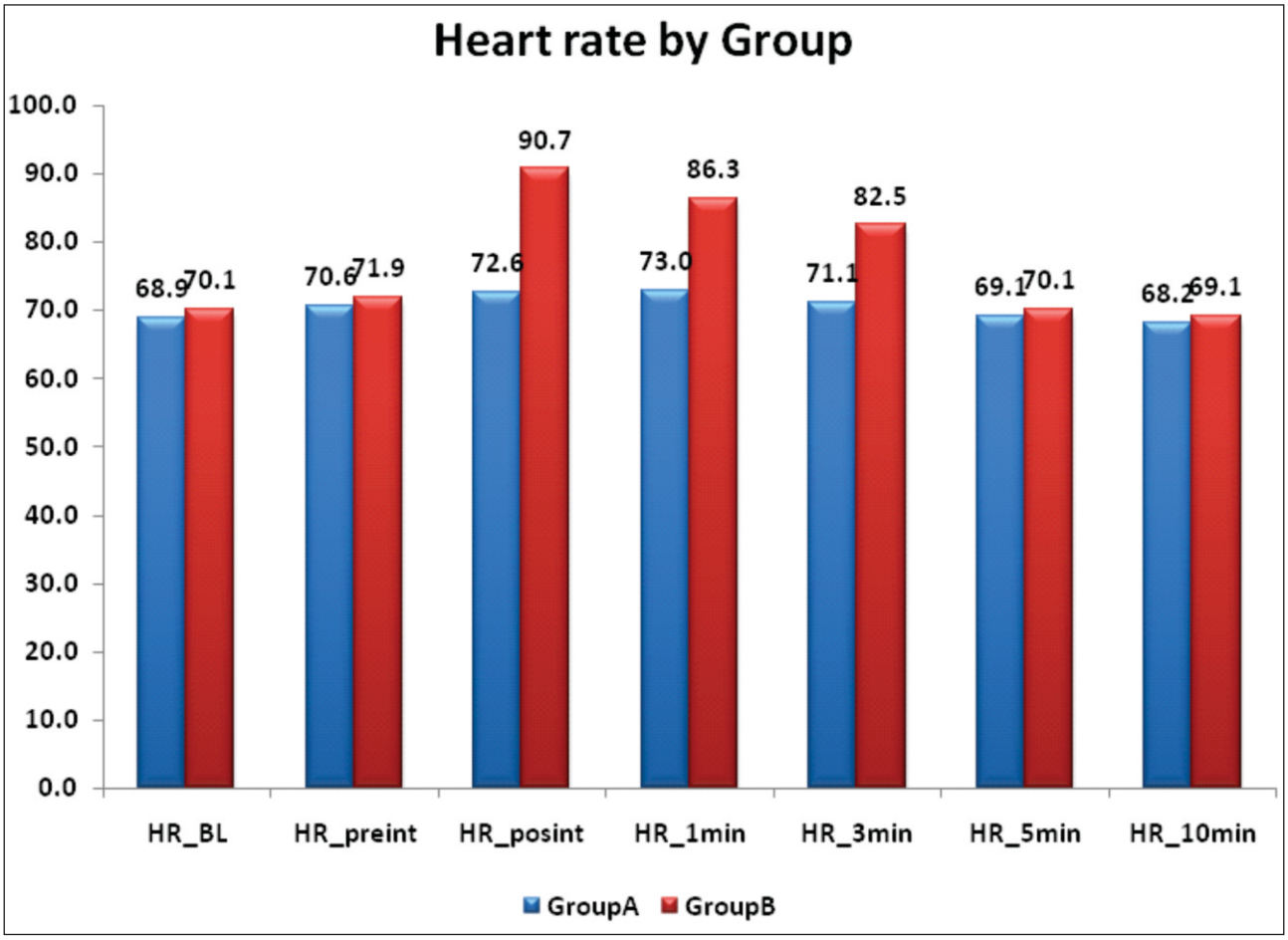
The p value is >0.05 and hence the two groups are comparable.

TABLE 7:COMPARISION OF HEART RATE CHANGES BETWEEN THE TWO GROUPS AT VARIED INTERVALS

Group statistics

	Group	N	Mean	Standard Deviation	P value	Inteference
HRBL	Group A	40	68.92	3.526	0.232	Insignificant
	Group B	40	70.08	4.896		
HRPI	Group A	40	70.58	3.587	0.176	Insignificant
	Group B	40	71.88	4.831		
HRPT	Group A	40	72.55	3.630	0.000	Significant
	Group B	40	90.72	5.463		
HR1min	Group A	40	72.95	3.121	0.000	Significant
	Group B	40	86.32	4.958		
HR3min	Group A	40	71.10	3.144	0.000	Significant
	Group B	40	82.48	4.176		
HR5min	Group A	40	69.10	2.901	0.105	Insignificant
	Group B	40	70.10	3.101		
HR10min	Group A	40	68.24	2.860	0.172	Insignificant
	Group B	40	69.14	2.980		

BAR DIAGRAM COMPARING THE HEART RATES AT VARIOUS TIME INTERVALS

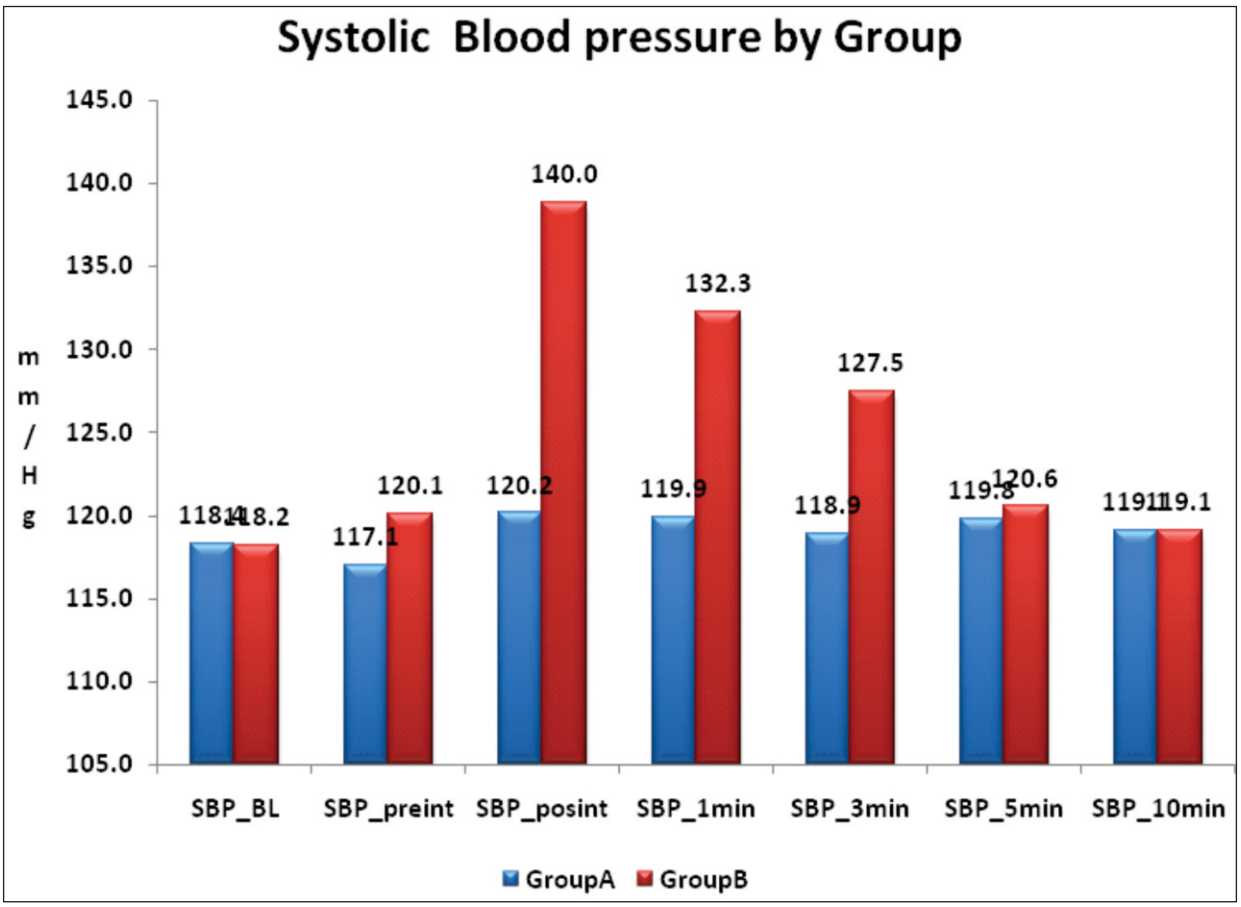


Maximal increase in heart rate in both the groups occurred following laryngoscopy and endotracheal intubation. The increase in mean heart rate in Group A was from 68 to 73 beats per minute while in Group B mean heart rate increased from 69 to 91 beats per minute during endotracheal intubation.In Group B there is a 25 % increase in heart rate in postintubation group from the baseline value.The increase was statistically significant as the p value in postintubation (0 min) ,1 minute and 3 minutes were 0.000 respectively .The heart rate reached the baseline 10 minutes after the intubation.

TABLE 8:COMPARISION OF SYSTOLIC BLOOD PRESSURE CHANGES BETWEEN TWO GROUPS AT VARIOUS TIME INTERVALS

	Group	N	Mean	Std. Deviation	P-value	Inference
SBPBL	Group A	40	118.35	8.640	0.925	Insignificant
	Group B	40	118.18	7.805		
SBPPI	Group A	40	117.05	7.362	0.070	Insignificant
	Group B	40	120.12	7.593		
SBPPT	Group A	40	120.15	6.867	0.000	Significant
	Group B	40	140.05	6.019		
SBP1min	Group A	40	119.88	7.314	0.000	Significant
	Group B	40	132.28	5.164		
SBP3min	Group A	40	118.88	7.380	0.000	Significant
	Group B	40	127.45	4.734		
SBP5min	Group A	40	119.82	8.108	0.681	Insignificant
	Group B	40	120.55	7.585		
SBP10min	Group A	40	119.10	8.485	0.989	Insignificant
	Group B	40	119.12	7.596		

BAR DIAGRAM COMPARING THE SYSTOLIC BLOOD PRESSURE AT VARIOUS TIME INTERVALS

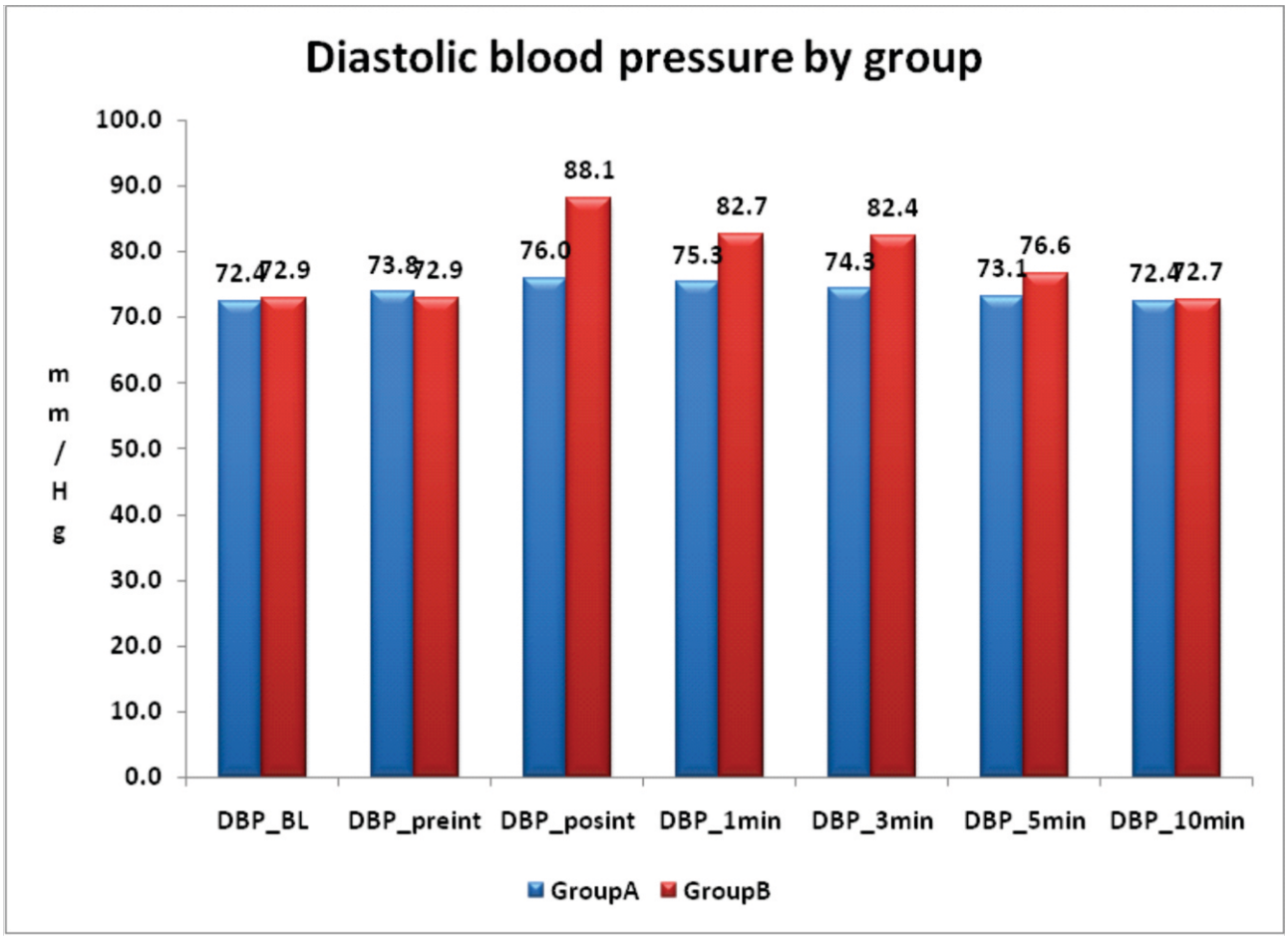


Maximal increase in Mean systolic Blood pressure in Group A was seen from 117 to 119mm of Hg and The Mean systolic Blood Pressure in Group B was seen from 118 to 140 mm of Hg .There is 20 % increase in Mean Systolic blood pressure in Group B from the baseline value which is statistically significant,and in Group A there is a 2 % increase from baseline value .The p value at postintubation (0 min) ,1 minute ,and 3 minutes are 0.000 respectively.Hence the data is statistically significant.

