"COMPARISON OF HAEMODYNAMIC CHANGES WITH LARYNGOSCOPY AND OROTRACHEAL INTUBATION, USING FIBREOPTIC LARYNGOSCOPE WITH ON SCREEN MONITORING AND DIRECT LARYNGOSCOPE – A CLINICAL TRIAL"

By

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Dissertation submitted to

BLDE UNIVERSITY, VIJAYAPUR, KARNATAKA.

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DOCTOR OF MEDICINE

IN

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Under the guidance of

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PROFESSOR

DEPARTMENT OF ANAESTHESIOLOGY

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DR. MEGHANA MALLANNA HIPPARAGI

LIST OF ABBREVATIONS USED

DL	Direct Laryngoscope
DLS	Direct Larnygoscopy
FOB	Fibreoptic Brochoscope
FOI	Fibreoptic Intubation
SBP	Systolic Blood Pressure
DBP	Diastolic Blood Pressure
MAP	Mean Arterial Pressure
HR	Heart Rate
ILMA	Intubating Laryngeal Mask Airway
ASA	American Society of Anesthesiologists

ABSTRACT

Back ground and objectives:

Orotarcheal intubation, following direct laryngoscopy is associated with transient increase in blood pressure and heart rate. Various methods have been tried to attenuate these responses as they may precipitate serious complications in those with underlying cardiac diseases. In our study we aim to evaluate haemodynamic responses to direct laryngoscopy and fibreoptic bronchoscopy.

Methods:

Seventy two patients with ASA grade 1 and 2 and Mallampati Grade 1 and 2 undergoing general anaesthesia requiring tracheal intubation from December 2014 to June 2016 were included for this study. Patients were randomly divided into two groups with 36 in each group either selected for direct laryngoscopy or fibreoptic intubation.

Result:

Our study showed that there is no significant difference between fibreoptic bronchoscopy and direct laryngoscopy in attenuating haemodynamic responses. However, laryngscopy and orotracheal intubation in both groups caused a significant increase in heart rate, blood pressure and mean arterial pressure. The mean duration of time taken for intubation was much higher in fibreoptic group than in direct laryngoscopy group.

Conclusion:

This study shows that fibreoptic intubation does not have any special role in attenuating haemodynamic responses in comparison to direct laryngoscopy.

Key words:

Fibreoptic intubation, direct laryngoscopy, haemodynamic changes, stress response orotracheal intubation.

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INTRODUCTION

(...)but that life may in a manner of speaking be restored to the animal, an opening must be attempted in the trunk of the arteria aspera, into which a tube of reed or cane should be put; you will then blow into this, so that the lung may rise again and the animal take in the air (...). (Vesalius1; "arteria aspera" refers to the trachea.)

Airway management is fundamental to the practice of anaesthesia and tracheal intubation is frequently required to ensure adequate airway control, while providing optimal operating conditions. Tracheal intubation is placement of the endotracheal tube into the trachea, either via oral or nasal route. It is considered as the ‘’Gold Standard’’ for airway management during general anaesthesia. Most routine orotracheal intubations are performed with the help of direct laryngoscope (DL). The ease of technique, cost effectiveness and availability makes the conventional laryngoscope the most popular device for intubations.

With dramatic advancement in airway management many other devices have been developed as alternatives to direct laryngoscopy (DLS). These include a number of fibreoptic viewing laryngoscopes such the flexible fibreoptic bronchoscope (FOB). Fibreoptic bronchoscopes are currently used to facilitate endotracheal intubations via either nasal or oral route.

The cardiovascular responses to laryngoscopy and endotracheal intubation cause a reflex increase in sympathetic activity that may result in hypertension and tachycardia, the extent of reaction is affected by the technique of laryngoscopy and the use of instruments like DL and FOB.[1]

DLS to facilitate tracheal intubation produces marked stress response and consequent haemodynamic changes that although short lived, might provoke

detrimental effects on the coronary or cerebral circulation, especially in high risk patients.[2]

Anaesthetic literature has focused more on the pharmacological methods for obtundation of the stress response, and literature related to non-pharmacological methods like use of different blades, fibreoptic scope, Intubating Laryngeal Mask Airway (ILMA) is limited.

Therefore our study aims to evaluate the efficacy of FOB in attenuating haemodynamic responses to orotracheal intubation in comparison with direct laryngoscope in patients undergoing general anaesthesia.

AIMS AND OBJECTIVES

Primary objective

- To compare and evaluate the haemodynamic changes seen with fibreoptic bronchscopy and direct laryngoscopy.

Secondary objective

- To study ease of intubation and associated complications.

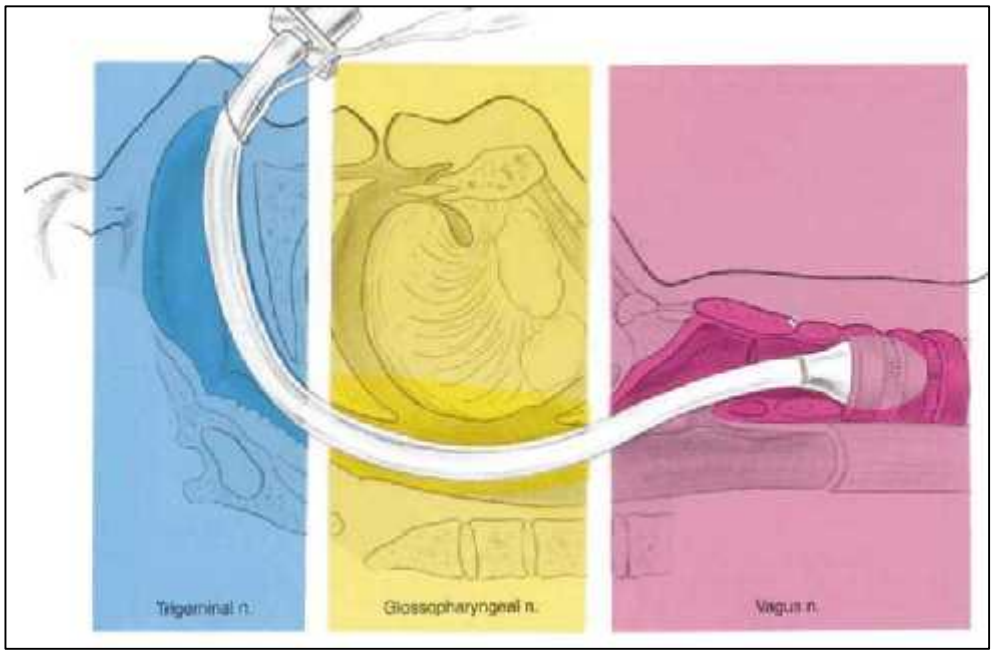
HAEMODYNAMIC RESPONSES TO LARYNGOSCOPY AND TRACHEAL INTUBATION.

In 1940, Reid and Brace first described haemodynamic response to laryngoscopy and intubation.[3]

The process of laryngoscopy and intubation can result in significant haemodynamic response and therefore, limiting or taming this response is a topic of debate and research in anesthesia.[4]

Basic anatomy

Figure 1: the sensory innervation of the airways[5]



The pharynx: sensory innervation – Glossopharyngeal nerve supplies the posterior third of the tongue, the fauces and tonsillae, anterior epiglottis and all parts of the pharynx with visceral sensory fibres. Motor innervation- the pharynx receives efferent supply from the vagus nerve through its pharyngeal branch.[5]

The larynx: sensory innervation – the internal laryngeal nerve, branch of the superior laryngeal nerve, provides sensory supply from the posterior epiglottis to the vocal cords. The recurrent laryngeal nerve supplies the larynx below the vocal cords. Motor

innervation: the recurrent laryngeal nerve supplies all intrinsic muscles of the larynx except the cricothyroid muscles. [5]