TABLE 9:COMPARISION OF DIASTOLIC BLOOD PRESSURE CHANGES AT VARIOUS TIME INTERVAL

	Group	N	Mean	Std. Deviation	P-value	Inference
DBPBL	Group A	40	72.35	4.881	0.677	Insignificant
	Group B	40	72.88	6.268		
DBPPI	Group A	40	73.75	4.482	0.471	Insignificant
	Group B	40	72.92	5.636		
DBPPT	Group A	40	75.95	4.523	0.000	Significant
	Group B	40	88.10	4.991		
DBP1min	Group A	40	75.28	4.484	0.000	Significant
	Group B	40	82.65	4.521		
DBP3min	Group A	40	74.25	4.283	0.000	Significant
	Group B	40	82.40	4.337		
DBP5min	Group A	40	73.08	4.358	0.001	Significant
	Group B	40	76.58	4.956		
DBP10min	Group A	40	72.38	4.634	0.795	Insignificant
	Group B	40	72.65	4.780		

BAR CHART COMPARING THE DIASTOLIC PRESSURE VARIATION BETWEEN THE GROUP A AND B

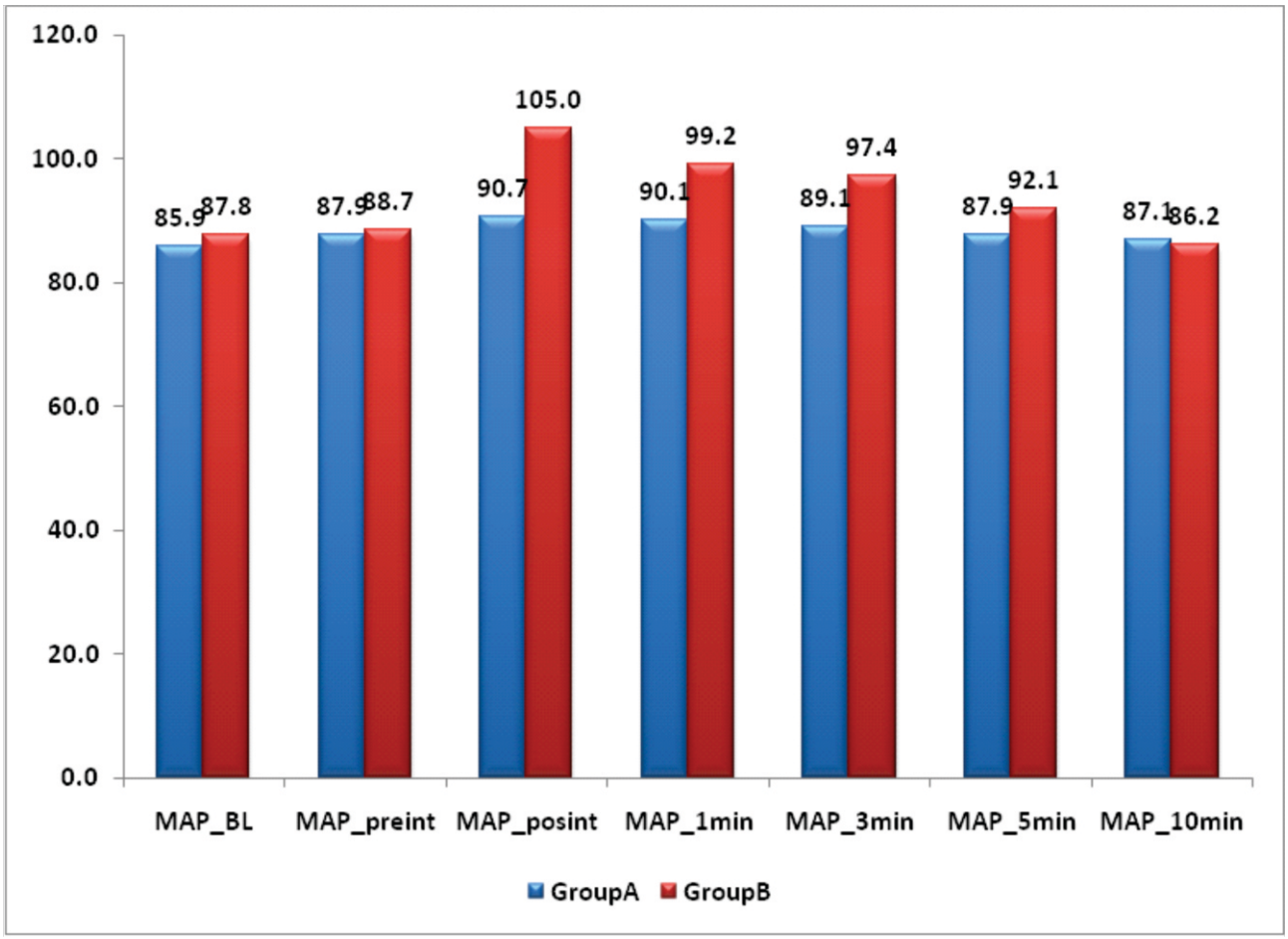


The maximal increase in diastolic blood pressure in Group A was from 72 to 76 mmHg and in Group B from 72 to 88mmHg.A difference of 22 % was seen in group B from the baseline value hence it is statistically significant and a increase in 8 % in Group A .The p value at postintubation(0 min),1 minute ,3 minutes and 5 minutes were 0.000,0.000,0.000 and 0.001 respectively hence the data is statistically significant.

TABLE 10:COMPARISION OF MEAN ARTERIAL BLOOD PRESSURE BETWEEN TWO GROUPS AT VARIOUS TIME INTERVALS

	Group	N	Mean	Std. Deviation	P-value	Inference
MAPBL	Group A	40	85.88	6.615	0.191	Insignificant
	Group B	40	87.78	6.257		
MAPPI	Group A	40	87.92	4.047	0.522	Insignificant
	Group B	40	88.65	5.864		
MAPPT	Group A	40	90.68	4.05	0.000	Significant
	Group B	40	105.02	4.28		
MAPIMIN	Group A	40	90.14	4.15	0.000	Significant
	Group B	40	99.19	3.74		
MAP3MIN	Group A	40	89.12	4.15	0.000	Significant
	Group B	40	97.42	3.64		
MAP5MIN	Group A	40	87.94	4.10	0.001	Significant
	Group B	40	92.11	4.63		
MAP10MIN	Group A	40	87.13	4.38	0.323	Insignificant
	Group B	40	86.15	4.39		

BAR DIAGRAM SHOWING MEAN ARTERIAL PRESSURE AT VARIOUS TIME INTERVALS BETWEEN THE TWO GROUPS



The maximal increase in mean arterial pressure in Group A is from 85 to 90 mmHg and in Group B is from 87 to 105mmHg.There is a 21 % increase in Mean arterial pressure in Group B which is statisctically significant and 7 % increase in Group A .The p value at postintubation(0 min),1 minute ,3 minutes and 5 minutes is 0.000 ,0.000 ,0.000 and 0.001 respectively Hence the data is statistically significant.

TABLE 11:COMPARISION OF SPO2 BETWEEN THE TWO GROUPS AT VARIOUS TIME INTERVALS

	Group	N	Mean	Std. Deviation	P-value
SPO2_BL	GroupA	40	99.35	.533	0.825
	GroupB	40	99.32	.474	
SPO2_preint	GroupA	40	99.38	.586	
	GroupB	40	99.25	.494	0.305
SPO2_posint	GroupA	40	99.55	.504	0.697
	GroupB	40	99.60	.632	
SPO2_1min	GroupA	40	99.40	.496	0.070
	GroupB	40	99.82	.385	
SPO2_3min	GroupA	40	99.52	.506	0.090
	GroupB	40	99.88	.335	
SPO2_ 5min	GroupA	40	99.32	.474	0.065
	GroupB	40	99.00	.000	
SPO2_10min	GroupA	40	99.42	.501	0.087
	GroupB	40	99.00	.000	

The increase in Mean SPO2 was seen from 99.32-99.52 in Group A and in Group B from 99-99.88 .As the p value is >0.05 at all time intervals the data is statistically insignificant.

TABLE 11:COMPARISION OF SPO2 BETWEEN THE TWO GROUPS AT VARIOUS TIME INTERVALS

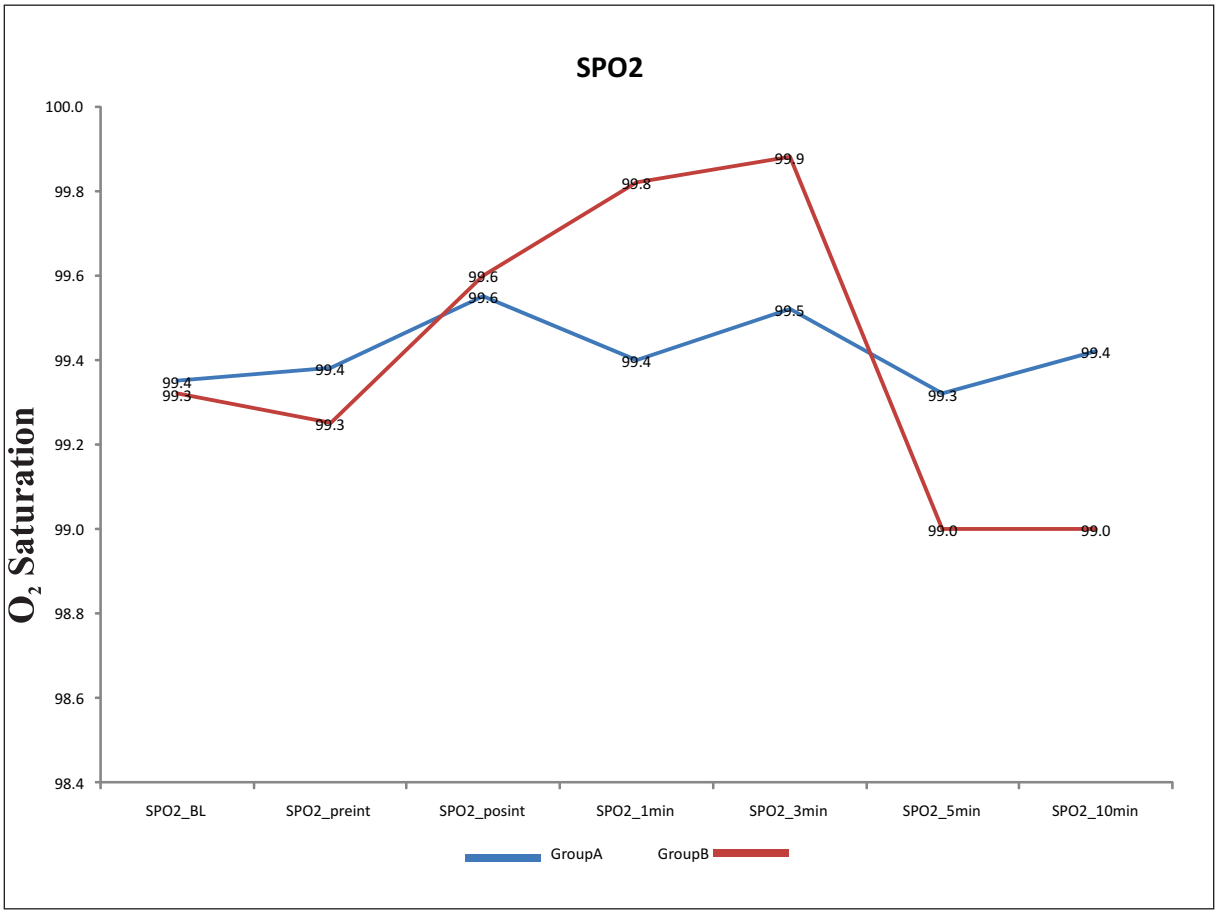
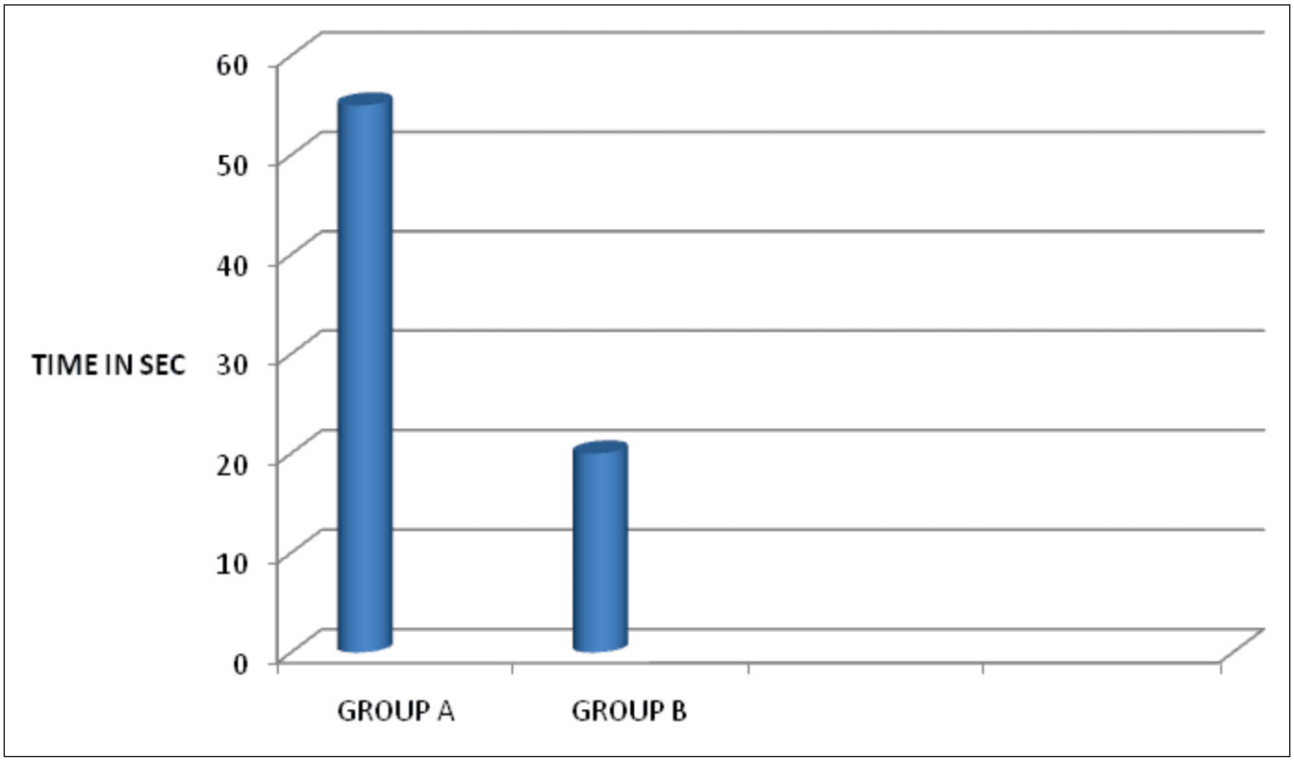


TABLE 12:COMPARISION OF TIME TAKEN FOR INTUBATION BETWEEN TWO GROUPS

	Group	N	Mean	Std. Deviation	P-value
Time_taken_intubation	GroupA	40	55.2	2.866	0.001
	GroupB	40	20.25	1.676	