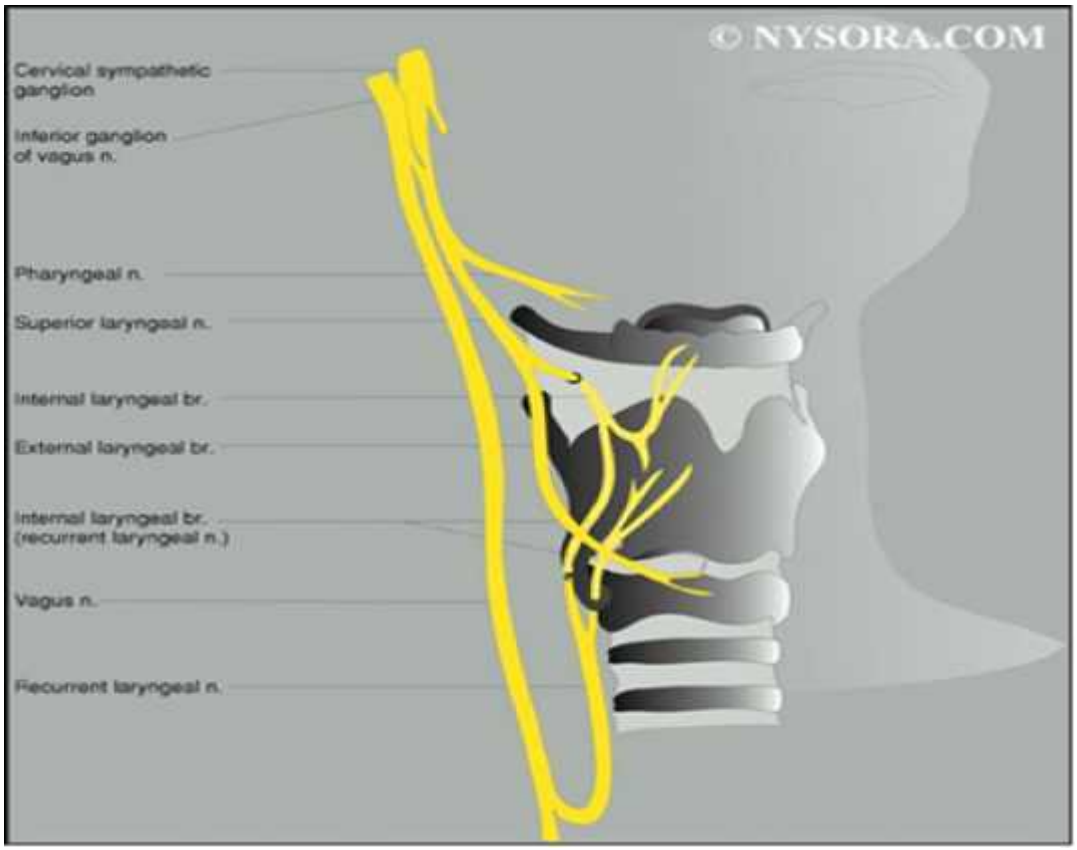


Figure 2: innervation of the larynx [6]

Mechanism of the intubation response

The haemodynamic response to laryngoscopy and intubation is regulated by the hypothalamo-pituitary-adrenocortical and sympathetic adreno-medullary response.[7] As a result of which there is secretion of cortisol, norepinephrine and epinephrine. The consequence of this neuro–endocrine system may vary from milder problems such as tachycardia, hypertension and occasional dysrhythmias to life threatening problems such as angina, myocardial infarction, stroke, *etc*. The haemodynamic response to laryngoscopy and intubation was first enunciated by King *et al* in 1951, although endotracheal intubation was being practiced since its inception into anaesthetic practice.[8,9]

Several drugs have been used, different laryngoscope designs have evolved and anaesthetic techniques have been modified to attenuate these reflexes.[4]

Haemodynamic response and the receptor location:

Mechanical stimulation of the upper respiratory tract, mainly: the nose, the epipharynx, and the tracheobronchial tree induce reflex cardiovascular responses associated with enhanced neuronal activity in cervical sympathetic efferent fibres. While stimulation of the epipharynx elicits maximum response, tracheobronchial tree elicits least response.[10] Cardiovascular response to endotracheal intubation is initiated by glossopharyngeal nerve (stimulus superior to anterior surface of epiglottis) and by vagus nerve (stimulus below posterior epiglottis down into the lower airway). Haemodynamic response to laryngoscopy and intubation results in diffuse autonomic response with a widespread release of norepinephrine from adrenergic nerve terminals and secretion of epinephrine from adrenal medulla along with activation of the renin angiotensin system.[11]

Physiology of haemodynamic response:

This is maximum at approximately 30-45 seconds after laryngoscopy and intubation.[12] Blood Pressure (BP), Heart Rate (HR), plasma adrenaline, noradrenaline and vasopressin concentrations increase slightly in response to laryngoscopy and intubation; all returning to baseline within 5 min with no change in angiotensin converting enzyme activity in normotensives. However, a three-fold increase in plasma noradrenaline levels which returned to baseline nearly 10 minutes following laryngoscopy and intubation was observed in hypertensives.[13-16]

Effects of haemodynamic responses on organ systems:

Haemodynamic responses have deleterious effects on various organ systems especially in those with pre-existing cardiovascular diseases or in hypertensives.

Sudden increase in blood pressure may cause rupture of aortic/cerebral aneurysm, increase cerebral blood flow due to increased cerebral metabolic activity and systemic cardiovascular effects, dysrhythmias, transient increase in choroid blood flow which can force vitreous gel forward into the anterior chamber during open eye surgery or can increase intraocular pressure in an intact eye.[17] The normal autoregulation mechanism may not be effective because of underlying disease. Patients with raised intracranial pressure who have minimal reserve in intracranial compliance are at a risk for brainstem herniation and sudden death.[18]

Haemodynamic response in relation to age:

In infants and small children, response may manifest initially as bradycardia owing to an increased vagal tone.[11] In geriatric patients, SBP and MAP increased significantly though the tachycardia response was less severe as the age advanced which was attributed to impaired β response with normal α responsiveness. It was also noted that the mean plasma norepinephrine concentrations were significantly less in the elderly. [19]

DIRECT LARYNGOSCOPY

Laryngoscopy is a term describing visualization or examination of the larynx by distraction of the upper airway structures, typically for the purpose of tracheal intubation and airway management in modern anaesthesia and critical care practice as well as in many trauma scenarios.[20]

Tracheal intubation is the placement of a tube into the trachea, whether via the oral or nasal routes. The first known description was by Andreas Vesalius in 1543, carried out on an animal pneumothorax model. However, it was only in 1896 that Trendelenburg [21] performed the first successful tracheal intubation on anaesthetized humans. He imagined a tube with an inflatable cuff at the distal end, which would make it possible to seal the airway when introduced via tracheostomy.

In the 19th century, indirect laryngoscopic techniques were developed that used various lights and mirrors to examine the larynx.[22] The German physician Bozzini described the first laryngoscope in 1805, although it was not until 1852 that the first surgical procedure was reported using the technique of direct laryngoscopy, in which a laryngeal polyp was excised.[23] Since its introduction as a method for tracheal intubation in 1913[24] and blade modifications by Miller[25] and Macintosh[26] in the 1940s, direct laryngoscopy has been the conventional technique and accepted standard for tracheal intubation, with success rates that may equal or exceed 99% in elective or emergency settings.[27,28,29]

Numerous laryngoscope blades have since been developed with a variety of modifications and improvements. Technological advances include improved illumination with brighter light sources and fiberoptic light transmission. Despite inherent limitations of the direct line-of-sight approach and the emergence and use of various newer technologies for intubation such as rigid indirect laryngoscopes,

flexible fiberoptic bronchoscopes, and video laryngoscopes, traditional direct laryngoscopic techniques remain fundamental in the practice of airway management and intubation. This may be due to the simplicity of direct laryngoscopy compared with newer technologies. In addition to very high success rates with the approach, other advantages include robust and portable equipment with relatively low cost and widespread availability as well as unparalleled speed with proper technique.[20]

A laryngoscope is composed of a handle and a blade that contains a light source.[20] The light may be provided by a bulb in the blade. This bulb location subjects it to soiling by fluids that can affect the electrical contact leading to light failure.[30]

Improved illumination with light-emitting diodes or fiberoptic light transmission has replaced incandescent bulb technology in recent years, improving laryngoscope design. The laryngoscope blade consists of 3 components: a spatula, which passes over the lingual surface of the tongue; a flange, which is used to direct or displace the tongue; and a tip, which is designed to lift the epiglottis either directly or indirectly.

A multitude of laryngoscope blades have been designed.[31] 2 basic blade designs dominate: curved blades exemplified by the standard Macintosh design and straight blades such as the common Miller blade. The large flange of the Macintosh is designed for tongue displacement, and the curved blade is designed to elevate the epiglottis indirectly. Like other straight blades, the Miller blade is designed to lift the epiglottis directly and is particularly useful if a large, floppy, or irregularly shaped epiglottis is encountered during laryngoscopy. These are available with variously sized blades and handles (standard, paediatric, or short) to accommodate patient size, anatomic characteristics, and operator preference. In general, straight blade designs as defined by the dimensions of their spatula and flange have smaller displacement

volumes and are favoured in patients with smaller displacement space (eg, children or patients with micrognathia, prominent upper incisors, or short mental-hyoid distance). Curved blades like the Macintosh may be favoured for tongue control or ease of intubation. In at least one study, the Miller blade's profile was found to provide a better view of laryngeal structures, but the Macintosh blade facilitated speed and ease of intubation.[32]

FIGURE 3: MACINTOSH DIRECT LARYNGOSCOPE

FIBREOPTIC BRONCHOSCOPE (FOB)

The transmission of a visual image through a flexible fibreoptic bundle was reported in 1954.[33] Over a decade later, an English anaesthetist named Peter Murphy used a fibreoptic choledoscope to aid in the nasal intubation of a patient with Still's disease.[34] Currently, FOI with a flexible FOB has become a mainstay of difficult airway management in awake, sedated, and anesthetized patients.

Fibreoptic Technology:

Light travels at different velocities in different substances. The effect of each substance on light velocity is indicated by the refractive index of the substance, which compares the velocity of the light through the substance with that through a vacuum. This difference in velocities has the effect of altering the direction of a light beam as it passes from one medium to another. If the light hits a glass-air interface at 90 degree, it will pass straight through, but at any other angle, as the light passes from the glass to the air, its direction will be altered. As the angle of incidence of the light is increased from the perpendicular, the greater the bending of the light as it emerges from the glass into the air. Eventually, there will be a point where the light is reflected back inside the glass, almost as if it had rebounded off a mirror. This is called 'total internal reflection' and occurs at the 'critical angle'. It becomes possible, therefore, to bounce light down the inside of a glass rod from one end to the other.

Construction:

The fibreoptic scope is a flexible instrument, which is capable of transmitting an image from the distal tip to the proximal end. The motion of the tip of the fibrescope can be controlled which enables the operator to direct the scope in any desired fashion. The combined characteristics of controllability, flexibility and image transmission permit anaesthesiologists to employ the fibrescope as an aid to tracheal

intubation. The technological factor, which makes it possible to use the flexible fibrescope, is the fact that a beam of light, which enters an ordinary glass rod, is reflected off the walls of the rod and emerges from the other end. The fact that the property of total internal reflection is maintained for glass fibres as small as 8 microns makes it possible for fibreoptic technology to be used in fibreoptic scopes. Heating and stretching a glass rod permits the formation of glass strands, which are less than 25 microns in diameter. At this small size the glass becomes flexible and is termed a fibre. Light, which enters one end of a fibre, is repeatedly reflected off the walls of the fibre and emerges at the other end with a uniform appearance. Therefore, a single fibre is capable of transmitting light but incapable of transmitting an image. To solve the problem of image transmission an objective lens is placed at the tip of the fibrescope. This lens focuses the image on a large number of flexible fibres, which are tightly fastened together at the proximal and distal ends of the scope. The fixed, flexible bundle has the identical arrangement of fibres at both ends of the scope, which permits the insertion cord to be flexible, and allows the image to be transmitted through the length of the scope. Without this organized, coherent bundle and the optical insulation of each fibre, an image could not be transmitted.

In order to prevent degradation of the image each fibre is coated with a transparent substance of lower refractive index in a process called cladding. The cladding aids in light transmission and optically insulates each fibre.

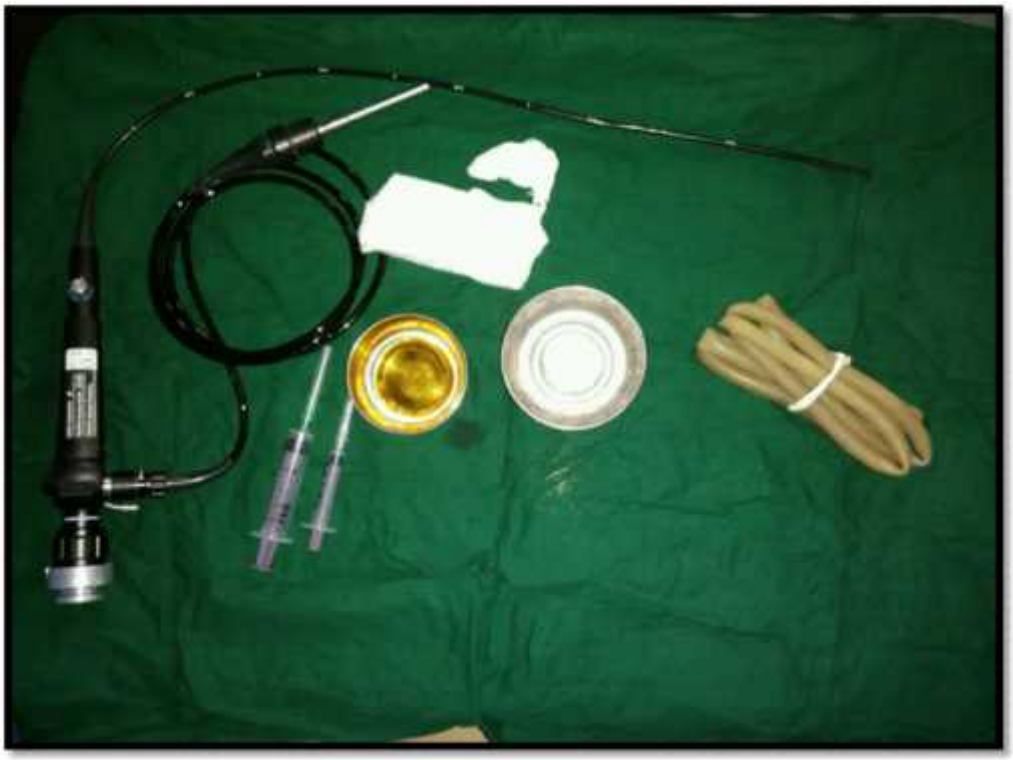
The image, which emerges at the handle of the fibrescope, is focused by the eyepiece lenses and can be viewed directly by the operator or can be transmitted with a video camera to a television screen and / or video recorder.

Fibreoptic bundles are used to transmit light from an external light source to the distal tip of the scope. This serves to light the field of view during endoscopy.

Since an image is not transmitted through these fibres there is no requirement to arrange them in a coherent bundle.

The fibrescope is composed of three parts a body, a flexible insertion cord and a light transmission cord. The body of the scope includes the tip deflection unit, eyepiece. Focusing light, and working channel sleeve. The insertion cord is the part of the scope, which is inserted into the patient. It contains the working channel, one image transmitting fibre bundle and one or two light transmitting bundles. [33] A separate port that travels the distance of the scope can be utilized for suction, injection of saline or local anaesthetic, oxygen insufflation, or passage of brushes or forceps for diagnostic purposes. [34] The light transmission cord sends light from an external source to the tip of the insertion cord, which allows the field of view to be illuminated.[33]

FIGURE 4: FIBREOPTIC BRONCHOSCOPE



Indications:

Common Indications of Fibreoptic Intubation[34]

1. Known difficult intubation
2. Suspected difficult intubation by direct laryngoscopy (eg, history of difficult intubation, limited mouth opening, decreased thyromental distance)
3. Unstable cervical spine
4. Abnormal anatomy

   Congenital airway deformities (eg, Pierre Robin syndrome)

   Head and neck cancers (eg, supraglottic tumors)
5. Trauma

   Face/neck and upper airway

Contraindications: [35]

1. Patients with massive facial injury, complete upper airway obstruction, apnoea, severe hypoventilation, or profuse upper airway bleeding are almost never appropriate candidates for fibreoptic intubation.
2. Lack of patient co-operation makes the technique more difficult.
3. Relative contraindications to nasal intubation include nasal fractures, and haemostatic disorders.
4. Nasal obstruction may preclude nasal intubation and basilar skull fractures raise the possibility of inadvertent intracranial penetration.