BAR DIAGRAM SHOWING TIME TAKEN FOR INTUBATION BETWEEN TWO GROUPS

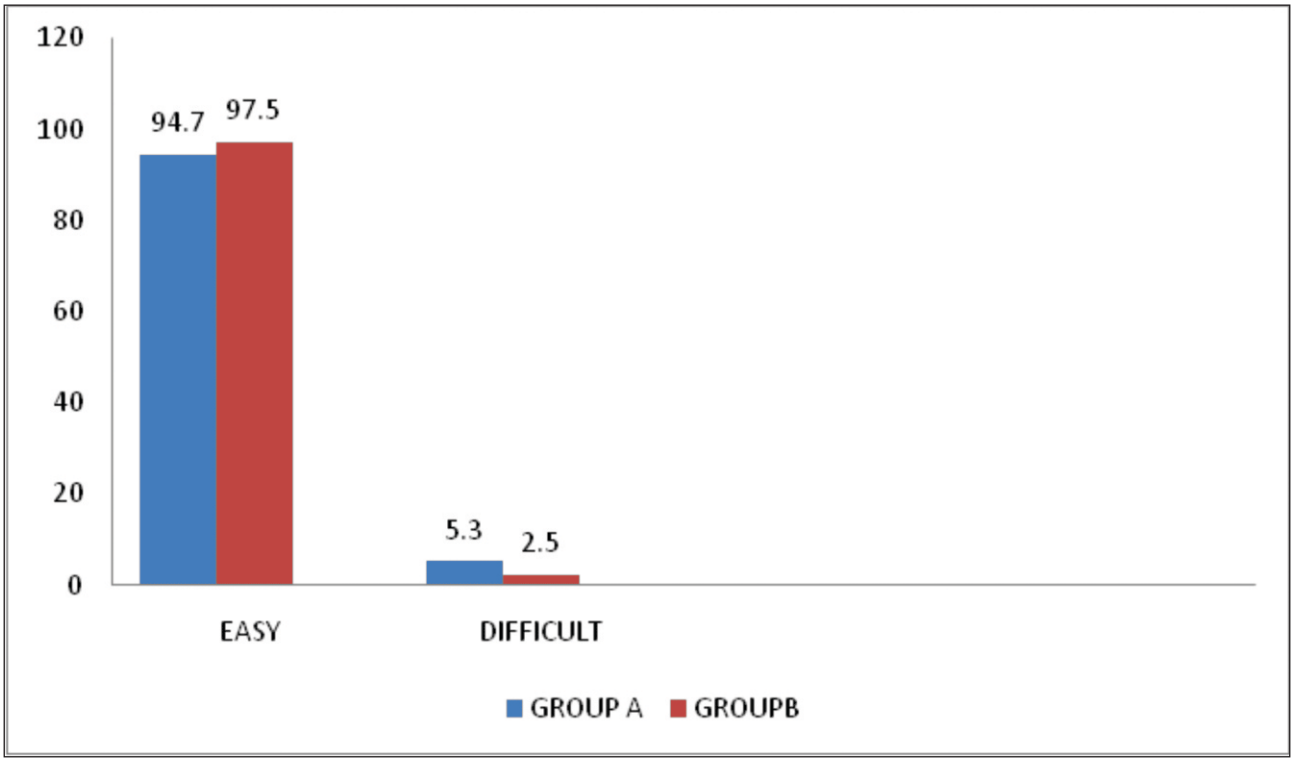


The Mean time taken for intubation in group A is 55 sec and in group B is 20 sec. on analyzing statistically p value is<0.05 and it is found to be statistically significant.

TABLE 13:COMPARISION OF EASE OF INTUBATION BETWEEN TWO GROUPS

			EASE OF INTUBATION		
			Easy	difficult	Total
Group	GroupA	Count	36	2	38
		% within Group	94.7%	5.3%	100.0%
	GroupB	Count	39	1	40
		% within Group	97.5%	2.5%	100.0%
Total		Count	75	3	78
		% within Group	96.15%	3.8%	100.0%

BAR CHART SHOWING EASE AND DIFFICULTY IN INTUBATION IN BOTH THE GROUPS AAND B



The proportion of ease of intubation in group A is 94.7% and difficult intubation is 5.3 %

The proportion of ease of intubation in group B is 97.5 % and difficulty is 2.5 %

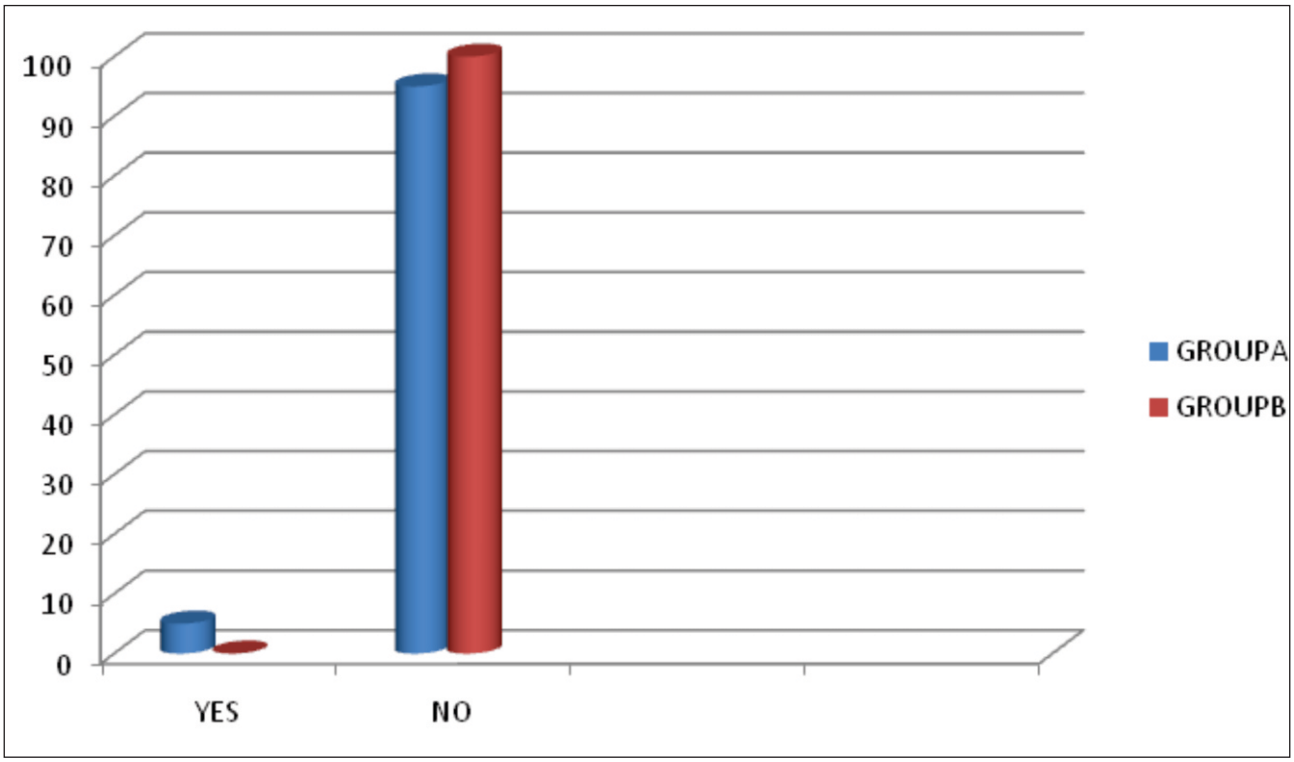
As the p value is more than 0.05 the data is statistically insignificant and the two groups are comparable.

TABLE 14:COMPARISION OF FAILURE RATE BETWEEN TWO GROUPS

			FAILURE RATE		
			Yes	No	Total
Group	GroupA	Count	2	38	40
		% within Group	5.0%	95.0%	100.0%
	GroupB	Count	0	40	40
		% within Group	0%	100.0%	100.0%
Total		Count	2	78	80
		% within Group	3.8%	96.2%	100.0%

P=1.000

COMPARISION OF FAILURE RATE BETWEEN THE TWO GROUPS



The proportion of failure rate in group A is 5.0% and success rate of intubation is 95%

The proportion of failure rate in group B is 2.5% and success rate of intubation is 97.5%

As the p value is more than 0.05 the data is statistically insignificant and the two groups are comparable.

COMPLICATIONS

In group A, there was no complications such as sore throat, bleeding and hoarseness of voice.

In group B, one case of hoarseness of voice was noted postoperatively and 2 cases of sore throat were recorded and symptoms resolved spontaneously in 24 hrs.

Hoarseness of voice of score 2 and sore throat of score 1 which was statistically insignificant.

DISCUSSION

CHAPTER 6
DISCUSSION

Laryngoscopy and intubation incur haemodynamic responses like increase in heart rate, systolic blood pressure , diastolic blood pressure, via reflex responses and physical presence of endotracheal tube placement, which has been well known for the past 60 yrs since description by Bruce. Stimulation of the mechanoreceptors in the pharyngeal wall, epiglottis and vocal cord was thought to be the cause for these haemodynamic responses. These transitory hypertension and tachycardia were probably of no concern in healthy individuals, but either one or both may be hazardous to those with hypertension, myocardial insufficency or cardiovascular diseases. Hence the need to attenuate the sympathetic response to laryngoscopy and endotracheal intubation was important. Both laryngoscopy and intubation separately result in sympathetic stimulation, but the catecholamine rise with intubation exceeds that with laryngoscopy alone.

Anaesthesiologists were in constant search for the methods to attenuate these haemodynamic responses. Many methods and strategies had been tried by anesthesiologists to blunt these stimulation and stress responses to laryngoscopy and intubation like anesthetic agents, adjuvants and analgesics.Newer airway aids for laryngoscopy and intubation has evolved to avoid these major sympathetic stimulation and in management of difficult airway situations. These airway gadgets were compared with the current standard routine use of direct laryngoscopy and endotracheal intubation.

Levitan optical stylet was in clinical practice since 1996 after its invention by Dr.Richard Levitan. Levitan FPS was the shorter version of shikani optical stylet.It combines the advantage of fiberoptic intubation along with its malleability,semirigidity and simpliticity of this equipment to facilitate endotracheal intubation. It requires no imaging screen or power connection. Its length mimics a standard malleable stylet. It is

intended for use in every laryngoscopy, replacing a standard stylet for shaping and handling of the tracheal tube. In easy direct laryngoscopy, the fiberoptic view provides immediate visual confirmation of intratracheal placement. In situations of poor glottic exposure, however, it can be used for fiberoptic-guided intubation within the time frame of inserting a standard stylet.

We conducted a prospective randomised study in an attempt to review whether this newer Levitan optical stylets can reduce the haemodynamic responses to laryngoscopy and intubation when compared with the routine Macintosh Laryngoscope.Many previous studies conducted with Shikani optical stylet which was the longer version of Levitan optical stylet for haemodynamic responses showed considerable reduction in stress responses but data concerning with Levitan optical stylet was lacking in Indian population. The fixed curvature and bulk of the tracheal tubescope unit means that it may be difficult to advance the unit towards the glottis even if a relatively clear view of the laryngeal inlet is obtained. In one study using the Shikani Optical stylet, 10% of intubations required reshaping of the scope curvature to achieve successful intubation. The recommendation of a 35° bend angle for the Levitan FPS is based on a previous study which assessed the optimal scope bend angle that allowed tip visualization and manoeuverability without compromising the ability for tracheal tube passage due to impaction on the anterior tracheal rings by the scope tip .

Hence we selected the intubation using Levitan optical stylet in Indian population and compared with routine Macintosh Laryngoscope for intubation stress response.We also compared the ease of intubation with both the techniques.

In our study , there were 40 patients in each group ,all belonging to American society of Anaesthesiologists status 1 and 2.Patients with difficult airway were not included in the study. This study mainly focused on stress response in people with normal airway.

AGE AS A VARIABLE

Age group between 18-60 years were included in the study, since the extremes of ages were more susceptible to haemodynamic changes , responses may be variable and to establish uniformity in the study group. Paediatric population was not included in the study since the Levitan optical stylet can be intubated only with endotracheal tubes greater than 6 mm internal diameter ,the diameter of the optical stylet was around 5mm.Majority of the patients were in the age group of 30-45 yrs and they were found to be statistically comparable

WEIGHT AS A VARIABLE

In our study patients weighing between 50-80 kgs were included .Obese patients were excluded from the study group. In group A ,the mean weight was 52.2 kgs and in group B 53.3 kgs. We found no significant difference statistically with respect to weight .Majority of the patients weighed between 50-60 kgs.

GENDER AS A VARIABLE

In this study both the genders were included as there is no predliction for gender for haemodynamic responses to intubation. Percentage of males included in the study outnumbered the females by 7%

PATIENTS EXCLUDED FROM THE STUDY

Hypertensive and cardiovascular patients were excluded from the study population since they might show erratic changes to intubation using a new optical stylet and values obtained would not be comparable with the normotensives and non cardiac patients .Patients with coagulapathy were also omitted from the study since instrumentation with newer optical stylet can precipitate bleeding episodes.No study proved that the use of optical stylet was safe in these patients and it is still debatable.

AIRWAY ASSESSMENT

1:Mallampatti Classification as a variable

In our study we included the patients with mallampatti classification of 1 and 2 .Higher grades of MPC were excluded from the study since we cannot compare the haemodynamic response to intubation between the newer Levitan optical stylet and Macintosh laryngoscope in difficult airway patients.They might show a bizarre response and standardization cannot be done.The percentage of patients in group A with MPC 1 and 2 were 56% and 55% respectively and the percentage of patients in group B with MPC 1 and 2 were 44% and 45%.The two groups were therefore comparable

2:Thyromental distance and interincisor gap

In our study we included patients with thyromental distance >6.5 cm and interincisor gap greater than 4 cms. Values less that that were excluded from the study population. We found that the mean thyromental distance and interincisor gap in group A were 11.48 cm and 4.8 cm .Mean thyromental distance and interincisor gap in group B were 11.61 cm and 5 cm .They were found to be statistically insignificant and both the groups were comparable

AMERICAN SOCIETY OF ANAESTHESIOLOGY STATUS AS A VARIABLE

Patients with ASA 1 and 2 were included in the study .Hypertensive ,obese patients were excluded. Patients in ASA 1 outnumbered ASA 2 by 10 percent.

Thus we conclude in our study that with demography and airway assessment as a tool, there was no significant differences in both the groups with respect to age ,sex, mallampatti classification, American society of anesthesiologists, thyromental distance, interincisor gap. They were found to be statistically insignificant

INTRAMUSCULAR GYCOPYRROLATE AS A PREMEDICATION:

Patients were given inj.glycopyrrolate10μg/kg I.M half an hour before the procedure, mainly to reduce the secretions and to enhance better viewing with the fiberoptic stylet. This was supported by a study conduced by **Bernstein CA,Water s JH et al**[58] on perioperative glycopyrrolate use .It concluded that there was dramatic decrease in oral and gastric secretions .

HEART RATE CHANGES BETWEEN THE TWO GROUPS

Laryngoscopy and endotracheal intubation impose an increase in heart rate but this was insignificant in many patients. We compared the heart rate variations in both the groups at various time intervals after intubation at 0 min, 1 min,3min,5min and 10 min.In group B ,immediately after intubation at 0 min, the mean heart rate raised to 80bpm from the baseline mean heart rate value of 70bpm which was about 25% increase from the base line value , found to be statistically significant.whereas in group A the mean heart rate in post intubation (0min) was 72 bpm which increased only by 4beats from the base line value.the increase was only 5% and this difference was found to be statistically insignificant

TABLE SHOWING PERCENTAGE OF INCREASE IN HEART RATE FROM THE BASE LINE VALUE

GROUP	POST.INTU(0MIN)	IMIN	3MIN	5MIN	10MIN
A	5.5%	5.3%	4%	4%	3%
B	25%	21%	17%	11%	3%

IN GROUP B:

The number of patients in post intubation group who had a raise in heart rate from the baseline value to 20-30% was 28 .Two patients had a raise in heart rate above 30%.Ten percent increase in heart rate was encountered in 10 patients .The increase in heart rate in patients were settled down by using volatile anaesthetics increasing the percentage of sevoflurane by 2% and opioid analgesics fentanyl 1μg/kg was given.