Techniques of FOI:

The intubating fibrescope can be introduced through the nose or mouth, advanced past the larynx, down the trachea, and into the bronchi.[36]

FOI can be performed nasally or orally in awake patients with topical or regional anaesthesia alone, or in sedated or anaesthetized patients.[34]

Problems faced during fibreoptic intubation [33]

1. Poor vision
    - Inexperience
    - Poorly focused eyepiece
    - Film over the lens
    - Fogging
    - Secretions and blood
    - Touching the mucosa
2. Bleeding
3. Coughing
4. Desaturation
    - Respiratory depression due to drugs
    - Excessive use of suction
    - Endobronchial intubation
    - Loss of airway
5. Laryngospasm and bronchospasm
6. Oesophageal intubation
7. Failure to railroad the endotracheal tube

REVIEW OF LITERATURE

The major stimuli to cardiovascular change during laryngoscopy and tracheal intubation are the forces exerted by the laryngoscope blade on the base of the tongue while lifting the epiglottis.[37] These haemodynamic changes can be detrimental in vulnerable patients, e.g., those with ischemic heart disease, cerebrovascular disease, etc., and need to be prevented.

Factors like degree and distortion or physical stimulus to oropharyngeal structures decide the extent of haemodynamic response to conventional laryngoscopy and endotracheal intubation. The pressor response to laryngoscopy and intubation can be reduced by either pharmacological methods or using alternative endotracheal tube guiding devices such as fibreoptic scope.[38]

King BD *et al***.** as early as in 1951 studied reflex circulatory responses to direct laryngoscopy and tracheal intubation performed under general anaesthesia in 46 patients. The results were grouped according to the clinical estimate of the depth of anaesthesia at the time of laryngoscopy and tracheal intubation. When the epiglottis was elevated by DLS there was usually an elevation in SBP and DBP within 5 seconds. Upon insertion of tube into the trachea a further increase in SBP occurred. Cardiac rate was increased an average of 23 beats/min in intubated tracheas. The study concluded that these changes are initiated by the laryngoscope pressing over the base of the tongue or lifting the epiglottis and are independent of the type of laryngoscope blades used. However a deeper anaesthesia may obtund these responses.[8]

In 1983, Ovassapian A *et al*. conducted a study to evaluate haemodynamic changes during awake fibreoptic nasotracheal intubation in 200 patients and found that MAP increased to 106 18mm Hg and 102 15mm Hg at the time of placement of

endotracheal tube (ETT) in the nostril and intubation of trachea respectively. The maximal increase in HR above the baseline levels occurred during placement of the ETT in the trachea (mean 14 beats/min). MAP increased more than 20mm Hg in 64 (32%) intubations and more than 30mm Hg in 23 (11.5%) intubations. HR increased more than 20beats/min in 61 (30.5%) intubations and more than 30 beats/min in 24(12.2%) intubations. They concluded that flexible fibreoptic endoscopy provides the opportunity for tracheal intubation in awake and sedated patients, producing minimal pressure or stimulation of the oropharyngeal tissues, which thereby limits increases in MAP and HR.[39]

Smith JE *et al.* in 1989 conducted a study in 60 patients to compare cardiovascular effects of fibrescope-guided nasotracheal intubation to those of a control group of patients who were intubated using the Macintosh laryngoscope and found that all the FOIs were completed within one minute, but the mean intubation time (37 seconds) was significantly greater than that of the control group (30 seconds). Systolic and diastolic arterial pressures in the fibreoptic group were significantly lower than in the control group during the first minute after intubation. The maximum increase in diastolic pressure was significantly lower in the fibreoptic group. The heart rate in the fibreoptic group was significantly higher than in the control group during all five minutes after intubation. The maximum increase in heart rate was signifcantly higher in the fibreoptic group. The study concluded that the marked tachycardia which occurred in both oral and nasal fibreoptic groups compared with controls may indicate that the heart rate response is more sensitive than the arterial pressure response to the effects of prolonged FOI and that the decreased pharyngeal stimulation may have been a more important factor, resulting in partial attenuation of the hypertensive response.[40]

Smith JE *et al*. in 1991 compared intubation time and cardiovascular effects of fibrescope-guided orotracheal intubation aided by the Berman 11 Intubating Airway with those of the tongue traction method of FOI and with conventional Macintosh intubation. They studied 75 patients who were allocated randomly to one of the three groups immediately before intubation. The mean time required to effect Berman airway intubation (34.9 s) was similar to that required for tongue traction intubation (35.3 s) and significantly greater than that required for Macintosh intubation (11.7 s). The cardiovascular responses to both types of FOI were significantly greater and more prolonged than those of Macintosh intubation. There were no significant differences between the responses to the two fibreoptic techniques. Thus they reported that haemodynamic effects should be considered when performing fibrescope-guided trachea/ intubation under general anaesthesia.[41]

L Davies *et al*. in 1997 studied cardiovascular effects of fibreoptic bronchoscopy in 45 patients with a median age of 65years. The study showed that Mean BP was raised initially (167/88 mmHg). Mean (SD) initial heart rate was 93beats/min and rose to 134 beats/min during the procedure. Four of the 45 patients showed unexpected ST segment depression of >1 mm for >1 min, and a further three developed bundle branch block. These seven patients had significantly greater tachycardia (152vs131 beats/min) and higher blood pressure (238/131vs207/109mmHg). They concluded that significant cardiovascular changes occur during fibreoptic bronchoscopy, with evidence of cardiac strain in 21% of patients over the age of 60 yrs. [42]

Yushi U Adachi *et al*. did a prospective single blind study in 2000 on 90 patients with ASA grade 1 and 2 in the age group of 19-70 years comparing cardiovascular responses to fibreoptic orotracheal intubation with DLS. The patients

showed significant increases in BP and HR. No significant differences between the two groups were observed in cardiovascular response immediately after intubation: the systolic BP, 169.5 ± 28.3 versus 167.0 ± 23.1 mmHg, and HR, 100.2±18.2 versus 98.8±16.6 bpm. They observed that cardiovascular responses were similar to those with intubation with laryngoscopy. Endotracheal intubation itself was the most invasive stimulus to laryngeal or pharyngeal tissues.[43]

In 2002, Barak *et al*. conducted a randomized prospective study on 51 pateints with ASA status 1 and 2 to compare stress response by measuring plasma epinephrine and nor ephinephrine levels and haemodynamic changes following tracheal intubation using direct laryngoscopy and fibreoptic bronchoscopy technique. The duration of intubation was shorter in the direct laryngoscopy group (16.9 (16.9±7.0 sec, range 8 to 40) compared with the fiberoptic intubation group (55.0±22.5 sec, range 29 to 120), $p<0.001$. In both groups, blood pressure and heart rate were significantly increased at 1, 2, and 3 minutes after intubation, but there was no significant difference between the two study groups. Catecholamine levels did not increase after intubation and did not correlate with the hemodynamic changes. The study concluded that use of either direct laryngoscopy or fiberoptic bronchoscopy produces a comparable stress response to tracheal intubation.[44]

Xue FS *et al*. in 2006 conducted a comparative study of hemodynamic responses to orotracheal intubation with fiberoptic bronchoscope and laryngoscope in 43 children and studied that in the DLS group, SBP, HR at intubation and 1 min after intubation were significantly higher than postinduction values, but did not exceed baseline values. In the FOB group, SBP, HR at intubation increased significantly compared with baseline and postinduction values. In the two groups, the maximal values of SBP, HR during the observation were significantly higher than baseline

values. Except for the HR at intubation, there were no significant differences in other haemodynamic parameters during the observation and the time required to reach maximal values of SBP, HR between the two groups. Orotracheal intubation using FOB and DLS in children may cause similar increases in SBP and HR. Compared with the DLS, the FOB had no advantage in attenuating the haemodynamic responses to orotracheal intubation.[45]

Zhang GH, Xue FS, *et al*. in 2007 conducted a randomized study on 50 adult patients posted for elective surgery under general anaesthesia with ASA grade 1 and 2. The study reported that the intubation time was significantly longer in the FOB group (34.9±8.5 seconds) than in the DLS group (27.8±10.7 seconds) $P<0.05$. No significant differences were seen in the demographic data and in the baseline values of BPs and HRs, thus concluding that the orotracheal intubations using a FOB and a DLS produced similar hemodynamic responses. The FOB had no special advantage in attenuating hemodynamic responses to orotracheal intubation compared to the DLS. [46]

In 2007, Siddiqui TN *et al*. researched Haemodynamic response to Tracheal Intubation via intubating laryngeal mask airway (IMLA) versus Direct Laryngoscopic Tracheal Intubation in 100 patients. The study showed that the rise in SBP in group-I (DL) was 26 and 13% when compared with the baseline for first two minutes, while in group II (IMLA) the increase was 8-12%. When both groups were compared statistically significant difference ($P<0.05$) was observed. The rise in diastolic blood pressure was 23% and 7% in group - I and II respectively when compared with the baseline. Statistically significant difference ($P<0.05$) was observed at first two minutes following intubation between the two groups. The rise in mean arterial blood pressure after intubation was statistically significant. The increase in heart rate was observed after intubation in both the groups and when both the groups were compared

the rise was not statistically significant. They concluded that intubation through intubating laryngeal mask airway is accompanied by minimal cardiovascular responses than those associated with direct laryngoscopic tracheal intubation, so it can be used for patients in whom a marked pressor response would be deleterious.[47]

Xue FS *et al*. in 2007 carried out a study to compare the hemodynamic responses to nasotracheal intubation with Glide Scope video-laryngoscope (GSVL), Macintosh direct laryngoscope (MDLS), and fiberoptic bronchoscope (FOB) on 60 patients. After anaesthesia induction, BP in all three groups decreased significantly compared to baseline values ($P < 0.05$), while HR had no significant change. After nasotracheal intubation, BP and HR in all three groups were significantly higher than the postinduction values ($P < 0.05$). In the FOB group, BP and HR at intubation significantly increased when compared with the baseline values ($P < 0.05$). In the MDLS group, HR at intubation, and maximum values of diastolic blood pressure (DBP), mean arterial pressure (MAP), and HR during the observation were significantly higher than the baseline values ($P < 0.05$). In the GSVL group, all haemodynamic parameters at intubation and after intubation were not significantly different from the baseline values. BP, HR and the incidences of HR more than 100 bpm during the observation were significantly higher in the FOB group than in the other two groups ($P < 0.05$). BP was not significantly different during the observation between the MDLS and GSVL. Thereby concluding that the haemodynamic responses to nasotracheal intubation are most severe with FOB, followed by MDLS, and then GSVL.[48]

Comparison Of Stress Response Performing Endotracheal Intubation By Direct Laryngoscopy, Fibreoptic Intubation And Intubation By The Glidescope Laryngoscope, was a study undertaken by Nataļja Jakušenko *et al*. in 2008. The aim

of the study was to compare patient stress response to different intubation techniques in 60 adult patients with median age of 54±18 years. The study showed that both heart rate and blood pressure increased during intubation in each group, but the difference between groups was not significant. In their opinion intubation with a fibreoptic bronchoscope requires the longest time, causing the greatest stress response to patients. Intubation with GlideScope laryngoscope is faster in comparison to Macintosh laryngoscope, and to a fibreoptic bronchoscope, at the same time causing the lesser stress response to patients.[49]

Amir Murad Khudad and Hoshyar Najeeb Karem**.** in 2010 conducted a prospective study on 120 patients with ASA grade 1 and 2 between the age groups of 20-60 years comparing haemodynamic responses to orotracheal intubation; direct vs fibreoptic bronchoscopy. Their study showed that there were no significant differences in the two groups regarding patient age, gender, height and weight. After induction of anesthesia, SBPs and DBPs decreased significantly in both groups in comparing to baseline value ($P < 0.05$). As compared with the post-induction values, the tracheal intubation caused significant increases in SBPs and DBPs. in both FOB (0.002, 0.0001) and DLS (0.001, 0.003) groups respectively. SBPs and DBPs increased at the time of intubation as compared to baseline values in both group and P value was in group A (0.1407 , 0.151) and group B(0.8666 , 0.432) respectively and it was statistically not significant ($P > 0.05$). HRs at intubation and 2 minutes after intubation were significantly higher than the postinduction (P value=0.001 in FOB and P value=0.007 in DLS groups) and baseline (P value=0.001 in FOB and P value=0.007 in DLS groups) values ($P < 0.05$). There were no significant differences between the two groups A and B in (SBPs, DBPs and HRs) response to tracheal intubation. Orotracheal intubations using either FOB or DLS produce similar

haemodynamic responses. The FOB had no special advantage in attenuating haemodynamic responses to orotracheal intubation in compared to the DLS.[1]

In a 2010 study by N Aghdaii *et al*. on 50 patients undergoing elective CABG opined that duration of intubation was shorter in DLS group (19.3 ± 4.7 sec) compared with FOB group (34.9 ± 9.8 sec; p = 0.0001). In both study groups basic SBP and DBP and HR were not significantly different (P >0.05). During the observation, there were no significant differences between the two groups in BP or HR at any time points or in their maximal values (all p values >0.05) thus concluding that the FOB had no advantage in attenuating the hemodynamic responses to orotracheal intubation in patients undergoing CABG surgery.[50]

Farbood *et al*. in 2011, conducted a study on 94 hypertensive patients, and found that heart rate at 2 minutes and diastolic blood pressure at 4 minutes after intubation in the fibreoptic group and systolic blood pressure at 6 minutes after intubation in the laryngoscopy group were significantly higher than the direct laryngoscopy group. Comparison of the data obtained after intubation with preintubation values revealed a significant rise except for diastolic blood pressure and heart rate at 6 minutes in the fiberoptic group. The findings of this study reveal that the haemodynamic change at the early moments of intubation is more prominent with the fibreoptic method while its duration is shorter than laryngoscopic intubation. It seems that the fibreoptic bronchoscopy cannot help more in attenuation of haemodynamic reflexes to intubation in hypertensive patients.[51]

M Kanchi *et al*. in 2011 studied the Haemodynamic response to endotracheal intubation in coronary artery disease: Direct versus video laryngoscopy, in 30 patients randomly allocated to either conventional laryngoscopy (group A) or video laryngoscopy (group B). The study reported that the time taken for endotracheal

intubation was significantly longer in group B (Pentax video laryngoscopy) patients as compared to group A (conventional laryngoscopy) patients (i.e., 36.4±2 vs. 22.08±8 seconds). However, there were no differences in the haemodynamic response between the groups. Both the groups showed a reduction in arterial pressure after anaesthetic induction but prior to laryngoscopy, as a result of haemodynamic effects of the anaesthetic induction and loss of consciousness. There were no significant differences between the groups with respect to SAP, MAP and DAP, but within the group, SAP, MAP and DAP decreased significantly during the 5-min observation period. The study study did not demonstrate benefit with the use of Pentax video laryngoscope in terms of obtundation of cardiovascular responses to laryngoscopy and endotracheal intubation in patients with ischemic heart disease who did not have intubation difficulty.[52]

Gupta K *et al*. in 2012 Compared haemodynamic responses to intubation with Flexible fibreoptic bronchoscope and Bonfils rigid intubation endoscope in 60 adult female patients. In their study they reported that both Bonfils rigid intubation endoscope and flexible fibreoptic bronchoscope required a similar time (less than 1min) for orotracheal intubation. After intubation, there was a significant increas e in HR, blood pressure P<0.001) in both the groups compared to the baseline. There was no significant difference in HR, BP and rate pressure product at any of the measuring points or in their maximum values during observation between the two groups. The time required for recovery of SBP and HR to post- induction value (±10%) was not significantly different between the two groups (more than 2 min). Thus concluding that among female adults under general anaesthesia, Bonfils rigid intubation endoscope and flexible fibreoptic bronchoscope

require a similar time for successful orotracheal intubation and cause a similar magnitude of haemodynamic response.[53]

Tushar B *et al*. in 2013 compared haemodynamic response in nasotracheal intubation under general anaesthesia between FOB and DLS in 50 patients. The study reported that haemodynamic response in the form tachycardia, increase in SBP, DBP & MAP occurred in nasotracheal intubations with both the fibreoptic bronchoscope and with direct laryngoscope. Tachycardia of similar magnitude was noted in both the groups following insertion of scope and after intubation whereas SBP, DBP & MAP were significantly high in DLS group $p<0.05$, at the time of intubation & SBP immediately after intubation was significantly high in FOB group, thus concluding that fibreoptic bronchoscopy provides no advantage over conventional laryngoscopy, in terms of decreasing the haemodynamic response to nasotracheal intubation under general anaesthesia.[54]

Mohamed NN *et al*. in 2013 carried out a study to evaluate haemodynamic responses on 44 patients having type 2 Diabetes Mellitus with Ischemic heart disease, and concluded that there was statistically significant increase in HR, SBP and DBP in DLS group than fibreoptic group. The intubation time in the fibreoptic group showed a statistically significant increase in comparison with direct laryngoscopy (39 12.04 vs 29.3 8.54) $P<0.05$, and that the optimum use of fibreoptic bronchoscope with avoidance of jaw thrust manoeuvre attenuates the haemodynamic response to intubation which is beneficial in diabetic patients with ischemic heart disease. Stress response hormones showed no statistically significant difference between groups.[55]