IN GROUP A:

The number of patients who had an increase in heart rate above 20% was 2.Only 15 patients had an increase in heart rate from 10-20% from baseline.the reason for increase in heart rate above 20% was due to difficulty in intubations,two attempts were made to intubate the patient and the time taken for intubation for these two patients was around 80-90 sec. This was in accordance with the study conducted by **Kimura et al** [47]who studied the hemodynamic responses to intubation using stylet scope and macintosh laryngoscope.Baseline heart rate were similar in both the groups,all hemodynamic measurements decreased in both the styletscope and direct laryngoscopy group after induction.Post intubation heart rate in group with direct laryngoscope increased above the base line and other variable reached the base line .The increase in heart rate was less in group intubated with styletscope.In also the study conducted by **Yao et al** [33] who

compared the haemodynamic changes to inbutaion with Shikani and Macintosh laryngoscope.In which baseline heart rate were the same in both the groups. Heart rate increased immediately after intubation in both the group but significantly to a greater level in group intubated with Shikani optical stylet and heart rate returned to base line at 3 mins after intubation.Many studies were conducted using different airway gadgets and haemodynamic response to intubation were measured during intubation. One such study was conducted by **Tsai et al** [41]who compared the haemodynamic responses to intubation with three airway gadgets such as glidescope,airwayscopes and Mc Intosh Laryngoscopes.60 normotensive patients of ASA 1 and 2 were selected .20 patients were allotted in each group.Haemodynamic values were noted baseline ,after induction,at intubation and at every 5 mins after intubation.A significant rise in heart rate in Glidescope and Mc Intosh group at 1 minute post intubation.$p<0.04$ and it was found to be statistically significant.

SYSTOLIC BLOOD PRESSURE CHANGES BETWEEN TWO GROUPS

We found in our study that systolic blood pressure increased significantly in group B patients compared with group A patients in postintubation period.In group B,the mean systolic blood pressure increased to 140 mmhg in postintubation(0 min) from the baseline value of118 mm hg.There was a significant rise of 25% from the baseline valve which was statistically significant . SBP remained at 132 mm Hg at 1 min,127 mm Hg at 3 min and reached the baseline at 10 minutes post intubation,whereas in group A,SBP raised only 7 % postintubation from the baseline value which was found to be haemodynamically insignificant

TABLE SHOWING PERCENTAGE OF INCREASE IN SYSTOLIC BLOOD PRESSURE FROM THE BASELINE

GROUP	POST INTUB(0) MIN	1MIN	3MIN	5 MIN	10 MIN
A	6%	5%	5%	3%	5%
B	25%	20%	15%	11.5%	4%

In group B

At 0 min postintubation,eighteen patients in group B had an increase in systolic blood pressure of 20-25%,5 patients had a rise of only 10-15% and 4 patients encountered a rise of 25% from the baseline.The rise in SBP above 25% was settled down by inj.fentanyl and increasing the concentration of sevoflurane to2%.Only 3 patients had an increase in systolic blood pressure at 5 min and all the other patient's SBP reached the baseline value at around 10 minutes.This could be attributed to cause of increased stimulation of the mechanoreceptors in the larynx and glottis structures.

In group A

Only 2 patients had an increase in systolic blood pressure above 10% and with all the other 38 patients ,the rise was only in the range of 5-10% in the postintubation group which was found to be statistically insignificant.This was comparable to the study conducted by **Yao yun tai et al** [33] which concluded that the systolic blood presssure

increased over baseline at 1 min after intubation in patients intubated with laryngoscopy.there was no increase in blood pressure within five min after intubation when compared with the baseline values and also in a study conducted by **Koyama Y et al** [57] which compared the haemodynamic responses to tracheal intubation using airway scope and Macintosh Laryngoscope in normotensive and hypertensive patients and found that the systolic blood pressure was higher while using Macintosh laryngoscopy when compared to Airway scope post intubation.they were found to be statistically significant .

DIASTOLIC BLOOD PRESSURE CHANGES BETWEEN THE TWO GROUPS

On comparing the diastolic blood pressure changes between the two groups ,patients intubated with Macintoshlaryngoscope showed a significant increase in diastolic blood pressure than the patient intubated with Levitan optical stylet.In group B after intubation,the mean DBP increased to 88 mm Hg from the baseline value of 72 mm of Hg.There was 21% increase in diastolic blood pressure from the baseline value at 0 min after intubation which was statistically significant.At 10 min post intubation,the DBP reached the baseline value.

TABLE SHOWING PERCENTAGE OF INCREASE IN DIASTOLIC BLOOD PRESSURE FROM THE BASELINE VALUE

GROUP	POSTINT (0MIN)	1 MIN	3 MIN	5 MIN	10 MIN
A	5.78%	5.02%	4.02%	3%	3%
B	21%	19%	14%	9.6%	1%

In group B:

AT 0 min post intubation ,the number of patients with 20-30% raise in DBP was 22 which was found to be statistically significant.only seven patients had an increase in DBP of only 5-10% from the base line value .DBP reached the baseline value at 10 min post intubation.

In group A:

The raise in diastolic blood pressure at post intubation 0 min,1 min,3 min,5 min and 10 min was found to be around 2-5% from the base line value and not haemodynamically significant.This study was comparable to the study conducted by **P Tsai B Chen et al**[41] where he compared the haemodynamic changes to endotracheal intubation with the airwayscope,glidescope and Macintosh laryngoscopes.All intubations were performed by a single anaesthesiologist.After intubation at 0 min DBP increased significantly to 20 % from the baseline vave and settled to 4% at 5 min after intubation.**Yao yun Tai et al**[33] also compared the response to intubation with shikani optical stylet with the conventional laryngoscope.there was significant rise of diastolic pressure about 22% at one min following direct laryngoscopy whereas with shikani optical stylet the rise was only 8%.This was comparable to our study.

MEAN ARTERIAL BLOOD PRESSURE CHANGES

On comparing the mean arterial pressure changes between the two groups A and B ,there was significant increase in MAP in group B compared to group A.In group B,MAP increased to 22% above the baseline and at 1 min too mean MAP was around 90.14 mm Hg .MAP returned to baseline at 10 minutes after intubation.

TABLE SHOWING PERCENTAGE OF INCREASE IN MEAN ARTERIAL BLOOD PRESSURE FROM THE BASELINE

GROUP	POSTINU(0MIN)	1 M1N	3MIN	5MIN
A	5.4%	4%	4.5%	3%
B	22%	19%	15%	7%

IN GROUP B

About 26 patients in group B had a raise of 20-30% increase in heart rate from the baseline .1 patients had a MAP of greater than 30 % from the base line.this was attributed to the reason that ,intubation was difficult and scopy time was longer which amounts to 40 sec.This study was comparable to **Barak et al**[43] where they compared the haemodynamic and catecholamine responses to intubation between direct laryngoscopy and fiberoptic intubation.The mean arterial blood pressure raised significantly from the MAP of 78(baseline) to 100 post intubation(0min) and it was found to be statistically significant.

We concluded in our study that MAP increase was more in group B than group A in post intubation time at 0 min ,1 min and 3 min respectively.

SP02 CHANGES BETWEEN THE TWO GROUPS

There was no significant changes in saturation levels in both the groups A and B and they were found to be statistically insignificant

COMPARISON OF TIME TAKEN FOR INTUBATION BETWEEN TWO GROUPS

The mean time taken for intubation of Levitan optical stylet was 55 secs and for Macintosh laryngoscope was 20 secs.

In group A the time taken for intubation ranges between 40 sec to 100 secs.This wide variation occurred since in two patients ,intubation could not be carried out with levitan even after three attempts and there was difficulty in intubation and procedure was carried out with conventional Macintosh Laryngoscope Blade .**Edward,Irwin et al** found intubation time with Levitan optical stylet was 20.1 sec and with bougie in simulated difficult airway patients was 9 secs.this was in contrast to our study where the time for intubation was longer(55 sec).But in the study conducted by **Islam.A.Eliwa et al** [34]found that intubation time using levitan alone was 81 s.levitan with Macintosh laryngoscopy was 44 s,which was comparable to our study. **Aziz and metz**[37] et al showed in their study that the mean intubation time with levitan scope when used alone without direct laryngoscopy was 23 s. This was in contrast to our study ,the problem that we encountered was that during intubation,glottis structures could nt be visualized even after 3 attempts in 2 patients so the time spent for intubation was around 90 to 100 sec..so the mean time taken for intubation was affected by this extremes of data. Supplemental oxygen was given during intubation in these three patients since the intubation time was prolonged.

COMPARISION OF EASE OF INTUBATION BETWEEN THE TWO GROUPS

In group A ,36 persons were intubated in first attempt and 2 patients were intubated in second attempt.Intubation was easier in 95 % of patients and difficult in 5 % in group A.2 patients had difficulty in intubation since the glottic structures could nt be visualized on first attempt.On manipulating the larynx externally they were able to intubate in second attempt.In group B, 39 patients were intubated in first attempt and 1 patient was

intubated in second attempt.97.5 % of intubation was easier in group B and 2.5 % were difficult .In group B one patient was intubated in second attempt because of anteriorly placed larynx. They were found to be statistically insignificant as p valve is> 0.05.**Greenland Lui et al** [48]compared Levitan FPS scope and single use bougie for simulated difficult airway.17 patients were enrolled in each group.prescotts test found that there were no significant difference in the rate of successful insertion between the two groups.Levitan group(31 out of 34) and bougie group(29 out of 34).p valve was found to be 0.71.

COMPARISON OF SUCCESS RATE BETWEEN TWO GROUPS

In our study 95 % of patients in group A were successfully intubated with levitan optical stylet and 5 % of the patients could not be intubated,because of the technical difficulty and secretions which hindered the field inspite of Intramuscular glycopyrrolate injections.In group B all the 40 patients were successfully intubated with macintosh laryngoscope.

In accordance with our results, **Islam.A eliwa et al**[34] concluded in their study that success rate with levitan optical stylet when it was used alone was 90 % and 96 % when used along with macintosh.while the success rate with shikani optical stylet when used alone was 86 % and 90 % with the use of direct laryngoscopy.**Turkstra et al** [49]in their study showed about 91.3% success rate with shikani optical stylet.

Mihai et al[56] in their meta analytic study of shikani optical stylet found the over all success percentage of 94.9 %. **Aziz and Metz**[37] showed a over all success rate of 99.7 % with levitan optical stylet when it is used with out a laryngoscopy,whereas **Greenland et al**[48] showed 91 % success rate with levitan optical stylet when used with laryngoscopy.

The high success rate of levitan optical stylet because of its easy learning curve and its rigid design and similarity with the ordinary familiar intubating stylet.

COMPLICATIONS

In our study group A patients had no complications like sorethroat, bleeding and hoarseness of voice and in group B one patient had hoarseness of voice and two other patients had sore throat which resolved spontaneously in 24 hrs.One patient who had hoarseness of voice had undergone adenotonsillectomy via snaring method.This was in accordance with the study conducted by **Yao et al**[33] where there was one case reported to have hoarseness of voice postoperatively in patients intubated with direct laryngoscope.The incidence and complications with the use of Levitan optical stylet was low when compared with Mc Intosh Laryngoscope as described in the study conducted by **Islam A.Eliwa**[34]**. Aziz and Metz et al** [37] concluded that the modified Levitan optical stylet can be used effectively ,rapid with the incidence of complications of only 1% of the 300 patient studied who suffered only minimal trauma.

CONCLUSION

CHAPTER 8

CONCLUSION

The haemodynamic responses to intubation was lesser with newer Levitan optical stylet when compared with the conventional Macintosh Laryngoscope. The stress response associated with the direct Laryngoscopy was overcome by Levitan optical stylet when used alone. But the concerning factor was the time taken for intubation with Levitan optical stylet , was quite longer than direct laryngoscope which was within limits.

.Hence I conclude that this Levitan optical stylet can serve as an ideal airway gadget for attenuating the stress response to intubation with no serious complications.

SUMMARY

CHAPTER 7

SUMMARY

Endotracheal intubation and laryngoscopy are very essential tools in the hands of anaesthesiologist in maintaining airway .Airway management is the fundamental aspect of anaesthetic practice ,emergency and critical care medicine. Endotracheal intubation incur haemodynamic responses like increase in heart rate, systolic blood pressure, diastolic blood pressure and mean arterial pressure.Since the upper airway is highly innervated, airway instrumentation results in significant haemodynamic responses. Anaesthesiologist found a technique of intubation which minimized the stimulation of the upper airway. Levitan optical stylet gained its importance ,since its introduction by Dr. Richard Levitan. The shorter length resembles standard stylet making it useful in every laryngoscopy, handling and shaping of the tracheal tube while offering a fibreoptic intubation and immediate visual confirmation of intratracheal placement. The primary objective of this study was to compare the haemodynamic responses to intubation using Levitan optical stylet alone versus intubation using levitan optical stylet along with Macintosh laryngoscope. Secondary outcome measures the ease of intubation, intubation time with two techniques,complications and failure rate.We recruited 80 patients in this prospective study,after obtaining ethical committee approval.These patients were aged between 18-60 yrs belonging to ASA I and ASA II with MPC I and MPC II and thyromental distance >6.5 cm. Hypertensive patients,difficult airway and cardiovascular patients were excluded from the study. They were divided into two groups .Group A –intubation carried with Levitan optical stylet, Group B- intubation carried out with Levitan optical stylet along with Macintosh laryngoscope.These patients were evaluated for the haemodynamic responses at preintubation,postintubation(0min),1min,3 min,5 min and 10 min respectively. The

time taken for intubation ,ease of intubation in both the groups were also noted down. Postoperatively patients were monitored for complications such as sorethroat ,hoarseness of voice and bleeding. These results were tabulated and analysed using SPSS software version 22.The two groups were comparable in terms of age,weight and sex.Other parameters such as ASA,thyromental distance,interincisor gap were also comparable.The stress response associated with endotracheal intubation was more with group B (patients intubated with Macintosh laryngoscope) than with group A(intubation with Levitan alone) at post intubation 0min,1min and 3 min as the p valve was 0.00.The mean time taken for intubation in group A (55 seconds) was longer than group B(20 seconds) and the p value was 0.00 and found to be statistically significant.The success rate of intubation in group B was 100% whereas in group A was 95%.The failure rate of intubation was 5% in group A. No serious complications were encountered in both the groups.Hence we concluded that Levitan optical stylet was more superior than conventional Macintosh laryngoscope in the aspect of haemodynamic responses.