Sharma VS *et al*. in 2014 conducted a study in order to compare the overall efficacy and haemodynamic effects following blind orotracheal intubation with ILMA vs. conventional direct laryngoscopy guided intubation with Macintosh laryngoscope

in 60 patients. They reported that the time required for successful intubation was significantly longer in the group with IMLA as compared to group with DL (152.46 ± 26.06 and 34.9 ± 7.59 respectively). 93.3% cases were intubated successfully in the group with DL with single attempt and no adjusting maneuver while only 76.6% of cases in the group IMLA could be successfully intubated in 1st attempt without any adjusting maneuver. 6.6% patients of the group DL required application of some adjusting maneuver but intubation could be finished within the same i.e. 1st attempt, whereas 20% of patients in the group IMLA required one attempt with some adjustment maneuver to complete intubation. Second attempt to intubation was required only for one patient in the group IMLA. Overall success rate of intubation in both the groups was 100%. Maximum average HR in group DL achieved over the whole process on intubation was 97.6 ± 4.06 (baseline: 81.63 ± 7.83) and that in the group IMLA was 95.9 ± 6.96 (baseline: 82.86 ± 7.84). Maximum average MAP in group DL achieved over the whole process on intubation was 102.15 ± 4.16 (baseline: 92.64 ± 2.99) and that with the ILMA was 104.43 ± 5.90 (baseline: 91.42 ± 2.89) ($P < 0.05$). All The changes in HR and MAP remained within acceptable 20% from the baseline values in both the groups and hence were clinically insignificant. Thus in patients with normal airway blind intubation with ILMA offers a good alternative to conventional direct laryngoscopy with equal success, similar haemodynamic advantage and insignificant oropharyngolaryngeal morbidity.[56]

Shrestha M *et al*. in 2014 conducted a study to assess Haemodynamic changes during endotracheal intubation: A prospective randomised comparative study using fibreoptic bronchoscope and intubating laryngeal mask airway in 50 patients. The study evaluated that after the induction of anaesthesia, HR increased in both the groups and further increase was seen at intubation but the difference was not

significant between the groups. The maximum values recorded during the observation in both the groups were also comparable. The MAP decreased than the baseline values after induction of anaesthesia, then increased at intubation and there after throughout the observation in both the groups but was not statistically significant. The mean arterial pressure returned to the baseline after three minutes of intubation. The maximum value recorded during the observation between the groups was comparable. In both the groups, the time taken for intubation in second attempt was significantly longer than those in whom intubation succeeded in first attempt. Similarly when the time taken for intubation was compared between the two groups, it was found to be significantly longer in Group II (IMLA) irrespective of the number of attempts. Hence in their conclusion, haemodynamic changes and complications during orotracheal intubation using FOB or ILMA were comparable. Therefore, ILMA, which has a better availability and is less expensive than FOB, can be used safely as an alternative method for securing airway in routine surgical patients.[57]

In 2015 Omprakash Sundrani *et al*. compared haemodynmic changes to nasotracheal intubation with direct vs fibreoptic bronchoscopy in 100 patients in the age group of 18-50 years. The study showed that the mean length of time for successful nasotracheal intubation was shorter in direct laryngoscopy group compared with the fibreoptic group, 39.24±1.985seconds (range 36 to 42) versus 61.78±3.683 seconds (range 62 to 68), respectively ($p<0.05$). Pre induction mean systolic and diastolic blood pressure and heart rate were similar in the two groups. A significant reduction in SBP and DBP was evident after the induction of general anaesthesia in both groups ($p<0.05$). At intubation there was an increase in those parameters. Mean SBP and DBP remained significantly elevated as compared to post induction values for 3 minutes after intubation in both groups. A gradual decline was inspected

between 2 and 5 minutes post intubation. Slight increase in mean heart rates was noted in both groups after the induction of general anaesthesia, the rise was not significant as compared to the baseline values ($p>0.05$). Tracheal intubation caused further significant increase in mean heart rate in both groups compared with baseline and post induction values ($p<0.05$). The increase compared to baseline values was sustained for 2 minutes in fibreoptic group and for 1 minute in conventional laryngoscopy group. At no time during the study period was there a significant difference between the patients intubated with the Macintosh laryngoscope and those intubated with the fibreoptic bronchoscope with respect to mean systolic or diastolic blood pressure or heart rate. Hence concluding that that the stress response to fiberoptic orotracheal intubation is similar to nasotracheal intubation facilitated by the Macintosh laryngoscopy blade.[58]

N Gill *et al*. conducted a study in 2015 to study haemodynamic responses to intubation: Flexible fibreoptic bronchoscope versus McCoy laryngoscope in presence of rigid cervical collar simulating cervical immobilization for traumatic cervical spine in 32 patients. They were divided as Group A (FOB) and Group B (McCoy). While intubation duration was significantly ($P < 0.05$) higher in Group A in comparison to Group B and glottic view was significantly ($P < 0.05$) less clear in Group B as compared to Group A. HR and blood pressure (SBP, DBP and MAP) were comparable at baseline in both groups ($P > 0.05$). In McCoy group, SBP, DBP, and MAP increases significantly ($P < 0.05$) after intubation and lasts up to 5 min as compared to the fibreoptic group. The increase in HR was statistically significant ($P < 0.05$) in McCoy group as compared to FOB group up to 1 min after intubation. They concluded that that although, with McCoy laryngoscope, intubation can be performed more swiftly in situation of emergency as compared to fibrescope, but in a situation of

cervical immobilization which is utmost priority to avoid further neurological injury or fracture instability in cervical trauma, as far as stable hemodynamic response to intubation and glottis visualization are concerned, FOB is superior device over McCoy laryngoscope, if available.[59]

Tempe DK *et al*. in 2015 conducted a study in 60 adult patients to compare haemodynamic responses to laryngoscopy and intubation with Truview PCD, McGrath and Macintosh laryngoscope in patients undergoing coronary artery bypass grafting. Patients were randomly allocated into 3 groups, MC (Macintosh), Truview (TV), McGrath (MG). The study showed that HR and DBP increased at 0 and 1 min of intubation in all three groups ($P < 0.05$), while MAP increased at 0 min in the MG and TV groups and at 1 min in all three groups ($P < 0.05$). A significant increase in SBP was only observed in TV group at 1 min ($P < 0.05$). These haemodynamic changes returned to baseline by 3 min of intubation in all groups. The intergroup comparisons of all haemodynamic parameters were not significant at any time of observation. However, duration of laryngoscopy and intubation was significantly less in MC (36.68 ±16.15 seconds) as compared with MG (75.25±30.94 t) and TW (60.47 ±27.45 t) groups ($P = 0.000$ and 0.003, respectively). Thus video laryngoscopes did not demonstrate any advantage in terms of haemodynamic response in patients with normal airway undergoing CABG.[60]

MATERIALS AND METHODOLOGY

Source of Data:

Patients of age group 18-60 years posted for elective surgery requiring general anaesthesia and orotracheal intubation at Shri B M Patil Medical College, Vijayapur during the period from December 2014 to June 2016. The study was conducted after obtaining approval from the ethical committee of the institution.

Method of collection of Data:

Study Design: 18 months of clinical trial.

Study Period: 18 months from December 2014 to June 2016.

Sample Size:

The sample size per group is 36. Patients were randomly allocated into either Group D or Group F.

Group D Direct Laryngoscopy.

Group F Fibreoptic intubation.

INCLUSION CRITERIA

1. Patients undergoing elective surgeries under general anaesthesia
2. ASA grade 1 and 2.

EXCLUSION CRITERIA:

1. Predicted difficult airway.
2. Pregnancy.

Methodology:

Pre-anaesthetic evaluation:

During preoperative visit, patient's detailed history, general physical examination and systemic examination was carried out. Basic demographic characters like age, sex, height and weight were recorded.

Following investigations were done as routine before taking any patient for elective surgeries:

1. Complete blood count.
2. Urine – sugar, albumin and microscopy.
3. Random blood sugar, Serum creatinine, Blood urea.
4. Electro-cardio-gram and Chest X-ray (when age of patient is >35yrs, or if necessary).
5. Baseline heart rate and blood pressure was recorded.
6. Tests to detect infection with Human Immunodeficiency Virus and Hepatitis B Virus (in accordance to Universal Safety Precautions).
7. 2 D ECHO if required.

A written informed consent was taken from all patients.

IV line was secured using 20G cannula. All patients were preloaded with 500ml RL solution.

Patients of ASA I - II aged 18 to 60 years undergoing elective surgeries under general anaesthesia were taken.

Patients were randomly allocated into either Group D or Group F.

1. Group D with 36 patients underwent direct laryngoscopy and intubation.
2. Group F with 36 patients will be underwent fibreoptic intubation.

All patients were fasted overnight. All patients were administered the same pre medication which will included IV Glycopyrrolate (0.005mg/kg), Midazolam (0.07-.15mg/kg), Fentanyl (1-1.5mcg/kg). Anaesthesia was induced with IV Propofol (2mg/kg) in a dose sufficient to produce loss of eyelash reflex. Following which IV Vecuronium (0.08 – 0.1mg/kg) was administered and intubation was carried out after 3 – 5 minutes. After the intubation all patients were ventilated by 100% oxygen and monitored for systolic and diastolic blood pressures and heart rates using ECG, Pulse oximetry and non-invasive arterial blood pressure recorder. Correct placement of the tube was confirmed by auscultation and ETCO2 monitoring.

Haemodynamic changes like heart rate, systolic, diastolic blood pressures and mean arterial pressure were monitored before pre-medication, after pre-medication, at the time of induction, laryngoscopy, intubation and every 2 minutes up to 6 minutes. Subsequent management was done as per the need of the case.

The study was carried out using Pentax F1 – 13BS fibreoptic bronchoscope for Group F and using conventional laryngoscope with Macintosh blades no 3 or no 4 in Group D.

OBSERVATIONS AND RESULTS

All characteristics were summarised descriptively. For continuous variables, the summary statistics of N, mean, standard deviation (SD) were used. For categorical data, the number and percentage were used in the data summaries. Chi-square (X^2)/Fisher exact test was employed to determine the significance of differences between groups for categorical data. The difference of the means of analysis variables was tested with the unpaired t-test. If the p-value was <0.05, then the results will be considered to be significant. Data were analysed using SPSS v.23.0.

Table 1: Distribution of cases according to Age between study groups

Age(Yrs)	Group D		Group F		p value
	N	%	N	%	
19-25	12	33.3%	5	13.9%	0.079
26-35	6	16.7%	14	38.9%	
36-45	12	33.3%	12	33.3%	
46-55	5	13.9%	2	5.6%	
56-60	1	2.8%	3	8.3%	
Total	36	100.0%	36	100.0%	

Figure A: Distribution of cases according to Age between study groups

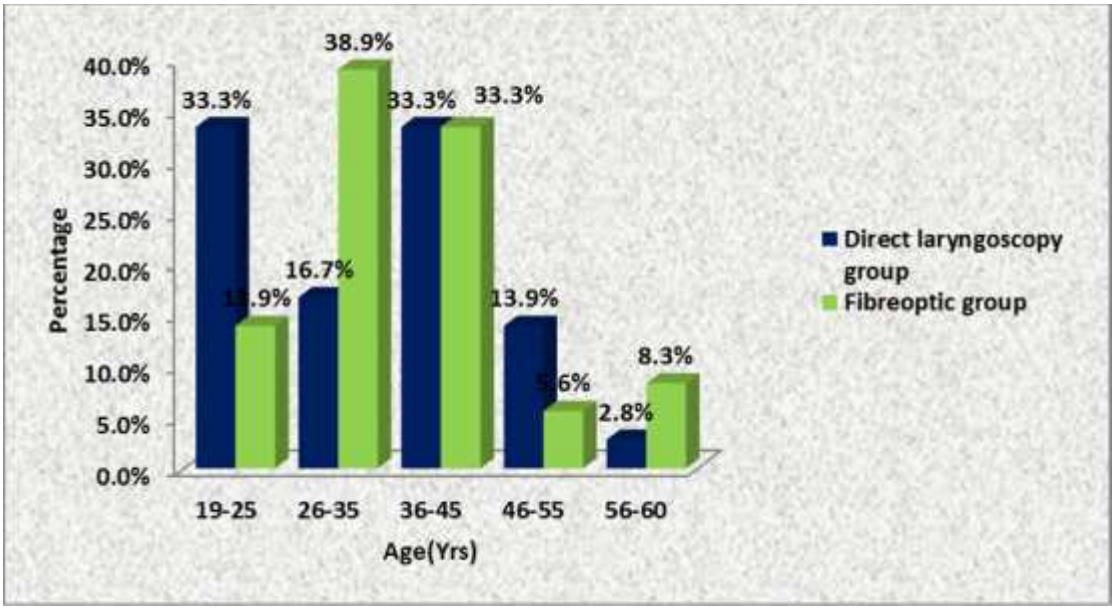


Table 1 shows age distribution between the two groups

In Group D majority of the patients were between the age of 19-25 and 36-45.

In Group f majority of the patients were between the ages of 26-35.

There was no significant difference between the age distribution in both groups.

Table 2: Mean Age between study groups

Parameters	Group D		Group F		Mean difference	p value
	Mean	SD	Mean	SD		
Age (Yrs)	34.9	12.0	36.6	9.5	-1.7	0.502

Figure B: Mean Age between study groups

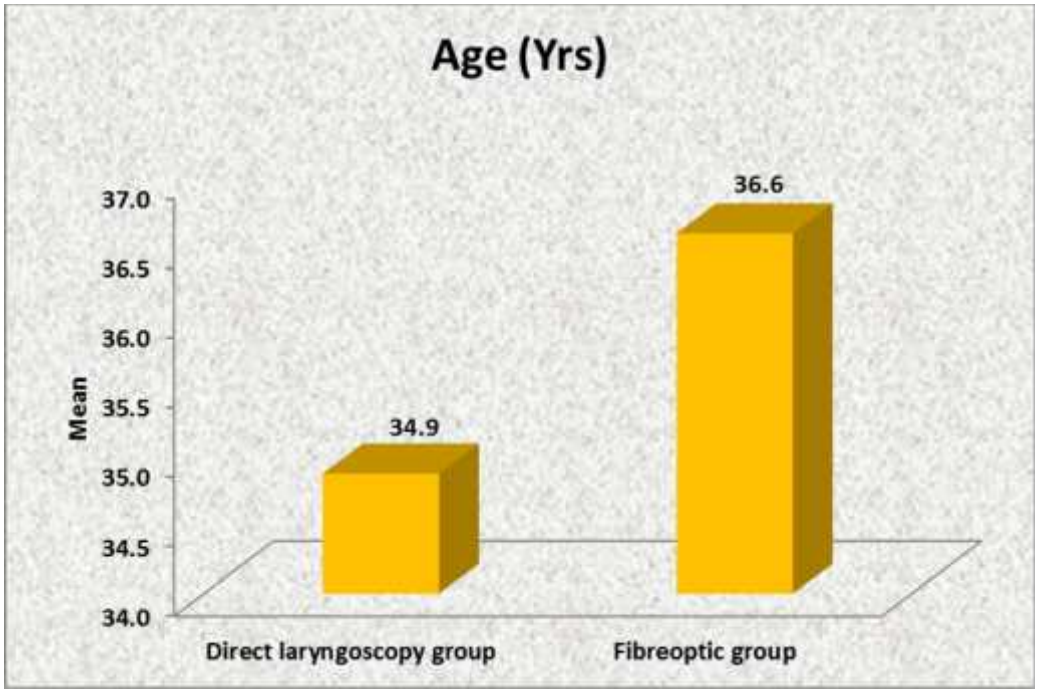


Table 2 shows the mean age

In Group D the mean age was 34.9.

In Group F the mean age was 36.6.