ANNEXURES

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GROUP	S.NO	NAME	AGE	WEIGHT	SEX	IP NO	DIAGNOSIS	PROCEDURE	ASA	MPC	THYROMDIS	INTER GAP	HRBL	HRPI	HRPT	HR1	HR3	HR5
A	1	JAYAKRISHNAN	27	68	M	210129	R.CSOM WITH CP	R.CORTICAL MASTOIDECTOMY	1	1	10.8	4	65	67	69	70	68	66
B	2	YOGARAJ	19	57	M	245643	THYROGLOSSAL CYCT	EXCISION	1	2	12	5	68	66	72	70	67	69
A	3	JAYALAKSHMI	35	70	F	54331	CHRONIC SINUSITIS WITH DNS	SEPTO FESS	1	2	11	4.5	68	69	72	74	73	70
A	4	SAIRAM	38	69	F	22407	SINONASAL POLYP	FESS	2	1	11.2	5	70	72	74	76	73	71
B	5	SANGEETHA	25	52	F	347823	L.CSOM WITH CP	L.CORTICAL MASTOIDECTOMY	2	1	12	5.5	60	62	68	68	67	90
A	6	THANGAVEL	45	66	M	19066	THYROGLOSSAL CYST	EXCISION	2	2	12	5.5	64	66	69	71	69	65
B	7	TAMILSELVI	34	54	F	326757	CHRONIC SINUSITIS	FESS	1	1	13	5.7	64	66	72	72	71	69
B	8	VINOTH	29	49	M	215678	SINONASAL POLYPOSIS	POLYPECTOMY	2	1	12.4	5.5	73	75	81	78	77	75
A	9	PAMAVATHY	37	57	F	220775	L.CSOM WITH CP	L.CORTICALMASTOIDECTOMY	2	2	11	5	67	68	70	71	68	67
B	10	PAVITHRA	19	51	F	256743	CHRONIC ADENOTONSILLITIS	EXCISION AND CURETTAGE	1	1	11	5	94	96	105	100	97	95
A	11	BALAN	30	59	M	212793	SINONASAL POLYPOSIS	POLYPECTOMY	2	1	12	5.5	70	72	74	76	73	73
B	12	VENKATESAN	34	66	M	342789	FACIOMAXILLARY TRAUMA	RECONSTRUCTION SURGERY	2	2	11	5	68	70	76	78	76	72
A	13	SIBAN	19	55	M	146545	CHRONIC ADENOTONSILITIS	EXCISION AND CURRETAGE	2	1	11	4	72	74	74	77	74	74
A	14	PRIYA	20	54	F	153791	CHRONIC ADENOTONSILLITIS	EXCISION AND CURRETAGE	2	2	12	5	66	68	69	72	70	70
B	15	RAMESH	42	63	M	258493	L.CSOM WITH CP	L.CORTICAL MASTOIDECTOMY	2	1	12.2	4.5	70	72	78	78	76	73
A	16	KANCHANA	27	59	F	165966	L.CSOM WITH CP	L.CORTICALMASTOIDECTOMY	1	1	11	4	65	67	69	70	67	66
B	17	KAMAKSHI	19	60	F	264933	R.CSOM WITH CP	R.CORTICAL MASTOIDECTOMY	1	1	12	4.8	78	80	85	84	82	81
B	18	RAJA	25	63	M	298754	CHRONIC SINUSITIS	FESS	2	1	13	5	66	68	75	74	70	68
A	19	JEEVAN	34	58	M	143542	FACIOMAXILLARY TRAUMA	RECONSTRUCTIVE SURGERY	2	1	12.5	4.4	68	69	71	74	73	70
A	20	PREM	29	53	M	238920	R.CSOM	R.CORTICAL MASTOIDECTOMY	1	1	10	4.8	66	68	70	71	69	66
B	21	LOGANATHAN	42	68	F	272356	CHRONIC ADENOTONSILLITIS	EXCISIONAND CURETTAGE	1	2	11	5	65	67	72	71	70	68
A	22	RAHEEMMABEE	30	64	F	234444	FUNGAL SINUSITIS	REVISION FESS	1	2	11	5	68	70	70	73	71	70
B	23	KARTHIK	33	59	M	298743	FUNGAL SINUSITIS	REVISION FESS	2	1	11	4.5	69	72	76	74	74	70
B	24	MARIYAPPAN	45	53	M	432891	R.CSOM WITH CP	R.CORTICAL MASTOIDECTOMY	1	2	12	5	64	67	72	70	68	66
A	25	MALLIGA	27	54	F	165966	L.CSOM WITH CP	L.CORTICALMASTOIDECTOMY	1	2	11	5.2	65	67	69	70	68	66
B	26	YUVARAJ	37	65	M	254329	CHRONIC SINUSITIS	FESS	1	2	12	5.5	68	71	78	75	73	70
A	27	BRITO	20	52	M	232432	FACIOMAXILLARY TRAUMA	RECONSTRUCTIVE SURGERY	1	1	12.5	5	68	69	69	72	69	69
A	28	SUNDARI	20	50	M	166076	L.CSOM WITH CP	L.CORTICALMASTOIDECTOMY	1	1	11.5	4.7	72	73	75	77	74	74
B	29	VENKATESAN	56	62	M	243786	SINONASAL POLYPOSIS	POLYPECTOMY	2	1	13	5	64	66	72	70	69	67
B	30	RAHUL GANDHI	20	48	M	328765	L.CSOM WITH CP	L.CORTICAL MASTOIDECTOMY	1	2	11	5.5	74	76	82	80	79	77
A	31	GOWRI	23	54	F	239043	CHRONIC SINUSITIS WITH DNS	FESS	1	2	10	4.8	66	68	70	72	69	69
A	32	VIGNESH	25	57	M	247076	R.CSOM WITH CP	MASTOIDECTOMY	1	1	12	5	67	68	70	72	71	69
A	33	VENNILA	19	46	F	287967	RECURRENT NEUROFIBROMA	EXCISION	2	2	11	5.2	71	73	75	73	72	72
B	34	USHA	32	51	F	211976	R.CSOM WITH CP	R.CORTICAL MASTOIDECTOMY	2	1	11	5	68	71	79	79	77	74
B	35	SHABINA	20	49	F	290087	CHRONIC SINUSITIS	FESS	1	2	10	5.5	78	80	88	86	82	80
A	36	KADAL KESAN	45	66	M	223671	L.CSOM WITH CP	L.MASTOIDECTOMY	1	1	12.5	5.5	74	75	77	76	75	74

GROUP	S.NO	NAME	AGE	WEIGHT	SEX	IP NO	DIAGNOSIS	PROCEDURE	ASA	MPC	THYROMDIS	INTERGAP	HRBL	HRPI	HRPT	HR1	HR3	HR5
B	37	DHANALAKSHMI	36	54	F	277543	FACIOMAXILLARY TRAUMA	RECONSTRUCTION SURGERY	2	1	11	4.5	67	69	75	74	72	70
B	38	THIRUMALAI	29	53	M	266854	SINONASAL POLYPOSIS	POLYPECTOMY	1	2	10	4	76	78	84	84	82	80
A	39	PARTHIBAN	20	54	M	207647	R.CSOM	R.CORTICAL MASTOIDECTOMY	1	2	11	5	68	69	71	73	70	70
A	40	PANNERSELVAM	30	55	M	209765	FUNGAL SINUSITIS	REVISION FESS	2	2	12	4.5	73	75	77	78	74	73
B	41	SUMITHRA	28	60	F	944831	R.ANTROCHOANAL POLYP	FESS	1	2	11	4.5	74	76	83	81	78	76
B	42	PANDIYAN	55	56	M	312116	CHRONIC ADENOTONSILLITIS	EXCISION AND CURETTAGE	2	1	11	4.5	63	65	74	73	71	68
A	43	ANITHA	40	64	F	234871	THYROGLOSSAL CYST	EXCISION	1	2	12.6	5	65	66	68	67	67	66
A	44	KRITHIKA	28	54	F	285432	CHRONIC ADENOTONSILLITIS	EXCISION AND CURRETAGE	1	2	11	5	74	76	77	76	76	75
A	45	SAKTHIVEL	20	54	M	261387	L.CSOM WITH CP	L.CORTICALMASTOIDECTOMY	2	1	12	4.6	72	74	74	75	74	73
B	46	ILAYARAJ	20	53	M	285001	CHRONIS SINUSITIS	FESS	1	1	10	5	75	77	82	79	76	76
B	47	MADHAN KUMAR	24	55	M	1484601	FACIOMAXILLARY TRAUMA	RECONSTRUCTION SURGERY	2	1	12	5.5	78	80	86	84	82	80
A	48	SELVAMARY	36	52	F	276323	FACIOMAXILLARY TRAUMA	RECONSTRUCTIVE SURGERY	2	1	12	5	68	69	72	70	70	69
A	49	KANNAN	38	64	M	218743	SINONASAL POLYPOSIS	POLYPECTOMY	1	2	12	5	65	67	69	68	66	65
B	50	JANAKIRAM	27	58	M	1435627	R.CSOM WITH CP	R.CORTICAL MASTOIDECTOMY	1	2	11	5	68	70	76	78	76	72
A	51	VALLI	42	54	F	294321	R.CSOM WITH CP	MASTOIDECTOMY	2	1	12	5.5	67	68	71	73	70	69
A	52	CHANDRAKALA	29	53	F	286521	FUNGAL SINUSITIS	REVISION FESS	1	2	12.5	5	76	78	80	78	77	77
B	53	KANCHANA	27	65	F	145966	L.CSOM WITH CP	L.CORTICAL MASTOIDECTOMY	2	1	11	4.5	70	72	79	78	76	72
B	54	HARIKA	22	65	F	214033	CHRONIC SINUSITIS	FESS	2	1	11	5	75	77	83	80	79	79
A	55	RAMU	33	54	M	273167	THYROGLOSSAL CYST	EXCISION	2	1	11	4.5	64	66	68	67	66	65
B	56	SHAKIRA	34	59	F	166484	R.CSOM WITH CP	R.CORTICAL MASTOIDECTOMY	2	1	12	5	66	68	75	73	70	68
B	57	SWETHA	21	53	F	194135	CHRONIC ADENOTONSILLITIS	EXCISION AND CURETTAGE	1	2	12.7	5	70	73	79	76	74	73
A	58	SARAVANAN	27	52	M	295248	R.CSOM WITH CP	MASTOIDECTOMY	2	2	11	4.6	68	70	73	71	70	70
B	59	HARI	43	68	M	1430787	CHRONIC TONSILLITIS	EXCISION AND CURETTAGE	1	2	12	5	80	82	89	86	84	83
A	60	SUDHA	36	60	F	211964	CHRONIC ADENOTONSILLITIS	EXCISION AND CURRETAGE	1	1	10.5	4	70	72	74	73	72	71
A	61	VIVEKANANDHAN	41	65	M	284189	RECURRENT NEUROFIBROMA	EXCISION	1	2	11	4.5	66	68	70	69	67	67
B	62	SUGUNA	49	63	F	289130	L.CSOM WITH CP	L.CORTICAL MASTOIDECTOMY	2	1	12.8	5	63	65	72	68	67	65
A	63	LOGESHWARI	34	60	F	285104	R.CSOM	R.CORTICAL MASTOIDECTOMY	2	1	11	4.8	73	75	77	74	73	72
B	64	SASIKALA	29	55	F	160660	CHRONIC ADENOTONSILLITIS	EXCISION AND CURETTAGE	1	2	12	5	76	78	84	80	77	77
B	65	RAJESH	78	60	M	167663	FACIOMAXILLARY TRAUMA	RECONSTRUCTION SURGERY	2	1	12	4.5	77	79	86	83	82	79
A	66	RAJA	43	62	M	286106	CHRONIC SINUSITIS WITH DNS	FESS	1	2	11	5	67	68	71	73	70	70
A	67	RAJAMOORTHY	23	53	M	283932	FACIOMAXILLARY TRAUMA	RECONSTRUCTIVE SURGERY	1	1	12	5.5	71	73	75	73	72	72
B	68	JAYACHANDRAN	25	52	M	185254	CHRONIC SINUSITIS	FESS	1	2	11	5.5	74	76	83	81	78	76
A	69	KUMARI	38	66	F	299528	FUNGAL SINUSITIS	REVISION FESS	2	2	13	5	74	75	78	76	75	74
B	70	SOUNDARAJAN	66	62	M	227488	SINONASAL POLYPOSIS	FESS	1	2	11	5	63	65	72	70	68	67
A	71	MUTHUKUMAR	37	63	M	211064	L.CSOM WITH CP	L.CORTICALMASTOIDECTOMY	1	1	11	5	76	78	81	79	77	77
B	72	DESAMMAL	35	69	F	1437303	L.CSOM WITH CP	L.CORTICAL MASTOIDECTOMY	1	2	12.6	5	79	81	88	85	83	80

GROUP	S.NO	NAME	AGE	WEIGHT	SEX	IP NO	DIAGNOSIS	PROCEDURE	ASA	MPC	THYROM DIS	INTER GAP	HRBL	HRPI	HRPT	HR1	HR3	HR5
B	73	VIJAYAKUMAR	29	64	M	672361	CHRONIS SINUSITIS	FESS	2	1	13	5	77	79	83	81	70	77
A	74	JAYALAKSHMI	28	63	F	296543	R.CSOM	R.CORTICAL MASTOIDECTOMY	2	2	12	5.5	65	67	69	68	66	65
A	75	DHANDAPANI	41	63	M	200631	SINONASAL POLYPOSIS	POLYPECTOMY	1	1	11	4.5	75	77	80	77	76	76
B	76	SELVAM	45	64	M	1436961	FACIOMAXILLARY TRAUMA	RECONSTRUCTION SURGERY	2	1	12	4.5	69	71	79	77	75	73
A	77	SUBRAMANI	33	54	M	227688	THYROGLOSSAL CYST	EXCISION	2	2	12	4.9	68	69	71	73	70	70
B	78	VIJAYALAKSHMI	21	61	F	140980	CHRONIC ADENOTONSILLITIS	EXCISION AND CURETTAGE	1	2	11	4.5	82	84	90	87	85	83
B	79	SUNDARI	35	59	F	1666076	L.CSOM WITH CP	L.CORTICAL MASTOIDECTOMY	2	1	11	4.5	68	70	78	77	75	70
B	80	AMALA	35	63	F	362285	R.CSOM WITH CP	R.CORTICAL MASTOIDECTOMY	1	2	12	5.3	74	76	82	79	77	76

GROUP	S.NO	NAME	HR10	SBL	SPI	SBPPT	SBP1	SBP3	SBP5	SBP10	DPBL	DPPI	DPPT	DP1	DP3	DP5	DP10	MAPBL	MAPPI	MAPPT	MAP1
A	1	JAYAKRISHNAN	66	118	120	124	124	122	120	117	70	72	74	75	74	73	70	86	88	91	91
B	2	YOGARAJ	65	130	130	156	150	140	136	136	60	62	88	85	85	78	70	83	85	111	107
A	3	JAYALAKSHMI	68	128	126	128	128	127	126	126	68	70	72	73	72	70	69	88	89	91	91
A	4	SAIRAM	70	120	118	122	124	124	122	118	72	74	75	73	73	72	73	88	89	91	90
B	5	SANGEETHA	63	126	128	150	145	140	138	126	72	70	88	86	85	80	74	90	89	109	106
A	6	THANGAVEL	65	126	120	122	123	124	122	122	69	71	73	72	72	70	70	88	87	89	89
B	7	TAMILSELVI	66	100	102	138	136	132	131	129	70	68	82	80	80	74	70	80	79	101	99
B	8	VINOTH	74	116	118	140	134	132	130	120	74	72	90	85	85	80	73	88	87	107	101
A	9	PAMAVATHY	67	104	106	110	112	110	108	108	71	73	75	74	72	72	71	82	84	87	87
B	10	PAVITHRA	95	118	120	132	127	124	120	119	65	67	78	75	75	68	66	83	85	96	92
A	11	BALAN	70	128	126	128	130	130	130	128	78	78	80	79	79	78	78	95	94	96	96
B	12	VENKATESAN	70	114	114	140	130	126	126	114	70	72	89	84	84	80	70	85	86	106	99
A	13	SIBAN	72	120	118	122	124	124	120	118	80	82	84	84	83	81	80	93	94	97	97
A	14	PRIYA	67	104	106	109	112	110	108	108	82	84	86	85	84	83	82	89	91	94	94
B	15	RAMESH	72	108	109	132	132	128	120	109	66	69	84	82	82	76	68	80	82	100	99
A	16	KANCHANA	65	126	120	123	122	121	122	120	70	72	74	75	74	73	70	89	88	90	91
B	17	KAMAKSHI	79	100	102	132	132	129	129	116	75	74	92	88	87	82	72	83	83	105	103
B	18	RAJA	67	120	118	136	132	129	126	125	60	64	88	82	82	78	70	80	82	104	99
A	19	JEEVAN	68	110	106	109	110	112	113	114	74	76	78	81	78	76	74	86	86	88	91
A	20	PREM	66	112	114	116	117	116	117	112	68	70	72	73	72	70	68	83	85	87	88
B	21	LOGANATHAN	67	110	110	136	134	132	132	120	72	72	89	85	85	84	80	85	85	105	101
A	22	RAHEEMMABEE	69	128	126	128	130	130	126	126	73	75	77	75	74	74	73	91	92	94	93
B	23	KARTHIK	70	102	110	134	131	130	124	120	64	65	90	85	85	82	76	77	80	105	100
B	24	MARIYAPPAN	65	116	117	132	126	124	120	118	67	65	82	80	80	70	70	83	82	99	95
A	25	MALLIGA	66	120	118	122	118	116	116	116	66	68	70	69	69	67	66	84	85	87	85
B	26	YUVARAJ	69	108	110	132	128	127	126	114	72	74	82	80	80	70	82	84	86	104	99
A	27	BRITO	68	104	106	110	110	108	108	106	72	74	76	75	75	74	72	83	85	87	87
A	28	SUNDARI	73	124	120	120	116	116	114	114	75	77	78	77	76	75	75	91	91	92	90
B	29	VENKATESAN	65	106	110	137	134	130	125	112	72	74	92	86	85	74	71	83	86	107	102
B	30	RAHUL GANDHI	75	110	112	134	128	128	120	112	67	65	92	86	85	74	68	81	81	105	99
A	31	GOWRI	67	124	120	124	124	124	122	122	68	69	71	70	69	68	67	87	86	89	88
A	32	VIGNESH	68	110	106	112	110	110	108	108	76	78	80	79	78	78	76	87	87	91	89
A	33	VENNILA	71	122	118	124	124	124	122	120	69	71	73	72	72	70	70	87	87	90	89
B	34	USHA	70	108	110	138	126	124	120	109	71	69	96	90	90	86	80	79	81	89	85
B	35	SHABINA	79	119	121	129	125	124	120	120	70	68	76	78	78	74	72	86	85	94	94
A	36	KADAL KESAN	74	106	108	112	110	110	108	108	79	81	83	82	81	80	80	88	90	93	91

GROUP	S.NO	NAME	HR10	SBL	SPI	SBPPT	SBP1	SBP3	SBP5	SBP10	DPBL	DPPI	DPPT	DP1	DP3	DP5	DP10	MAPBL	MAPPI	MAPPT	MAP1
B	37	DHANALAKSHMI	68	107	109	116	114	112	110	108	69	71	78	77	77	74	74	82	84	91	89
B	38	THIRUMALAI	77	120	122	128	126	124	122	120	75	78	85	80	80	78	78	90	93	100	95
A	39	PARTHIBAN	69	126	120	126	124	124	124	122	73	75	76	77	75	74	73	91	90	93	93
A	40	PANNERSELVAM	74	120	122	124	124	124	120	120	76	78	80	77	75	75	76	91	93	95	93
B	41	SUMITHRA	75	122	124	130	128	126	124	123	74	78	87	82	82	80	80	90	93	101	97
B	42	PANDIYAN	65	108	110	116	114	112	110	109	72	70	81	78	78	74	70	84	83	93	90
A	43	ANITHA	65	128	126	128	126	126	126	126	73	75	77	75	74	74	73	91	92	94	92
A	44	KRITHIKA	75	108	112	116	114	114	112	112	72	70	74	75	72	71	84	84	88	84	86
A	45	SAKTHIVEL	73	127	128	130	130	128	130	130	76	78	82	80	79	77	78	76	93	95	98
B	46	ILAYARAJ	75	124	126	132	130	128	126	125	84	82	90	89	89	85	87	97	97	104	103
B	47	MADHAN KUMAR	79	129	131	138	134	131	132	130	81	80	88	87	87	82	84	94	97	104	103
A	48	SELVAMARY	68	124	122	124	124	122	122	122	72	74	76	74	73	70	70	72	89	90	92
A	49	KANNAN	64	126	124	126	128	126	126	124	70	72	74	75	74	73	70	89	89	91	93
B	50	JANAKIRAM	70	105	107	114	112	108	107	106	68	65	74	70	70	68	69	80	79	87	84
A	51	VALLI	68	106	108	112	110	108	108	106	68	70	72	68	72	71	69	81	83	85	82
A	52	CHANDRAKALA	76	118	120	116	114	114	112	114	74	76	79	77	76	75	75	89	91	91	89
B	53	KANCHANA	70	120	123	129	127	125	124	123	78	76	85	80	80	77	79	92	92	100	95
B	54	HARIKA	76	123	125	131	129	127	125	124	83	80	86	82	82	81	82	96	95	101	98
A	55	RAMU	64	112	116	118	114	114	112	112	66	68	70	71	69	68	67	81	84	86	85
B	56	SHAKIRA	67	117	119	125	124	118	116	117	67	70	78	72	72	70	70	84	86	94	89
B	57	SWETHA	72	118	120	128	124	120	119	119	69	67	78	73	73	75	72	85	85	95	90
A	58	SARAVANAN	69	106	108	110	106	106	104	104	69	70	73	71	70	72	70	81	83	85	83
B	59	HARI	81	104	106	112	110	108	106	105	70	72	79	75	75	72	71	81	83	90	87
A	60	SUDHA	71	120	118	122	120	118	118	116	66	68	70	69	69	67	66	84	85	87	86
A	61	VIVEKANANDHAN	66	120	122	124	122	122	120	118	68	70	72	69	67	66	67	85	87	89	87
B	62	SUGUNA	64	112	114	120	118	116	115	114	65	68	76	75	75	74	70	81	83	91	89
A	63	LOGESHWARI	72	108	110	112	114	110	108	108	64	66	69	68	67	66	65	79	81	83	83
B	64	SASIKALA	76	108	110	116	114	112	110	109	68	70	82	75	75	72	74	81	83	93	88
B	65	RAJESH	78	122	124	130	128	126	124	122	84	82	90	83	83	85	82	97	96	103	98
A	66	RAJA	69	128	126	128	128	126	126	126	82	80	85	84	81	80	80	97	95	99	99
A	67	RAJAMOORTHY	71	118	116	118	118	117	117	116	80	78	76	78	76	75	77	93	91	90	91
B	68	JAYACHANDRAN	75	110	112	119	117	116	114	112	64	66	72	68	68	68	65	79	81	88	84
A	69	KUMARI	73	106	108	110	112	110	108	106	72	70	74	75	72	70	70	83	83	86	87
B	70	SOUNDARAJAN	64	109	111	119	118	116	112	110	66	68	76	72	72	72	70	80	82	90	87
A	71	MUTHUKUMAR	76	132	130	132	134	130	128	126	82	80	82	80	81	80	80	99	97	99	98
B	72	DESAMMAL	79	122	124	133	132	128	126	123	76	74	82	75	75	72	73	91	91	99	94

GROUP	S.NO	NAME	HR10	SBL	SPI	SBPPT	SBP1	SBP3	SBP5	SBP10	DPBL	DPPI	DPPT	DP1	DP3	DP5	DP10	MAPBL	MAPPI	MAPPT	MAP1
B	73	VIJAYAKUMAR	78	121	123	129	127	126	125	122	73	75	84	76	76	72	73	89	91	99	93
A	74	JAYALAKSHMI	64	112	110	115	113	108	108	106	66	68	71	73	70	68	67	81	82	86	86
A	75	DHANDAPANI	75	122	118	120	122	122	118	116	69	71	73	72	72	70	70	87	87	89	89
B	76	SELVAM	70	109	111	119	118	116	114	110	68	66	74	69	69	72	70	82	81	89	85
A	77	SUBRAMANI	69	126	128	130	130	128	126	124	76	78	82	80	79	77	78	93	95	98	97
B	78	VIJAYALAKSHMI	83	123	125	130	129	128	126	122	78	75	83	78	78	77	75	93	92	97	95
B	79	SUNDARI	69	119	121	130	128	127	124	122	70	72	79	72	72	69	67	86	88	96	91
B	80	AMALA	75	130	132	136	134	132	132	130	82	84	89	85	85	84	82	98	100	105	101

GROUP	S.NO	NAME	MAP3	MAP5	MAP10	S0BL	SOPI	SOPT	SO1	S03	S05	SO10	TIME TAKEN FOR INTUBATION	EASE OF INTUBATION	FAILURE RATE	POST HR	POST BP	POSTS P02	POST HR 6
A	1	JAYAKRISHNAN	90	89	86	99	99	100	99	99	100	99	45	EASY	NO	66	120/72	100	65
B	2	YOGARAJ	103	97	82	99	99	100	100	99	99	99	19	EASY	NO	68	130/80	100	66
A	3	JAYALAKSHMI	91	90	88	99	99	100	100	99	99	99	48	EASY	NO	62	120/70	99	64
A	4	SAIRAM	90	89	88	99	99	99	99	100	100	99	52	EASY	NO	70	128/76	100	72
B	5	SANGEETHA	103	99	91	99	99	100	100	100	99	99	15	EASY	NO	64	120/68	99	66
A	6	THANGAVEL	89	88	87	98	99	99	100	99	99	99	54	EASY	NO	65	120/80	100	67
B	7	TAMILSELVI	97	93	90	99	99	100	100	99	99	99	21	EASY	NO	63	118/76	100	65
B	8	VINOTH	101	97	89	99	100	100	100	100	99	99	21	EASY	NO	74	130/80	99	76
A	9	PAMAVATHY	85	84	83	99	100	100	99	99	100	100	56	EASY	NO	72	128/76	100	74
B	10	PAVITHRA	91	85	84	99	99	99	100	100	99	99	20	EASY	NO	94	110/84	99	97
A	11	BALAN	96	95	95	100	99	99	99	99	100	99	59	EASY	NO	76	110/68	100	78
B	12	VENKATESAN	98	95	85	99	100	100	99	100	99	99	18	EASY	NO	69	120/76	100	72
A	13	SIBAN	97	81	93	100	100	99	99	100	99	99	61	EASY	NO	71	128/78	99	73
A	14	PRIYA	93	91	91	99	99	100	99	100	99	99	59	EASY	NO	66	108/70	100	68
B	15	RAMESH	97	91	82	99	99	100	100	100	99	99	12	EASY	NO	70	110/76	99	73
A	16	KANCHANA	90	89	90	99	98	99	100	100	99	99	51	EASY	NO	65	120/80	100	67
B	17	KAMAKSHI	101	98	87	100	99	100	99	100	99	99	14	EASY	NO	78	134/82	99	79
B	18	RAJA	98	94	88	99	99	99	100	100	99	99	15	EASY	NO	66	120/72	100	65
A	19	JEEVAN	89	88	86	99	100	100	99	100	99	99	55	EASY	NO	68	118/80	99	69
A	20	PREM	87	86	82	100	99	99	100	99	99	100	45	EASY	NO	66	112/70	99	68
B	21	LOGANATHAN	101	100	93	100	99	100	99	100	99	99	22	EASY	NO	65	120/80	100	67
A	22	RAHEEMMABEE	93	91	91	99	100	100	99	100	99	99	53	EASY	NO	68	130/80	100	66
B	23	KARTHIK	100	96	91	99	99	100	100	99	99	99	21	EASY	NO	69	120/76	100	72
B	24	MARIYAPPAN	95	87	86	99	99	100	100	100	99	99	19	EASY	NO	64	120/68	99	66
A	25	MALLIGA	85	83	83	100	99	99	99	100	99	99	53	EASY	NO	65	120/80	100	67
B	26	YUVARAJ	98	97	93	99	100	100	99	100	99	99	20	EASY	NO	68	130/80	100	66
A	27	BRITO	86	85	84	99	100	100	99	100	99	99	62	EASY	NO	68	118/80	99	69
A	28	SUNDARI	89	88	93	99	98	99	100	99	99	99	54	EASY	NO	72	128/76	100	74
B	29	VENKATESAN	100	91	85	100	99	99	100	100	99	99	16	EASY	NO	64	120/68	99	66
B	30	RAHUL GANDHI	99	91	83	99	99	98	100	100	99	99	14	EASY	NO	74	118/78	100	76
A	31	GOWRI	87	86	88	100	100	99	100	99	99	99	51	EASY	NO	66	120/72	100	65
A	32	VIGNESH	89	88	86	99	100	100	99	99	99	99	53	EASY	NO	67	118/80	99	69
A	33	VENNILA	89	87	87	100	99	100	99	99	99	100	59	EASY	NO	71	128/78	99	73
B	34	USHA	83	81	78	100	99	100	99	100	99	99	20	EASY	NO	68	118/80	99	69
B	35	SHABINA	93	89	88	99	100	100	100	100	99	99	15	EASY	NO	78	129/78	100	79
A	36	KADAL KESAN	91	89	89	100	99	99	100	100	99	99	56	EASY	NO	74	118/78	100	76

GROUP	S.NO	NAME	MAP3	MAP5	MAP10	S0BL	SOPI	SOPT	SO1	S03	S05	SO10	TIME TAKEN FOR INTUBATION	EASE OF INTUBATION	FAILURE RATE	POST HR	POST BP	POSTS P02	POST HR 6
B	37	DHANALAKSHMI	89	86	85	99	99	100	100	100	99	99	24	EASY	NO	67	118/80	99	69
B	38	THIRUMALAI	95	93	92	99	100	99	100	99	99	99	25	EASY	NO	76	110/68	100	78
A	39	PARTHIBAN	91	91	89	99	100	100	99	99	100	100	69	EASY	NO	68	118/80	99	69
A	40	PANNERSELVAM	91	90	91	99	100	100	99	100	99	100	49	EASY	NO	73	130/80	100	75
B	41	SUMITHRA	97	95	94	100	99	100	100	100	99	99	20	EASY	NO	74	118/78	100	76
B	42	PANDIYAN	89	86	83	99	100	100	99	100	99	99	22	EASY	NO	63	118/76	100	65
A	43	ANITHA	91	91	91	99	100	99	100	99	100	99	57	EASY	NO	65	120/80	100	67
A	44	KRITHIKA	84	86	85	99	100	100	99	99	99	100	50	EASY	NO	74	118/78	100	76
A	45	SAKTHIVEL	97	95	95	100	100	99	100	99	99	100	55	EASY	NO	72	128/76	100	74
B	46	ILAYARAJ	102	99	100	99	99	100	100	100	99	99	21	EASY	NO	73	130/80	100	75
B	47	MADHAN KUMAR	102	99	99	99	98	99	100	100	99	99	23	EASY	NO	78	129/78	100	79
A	48	SELVAMARY	91	91	88	99	99	100	100	99	99	99	51	EASY	NO	68	118/80	99	69
A	49	KANNAN	91	91	88	99	99	100	100	99	99	99	57	EASY	NO	65	120/80	100	67
B	50	JANAKIRAM	83	81	81	99	99	100	100	100	99	99	22	EASY	NO	67	118/80	99	69
A	51	VALLI	84	83	81	99	100	100	99	100	100	100	50	EASY	NO	68	110/70	100	70
A	52	CHANDRAKALA	89	87	75	100	99	99	100	100	99	99	49	EASY	NO	76	110/68	100	78
B	53	KANCHANA	95	93	93	99	100	98	100	100	99	99	19	EASY	NO	70	110/76	99	73
B	54	HARIKA	97	96	96	100	99	100	99	100	99	99	16	EASY	NO	74	130/80	99	76
A	55	RAMU	84	83	82	99	99	100	99	99	100	100	58	EASY	NO	65	120/80	100	67
B	56	SHAKIRA	87	85	86	99	100	98	100	100	99	99	15	EASY	NO	66	108/70	100	68
B	57	SWETHA	89	90	88	100	99	100	100	100	99	99	12	EASY	NO	72	128/76	100	74
A	58	SARAVANAN	82	83	81	100	100	99	99	100	100	100	54	EASY	NO	68	110/70	100	70
B	59	HARI	86	83	82	99	100	99	100	100	99	99	92	DIFFICULT	NO	80	110/68	99	82
A	60	SUDHA	85	84	83	99	99	99	100	100	100	100	52	EASY	NO	71	128/78	99	73
A	61	VIVEKANANDHAN	85	84	84	100	100	100	99	100	99	100	59	EASY	NO	67	118/80	99	69
B	62	SUGUNA	89	88	85	99	99	100	100	100	99	99	17	EASY	NO	63	118/76	100	65
A	63	LOGESHWARI	81	80	79	100	99	99	99	100	100	99	58	EASY	NO	72	128/76	100	74
B	64	SASIKALA	87	85	86	100	99	100	100	100	99	99	18	EASY	NO	76	110/68	100	78
B	65	RAJESH	97	98	95	99	99	99	100	100	99	99	14	EASY	NO	77	122/78	99	79
A	66	RAJA	96	95	95	99	99	100	99	99	99	100	109	DIFFICULT	YES	68	110/70	100	70
A	67	RAJAMOORTHY	90	89	90	99	100	100	99	100	100	100	57	EASY	NO	70	110/76	99	73
B	68	JAYACHANDRAN	84	83	81	100	99	100	100	100	99	99	15	EASY	NO	74	118/78	100	76
A	69	KUMARI	85	83	82	100	100	100	99	100	99	99	97	DIFFICULT	YES	73	110/70	9	75
B	70	SOUNDARAJAN	87	85	83	99	100	99	100	100	99	99	13	EASY	NO	63	118/76	100	65
A	71	MUTHUKUMAR	97	96	95	99	99	100	99	100	100	100	55	EASY	NO	76	130/78	99	77
B	72	DESAMMAL	93	90	90	100	99	100	100	100	99	99	10	EASY	NO	80	110/68	99	82

GROUP	S.NO	NAME	MAP3	MAP5	MAP10	S0BL	SOPI	SOPT	SO1	S03	S05	SO10	TIME TAKEN FOR INTUBATION	EASE OF INTUBATION	FAILURE RATE	POST HR	POST BP	POSTS P02	POST HR 6
B	73	VIJAYAKUMAR	93	90	88	100	99	100	100	100	99	99	12	EASY	NO	77	122/78	99	79
A	74	JAYALAKSHMI	83	81	80	99	99	99	100	100	99	99	54	EASY	NO	65	120/80	100	67
A	75	DHANDAPANI	89	86	85	100	99	99	100	100	99	100	50	EASY	NO	75	120/70	99	77
B	76	SELVAM	85	86	83	99	100	99	100	100	99	99	14	EASY	NO	69	110/70	100	70
A	77	SUBRAMANI	95	93	93	100	99	100	100	99	99	100	56	EASY	NO	68	128/70	99	69
B	78	VIJAYALAKSHMI	95	93	91	99	99	99	100	100	99	99	23	EASY	NO	80	110/68	99	82
B	79	SUNDARI	90	87	85	100	99	100	100	100	99	99	20	EASY	NO	68	110/70	100	70
B	80	AMALA	101	100	98	99	99	100	100	99	99	99	23	EASY	NO	74	132/78	99	76

GROUP	S.NO	NAME	POST BP 6	POST SPO26	POST HR 12	POST BP 12	POST SPO2 12	POST HR 18	POST BP 18	POST SPO2 18	POST HR 24	POST BP 24	POST SPO2 24
A	1	JAYAKRISHNAN	110/80	99	63	110/70	99	64	120/70	99	64	110/70	99
B	2	YOGARAJ	128/76	99	67	130/70	99	65	130/78	99	65	130/70	99
A	3	JAYALAKSHMI	126/76	100	67	120/70	99	68	120/78	99	69	120/76	99
A	4	SAIRAM	130/80	100	68	128/76	99	71	130/78	99	70	128/70	99
B	5	SANGEETHA	124/70	99	66	124/76	99	68	126/78	100	68	130/78	100
A	6	THANGAVEL	122/76	100	68	126/88	100	69	126/80	100	70	130/70	100
B	7	TAMILSELVI	122/78	99	66	120/78	99	67	124/80	99	69	126/78	99
B	8	VINOTH	128/74	100	72	128/78	100	74	126/80	100	73	128/78	100
A	9	PAMAVATHY	126/78	99	74	130/76	99	76	128/78	99	77	126/74	99
B	10	PAVITHRA	112/80	100	94	116/78	99	95	120/70	100	97	122/74	100
A	11	BALAN	110/74	99	80	112/76	100	81	114/80	100	82	118/70	100
B	12	VENKATESAN	122/80	100	74	124/76	99	75	126/80	99	77	128/82	99
A	13	SIBAN	126/76	99	75	128/76	100	77	128/76	100	78	126/78	99
A	14	PRIYA	110/76	100	67	118/78	99	69	118/76	99	66	110/82	100
B	15	RAMESH	118/78	99	75	120/76	100	77	120/80	100	76	126/82	99
A	16	KANCHANA	122/76	100	68	126/88	100	69	126/80	100	70	130/70	100
B	17	KAMAKSHI	130/86	100	82	128/76	99	84	130/78	99	83	130/68	100
B	18	RAJA	110/80	99	63	110/70	99	64	120/70	99	64	110/70	99
A	19	JEEVAN	120/70	100	70	118/86	100	72	122/76	100	73	126/80	100
A	20	PREM	118/68	99	70	120/76	99	72	122/80	99	74	126/78	99
B	21	LOGANATHAN	122/76	100	68	126/88	100	69	126/80	100	70	130/70	100
A	22	RAHEEMMABEE	128/76	99	67	130/70	99	65	130/78	99	65	130/70	99
B	23	KARTHIK	122/80	100	74	124/76	99	75	126/80	99	77	128/82	99
B	24	MARIYAPPAN	124/70	99	66	124/76	99	68	126/78	100	68	130/78	100
A	25	MALLIGA	122/76	100	68	126/88	100	69	126/80	100	70	130/70	100
B	26	YUVARAJ	128/76	99	67	130/70	99	65	130/78	99	65	130/70	99
A	27	BRITO	120/70	100	70	118/86	100	72	122/76	100	73	126/80	100
A	28	SUNDARI	126/78	99	74	130/76	99	76	128/78	99	77	126/74	99
B	29	VENKATESAN	124/70	99	66	124/76	99	68	126/78	100	68	130/78	100
B	30	RAHUL GANDHI	120/80	99	77	122/78	100	79	124/80	99	77	122/78	99
A	31	GOWRI	110/80	99	63	110/70	99	64	120/70	99	64	110/70	99
A	32	VIGNESH	120/70	100	69	120/84	100	71	122/78	100	73	120/76	100
A	33	VENNILA	126/76	99	75	128/76	100	77	128/76	100	78	126/78	99
B	34	USHA	120/70	100	70	118/86	100	72	122/76	100	73	126/80	100
B	35	SHABINA	130/80	99	77	128/76	99	79	126/80	99	76	120/70	99
A	36	KADAL KESAN	120/80	99	77	122/78	100	79	124/80	99	77	122/78	99

GROUP	S.NO	NAME	POST BP 6	POST SPO26	POST HR 12	POST BP 12	POST SPO2 12	POST HR 18	POST BP 18	POST SPO2 18	POST HR 24	POST BP 24	POST SPO2 24
B	37	DHANALAKSHMI	120/70	100	69	120/84	100	71	122/78	100	73	120/76	100
B	38	THIRUMALAI	110/74	99	80	112/76	100	81	114/80	100	82	118/70	100
A	39	PARTHIBAN	120/70	100	70	118/86	100	72	122/76	100	73	126/80	100
A	40	PANNERSELVAM	128/78	99	77	128/80	99	79	130/78	99	81	128/80	99
B	41	SUMITHRA	120/80	99	77	122/78	100	79	124/80	99	77	122/78	99
B	42	PANDIYAN	122/78	99	66	120/78	99	67	124/80	99	69	126/78	99
A	43	ANITHA	122/76	100	68	126/88	100	69	126/80	100	70	130/70	100
A	44	KRITHIKA	120/80	99	77	122/78	100	79	124/80	99	77	122/78	99
A	45	SAKTHIVEL	126/78	99	74	130/76	99	76	128/78	99	77	126/74	99
B	46	ILAYARAJ	128/78	99	77	128/80	99	79	130/78	99	81	128/80	99
B	47	MADHAN KUMAR	130/80	99	77	128/76	99	79	126/80	99	76	120/70	99
A	48	SELVAMARY	120/70	100	70	118/86	100	72	122/76	100	73	126/80	100
A	49	KANNAN	122/76	100	68	126/88	100	69	126/80	100	70	130/70	100
B	50	JANAKIRAM	120/70	100	69	120/84	100	71	122/78	100	73	120/76	100
A	51	VALLI	116/76	99	69	118/78	99	68	120/76	99	67	118/78	99
A	52	CHANDRAKALA	110/74	99	80	112/76	100	81	114/80	100	82	118/70	100
B	53	KANCHANA	118/78	99	75	120/76	100	77	120/80	100	76	126/82	99
B	54	HARIKA	128/74	100	72	128/78	100	74	126/80	100	73	128/78	100
A	55	RAMU	122/76	100	68	126/88	100	69	126/80	100	70	130/70	100
B	56	SHAKIRA	110/76	100	67	118/78	99	69	118/76	99	66	110/82	100
B	57	SWETHA	126/78	99	74	130/76	99	76	128/78	99	77	126/74	99
A	58	SARAVANAN	116/76	99	69	118/78	99	68	120/76	99	67	118/78	99
B	59	HARI	112/78	100	83	114/76	100	84	116/78	100	85	118/80	100
A	60	SUDHA	126/76	99	75	128/76	100	77	128/76	100	78	126/78	99
A	61	VIVEKANANDHAN	120/70	100	69	120/84	100	71	122/78	100	73	120/76	100
B	62	SUGUNA	122/78	99	66	120/78	99	67	124/80	99	69	126/78	99
A	63	LOGESHWARI	126/78	99	74	130/76	99	76	128/78	99	77	126/74	99
B	64	SASIKALA	110/74	99	80	112/76	100	81	114/80	100	82	118/70	100
B	65	RAJESH	120/76	100	81	124/80	99	81	126/82	100	83	120/70	99
A	66	RAJA	116/76	99	69	118/78	99	68	120/76	99	67	118/78	99
A	67	RAJAMOORTHY	118/78	99	75	120/76	100	77	120/80	100	76	126/82	99
B	68	JAYACHANDRAN	120/80	99	77	122/78	100	79	124/80	99	77	122/78	99
A	69	KUMARI	112/78	100	76	110/76	99	77	110/82	100	78	112/84	100
B	70	SOUNDARAJAN	122/78	99	66	120/78	99	67	124/80	99	69	126/78	99
A	71	MUTHUKUMAR	132/80	100	78	132/80	100	79	128/76	100	80	130/80	100
B	72	DESAMMAL	112/78	100	83	114/76	100	84	116/78	100	85	118/80	100

GROUP	S.NO	NAME	POST BP 6	POST SPO26	POST HR 12	POST BP 12	POST SPO2 12	POST HR 18	POST BP 18	POST SPO2 18	POST HR 24	POST BP 24	POST SPO2 24
B	73	VIJAYAKUMAR	120/76	100	81	124/80	99	81	126/82	100	83	120/70	99
A	74	JAYALAKSHMI	122/76	100	68	126/88	100	69	126/80	100	70	130/70	100
A	75	DHANDAPANI	122/78	99	76	118/78	99	78	128/78	99	80	129/78	99
B	76	SELVAM	116/76	99	69	118/78	99	68	120/76	99	67	118/78	99
A	77	SUBRAMANI	120/78	100	70	122/80	100	72	124/78	100	70	120/76	100
B	78	VIJAYALAKSHMI	112/78	100	83	114/76	100	84	116/78	100	85	118/80	100
B	79	SUNDARI	116/76	99	69	118/78	99	68	120/76	99	67	118/78	99
B	80	AMALA	130/68	100	72	128/76	100	74	128/80	100	76	124/76	100

PROFORMA

NAME OF THE PATIENT: DATE:

AGE/SEX: WEIGHT:

I.P NO: GROUP:

PREANAESTHETIC ASSESSMENT AND NUMBER:

DIAGNOSIS:

PROCEDURE:

ANAESTHETIST: SURGEON:

PARAMETERS:

1.MALLAMPATTI SCORE:

2.THYROMENTAL DISTANCE:

3.INTERINCISOR GAP:

BASELINE VITAL PARAMETERS

SYSTOLIC BLOOD PRESSURE	
DIASTOLIC BLOOD PRESSURE	
MEAN ARTERIAL PRESSURE	
HEART RATE	
ARTERIAL SATURATION OF OXYGEN	

PREINTUBATION VITAL PARAMETERS

SYSTOLIC BLOOD PRESSURE	
DIASTOLIC BLOOD PRESSURE	
HEART RATE	
ARTERIAL SATURATION OF OXYGEN	

POST INTUBATION VITAL PARAMETERS

	0 min	**1 min**	**3 min**	**5 min**	**10 min**
SYSTOLIC BLOOD PRESSURE					
DIASTOLIC BLOOD PRESSURE					
MEAN ARTERIAL BLOOD PRESSURE					
HEART RATE					
ARTERIAL SATURATION OF O2					

- TIME TAKEN FOR INTUBATION

GROUP A	
GROUP B	

- TOTAL NUMBER OF ATTEMPTS:
- EASE OF INTUBATION:
- FAILURE RATE:

  FOR GROUP A

  FOR GROUP B

- REMARKS:

INSTITUTIONAL ETHICAL COMMITTEE, STANLEY MEDICAL COLLEGE, CHENNAI-1

Title of the Work : A randomized control study comparing the Haemodynamic changes to intubation using lavitan Optical stylet alone versus intubation using levitan optical stylet along with Macintosh laryngoscope in Stanley Hospital, Chennai- 01.

Principal Investigator : Dr. Preethi.D

Designation : PG in MD (Anaesthesiology)

Department : Department of Anaesthesiology
Government Stanley Medical College,
Chennai-01

The request for an approval from the Institutional Ethical Committee (IEC) was considered on the IEC meeting held on 02.07.2014 at the Council Hall, Stanley Medical College, Chennai-1 at 2PM

The members of the Committee, the secretary and the Chairman are pleased to approve the proposed work mentioned above, submitted by the principal investigator.

The Principal investigator and their team are directed to adhere to the guidelines given below:

1. You should inform the IEC in case of changes in study procedure, site investigator investigation or guide or any other changes.
2. You should not deviate from the area of the work for which you applied for ethical clearance.
3. You should inform the IEC immediately, in case of any adverse events or serious adverse reaction.
4. You should abide to the rules and regulation of the institution(s).
5. You should complete the work within the specified period and if any extension of time is required, you should apply for permission again and do the work.
6. You should submit the summary of the work to the ethical committee on completion of the work.

K Vasanta

MEMBER SECRETARY,
IEC, SMC, CHENNAI

நோயாளி தகவல் தாள்

ஆப்டிகல் ஸ்டில்லட் தனியாகவும் மற்றும் ஆப்டிகல் ஸ்டில்லட் அதனுடன் மெக்ன்டாஷ் குரல்வளைகாட்டி ஆகியவற்றை பயன்படுத்தி செயற்கை சுவாசம் செய்யும்போது வரும் இரத்த அழுத்தம் இதயதுடிப்பு இரத்தத்திலுள்ள ஆக்ஸிஜன் அளவுகளில் வரும் மாற்றங்களை ஒப்பிட்டு பார்த்தல்

ஆராய்ச்சியின் நோக்கமும், ஆதாயங்களும்.

பிரச்சனைக்குரிய மூச்சுக்குழலுக்குள் செயற்கை சுவாசத்திக்காக குழாய் செருகுதல் சவாலான விஷயமாக உள்ளது. இதனால் ஏற்படும் பின்விளைவுகள் சிறிய பாதிப்பு முதல் பெரிய பாதிப்புகள் வரை ஏற்படலாம், மரணம் வரை செல்லலாம். மெக்ன்டாஷ் குரல்வளைகாட்டி சுவாசக்குழாயில் செலுத்துவது ஆரம்பநிலை மயக்கவியல் மருத்துவம் ஆகும்.

இதனால் புதியமுறையான ஒலி உபகாரணம் கொண்ட லெவிக்டான் கருவியை பிரச்சனைக்குரிய சுவாசக்குழாயில் செலுத்தி அதன் மூலம் காட்சியைக் கொண்டு சுலபமாக குழாயை செலுத்தலாம்.

ஆய்வுமுறை :

எனது ஆராய்ச்சியில் நீங்கள் இரண்டு குழுவாக பிரிக்கப்படுவீர்கள். முதலாம் குழுவிற்கு லெவிக்டான் கருவியை செலுத்துதல். இரண்டாம் குழுவிற்கு லெவிக்டான் உடன் இணைத்து மெக்ன்டாஷ் கருவியை செலுத்துதல். இதனால் ஏற்படும் இதயத்துடிப்பு, இரத்த அழுத்தம், இரத்தத்தில் உள்ள ஆக்ஸிஷன் அளவில் ஏற்படும் மாற்றங்களை ஒப்பிட்டு பார்க்கப்படுவீர்கள்.

உண்டாகக்கூடிய இடர்கள் :

இந்த ஆய்வில் பயன்படுத்தப்படும் மயக்க முறைகளால் குரல் கரகரப்பு, தொண்டைபுண், இரத்தப்போக்கு ஏற்பட வாய்ப்புகள் உள்ளது.

ஆய்வில் உங்கள் உரிமைகள் :

உங்கள் மருத்துவ பதிவேடுகள் அந்தரங்கமாக வைத்துக் கொள்ளப்படும். இந்த ஆய்வின் முடிவுகள் அறிவியல் பத்திரிக்கைகளில் வெளியிடப்படலாம். இதனால் நீங்களோ உங்கள் பெயரோ வெளியிடப்படாது. ஆய்வில் பங்கேற்பது தன்னிச்சையானது மற்றும் காரணங்கள் எதுவும் கூறாமலேயே நீங்கள் எப்போது வேண்டுமென்றாலும் விலகிக் கொள்ளலாம். ஏதேனும் பக்க விளைவுகள் ஏற்பட்டால் முழு சிகிச்சையும் மருத்துவ குழுவினரால் உடனடியாக வழங்கப்படும்.

நாள் :

நோயாளியின் கையொப்பம்
(அல்லது) இடது பெருவிரல் ரேகை
(மருத்துவரால் படித்து காட்டாப்பட்டது)

சுய ஒப்புதல் படிவம்

ஆப்டிகல் ஸ்டில்லட் தனியாகவும் மற்றும் ஆப்டிகல் ஸ்டில்லட் அதனுடன் மெக்ன்டாஷ் குரல்வளைகாட்டி ஆகியவற்றை பயன்படுத்தி செயற்கை சுவாசம் செய்யும்போது வரும் இரத்த அழுத்தம் இதயதுடிப்பு இரத்தத்திலுள்ள ஆக்ஸிஜன் அளவுகளில் வரும் மாற்றங்களை ஒப்பிட்டு பார்த்தல்

ஆய்வாளர் : **மரு.தே.பிரீத்தி**
முதுநிலை பட்டமேற்படிப்பு மாணவர்
மயக்கவியல் துறை

வழிகாட்டி : **பேராசிரியர் மரு.கிருஷ்ணன்**
மயக்கவியல் துறை
அரசு ஸ்டான்லி மருத்துவமனை

பெயர் : வயது : உள்ளிருப்பு எண். :

இந்த மருத்துவ ஆய்வின் விவரங்கள் எனக்கு விளக்கப்பட்டது. என்னுடைய சந்தேகங்களை தீர்க்கவும் அதற்கான தகுந்த விளக்கங்களை பெறவும் வாய்ப்பளிக்கப்பட்டது.

நான் இவ்வாய்வில் தன்னிச்சையாகதான் பங்கேற்கிறேன். எந்த காரணத்தினாலும் எந்த கட்டத்திலும் எந்த சட்ட சிக்கலும் இன்றி இந்த ஆய்விலிருந்து விலகிக் கொள்ளலாம் என்று அறிந்து கொண்டேன்.

நான் ஆய்விலிருந்து விலகிக்கொண்டாலும் ஆய்வாளர் என்னுடைய மருத்துவ அறிக்கைளை பார்ப்பதற்கோ அல்லது உபயோகிக்கவோ என் அனுமதி தேவையில்லை எனவும் அறிந்து கொண்டேன். என்னை பற்றிய தகவல்கள் ரகசியமாக பாதுக்காக்கப்படும் என்பதையும் அறிவேன்.

இந்த ஆய்வின் மூலம் கிடைக்கும் தகவல்களையும் பரிசோதனை முடிவுகளையும் ஆய்வாளர் அவர் விருப்பதிற்கேற்ப பயன்படுத்திக் கொள்ளவும் அதனை பிரசுரிக்கவும் முழுமனதுடன் சம்மதிக்கிறேன்.

இந்த ஆய்வில் பங்கு கொள்ள ஒப்புக்கொள்கிறேன். எனக்கு கொடுக்கப்பட்டுள்ள அறிவுரைகளின்படி நடந்து கொள்வதுடன் ஆய்வாளருக்கு உண்மையுடன் இருப்பேன் என்றும் உறுதி அளிக்கிறேன்.

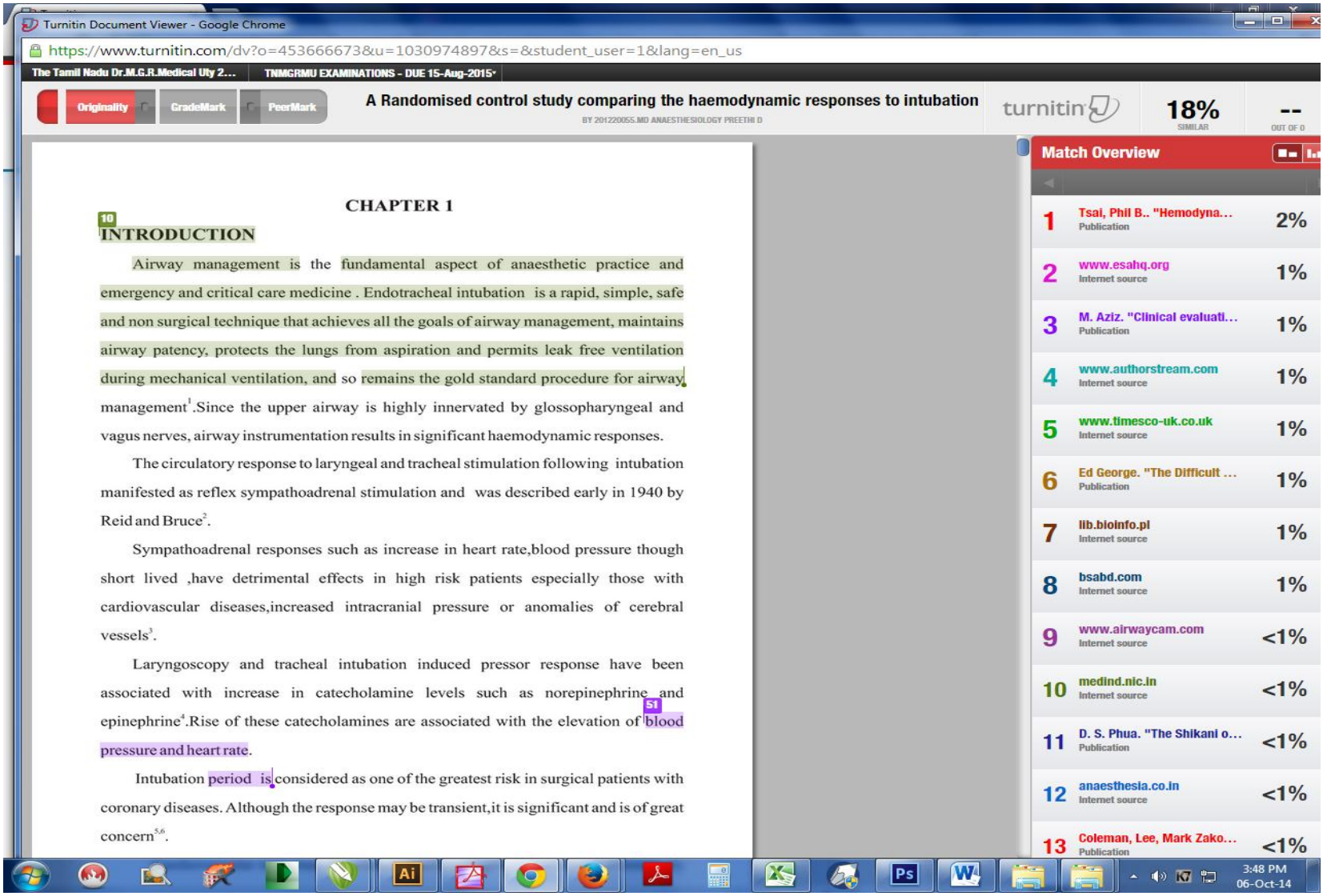
உடல்நலம் பாதிக்கப்பட்டலோ வழக்கத்திற்கு மாறான நோய்குறி தென்பட்டாலோ அதனை தெரிவிப்பேன் என்று உறுதி கூறுகிறேன்.

இந்த ஆய்வில் எனக்கு எவ்விதமான பரிசோதனைகளையும் சிகிச்சைகளையும் மேற்கொள்ள நான் முழுமனதுடன் சம்மதிக்கிறேன்.

இப்படிக்கு

நோயாளியின் கையொப்பம் ஆய்வாளரின் கையொப்பம்

(பெயர்)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CHAPTER 1
INTRODUCTION
Airway management is the fundamental aspect of anaesthetic practice and emergency and critical care medicine . Endotracheal intubation is a rapid, simple, safe and non surgical technique that achieves all the goals of airway management, maintains airway patency, protects the lungs from aspiration and permits leak free ventilation during mechanical ventilation, and so remains the gold standard procedure for airway management[1].Since the upper airway is highly innervated by glossopharyngeal and vagus nerves, airway instrumentation results in significant haemodynamic responses.
The circulatory response to laryngeal and tracheal stimulation following intubation manifested as reflex sympathoadrenal stimulation and was described early in 1940 by Reid and Bruce[2].
Sympathoadrenal responses such as increase in heart rate,blood pressure though short lived ,have detrimental effects in high risk patients especially those with cardiovascular diseases,increased intracranial pressure or anomalies of cerebral vessels[3].
Laryngoscopy and tracheal intubation induced pressor response have been associated with increase in catecholamine levels such as norepinephrine and epinephrine[4].Rise of these catecholamines are associated with the elevation of blood pressure and heart rate.
Intubation period is considered as one of the greatest risk in surgical patients with coronary diseases. Although the response may be transient,it is significant and is of great concern[5,6].
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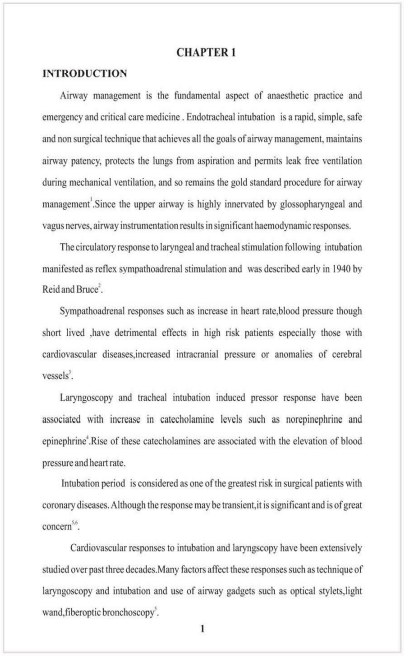

CHAPTER 1

INTRODUCTION

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Intubation period is considered as one of the greatest risk in surgical patients with coronary diseases. Although the response may be transient,it is significant and is of great concern[5,6].

Cardiovascular responses to intubation and laryngscopy have been extensively studied over past three decades.Many factors affect these responses such as technique of laryngoscopy and intubation and use of airway gadgets such as optical stylets,light wand,fiberoptic bronchoscopy[7].

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