Table 3: Distribution of cases according to sex between study groups

Sex	Group D		Group F		p value
	N	%	N	%	
Male	14	38.9%	18	50.0%	
Female	22	61.1%	18	50.0%	0.343
Total	36	100.0%	36	100.0%	

Figure C: Distribution of cases according to sex between study groups

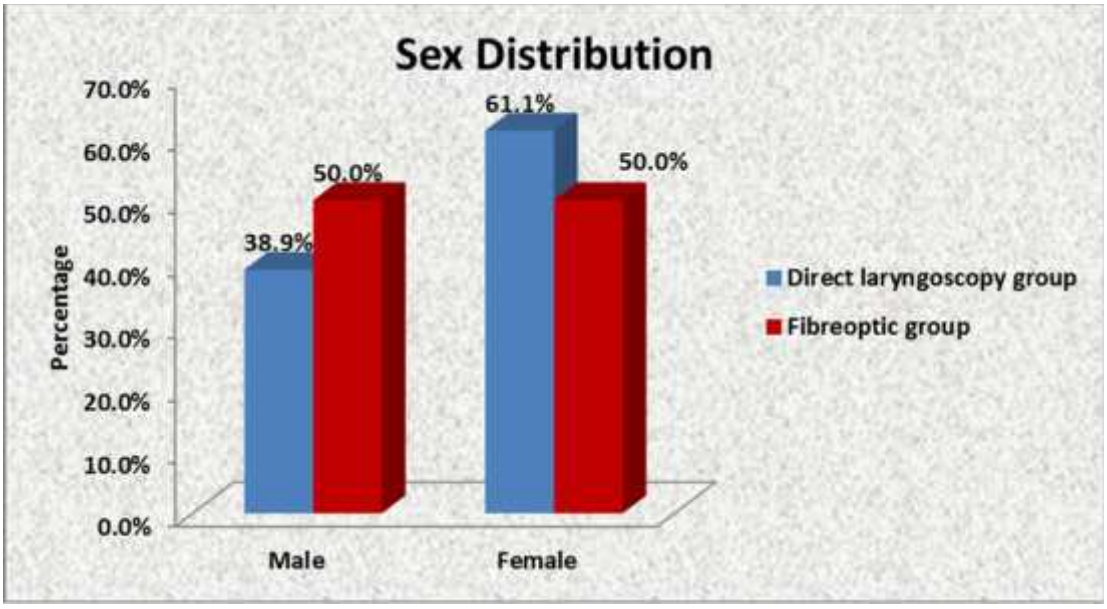


Table 3 shows sex distribution

In Group D females are more than males.

In Group F the number of females is equal to the number of males.

There is no significant difference in sex distribution between the two groups.

Table 4: Distribution of cases according to Surgery between study groups

Surgery	Group D		Group F		p value
	N	%	N	%	
APR	1	2.8%	0	0.0%	
Carcinoma Esophagus TTE	0	0.0%	1	2.8%	
Cystogastrostomy	0	0.0%	1	2.8%	
Exploratory Laparotomy	1	2.8%	0	0.0%	
FESS	0	0.0%	1	2.8%	
Fibroadenoma Excision	1	2.8%	0	0.0%	
Gynaecomastia Excision	1	2.8%	0	0.0%	
Hemithyroidectomy	0	0.0%	2	5.6%	
Laparoscopic Appendicectomy	7	19.4%	5	13.9%	
Laparoscopic Hernioplasty	1	2.8%	2	5.6%	
Laparoscopic Hysterectomy	1	2.8%	0	0.0%	
Laparoscopic cholecystectomy	9	25.0%	10	27.8%	
Left Hemithyroidectomy	2	5.6%	0	0.0%	
Left Vocal ord Polyp Excision	0	0.0%	1	2.8%	
Left thyroid Lobectomy	0	0.0%	1	2.8%	
Lipoma Excision	1	2.8%	0	0.0%	0.282
Microdocectomy	1	2.8%	0	0.0%	
Modified Radical Mastectomy	1	2.8%	1	2.8%	
Near total Thyroidectomy	2	5.6%	1	2.8%	
Pleomorphic adenoma	1	2.8%	0	0.0%	
Right Hemicolectomy	1	2.8%	0	0.0%	
Right PCNL	0	0.0%	1	2.8%	
Right Thoracic Empyema	0	0.0%	1	2.8%	
Right hemithyroidectomy	0	0.0%	1	2.8%	
Splenectomy	1	2.8%	0	0.0%	
Subtotal Thyroidectomy	0	0.0%	4	11.1%	
Subtotal thyroidectomy	2	5.6%	0	0.0%	
Superior Parotidectomy	0	0.0%	1	2.8%	
Superior parotidectomy	1	2.8%	0	0.0%	
Total thyroidectomy	1	2.8%	2	5.6%	
Total	36	100.0%	36	100.0%	

There is no significant difference in distribution of surgeries between the two groups.

Table 5: Mean HR (in bpm) between study groups according to different time intervals

HR	Group D		Group F		Mean difference	p value
	Mean	SD	Mean	SD		
Before Pre Medication	82.2	10.9	84.8	10.5	-2.6	0.305
After Pre Medication	83.9	11.2	87.3	11.2	-3.3	0.214
At the Time of Induction	85.2	10.7	86.1	10.0	-0.9	0.709
At the time of Laryngoscopy	85.7	10.5	87.9	10.6	-2.2	0.380
At the time of Intubation	86.5	10.2	88.4	10.9	-1.9	0.449
2 mins after Intubation	86.7	9.8	87.5	10.6	-0.8	0.739
4 mins after Intubation	86.3	10.2	87.1	9.1	-0.8	0.725
6 mins after Intubation	86.6	10.7	86.4	9.3	0.2	0.926

Table 6: Within study groups mean HR (in bpm) Comparison with compare to baseline value according to different time intervals

HR	Group D		Group F	
	Mean	p value	Mean	p value
Before Pre Medication	82.2	--	84.8	--
At the time of Laryngoscopy	85.7	<0.001 (Sig)	87.9	0.007 (Sig)
At the time of Intubation	86.5	<0.001 (Sig)	88.4	0.011 (Sig)
2 mins after Intubation	86.7	<0.001 (Sig)	87.5	0.101
4 mins after Intubation	86.3	<0.001 (Sig)	87.1	0.114
6 mins after Intubation	86.6	<0.001 (Sig)	86.4	0.282

Figure D: Mean HR between study groups according to different time intervals

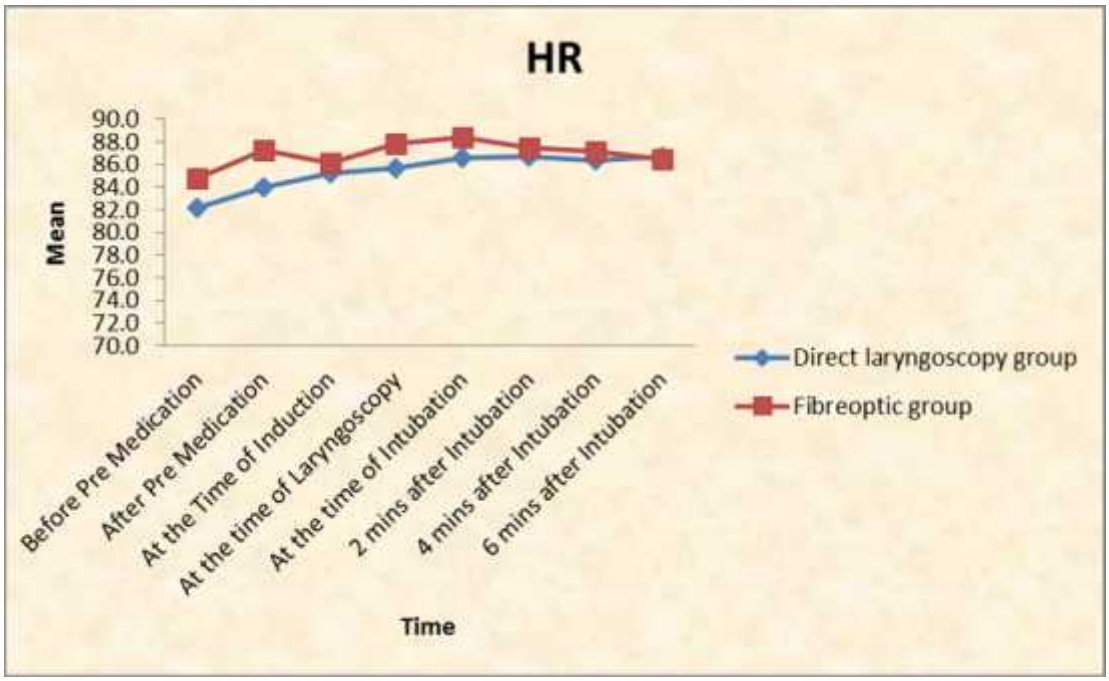


Table 5 shows changes in HR. HR at before pre-medication are considered as baseline values.

There is no significant difference between the two groups with regard to change in HR.

Table 6 shows changes in HR within the two groups.

Group D showed an increase in the HR at the time of laryngoscopy, intubation and at 2, 4 and 6 minutes after intubation with a $p<0.001$ making it statistically significant.

Group F showed an increase in the HR at the time of laryngoscopy ($p<0.007$), and at the time of intubation ($p<0.011$).

Thus the change in HR within the study groups is statistically significant.

Table 7: Mean SBP (in mm Hg) between study groups according to different time intervals

SBP	Group D		Group F		Mean difference	p value
	Mean	SD	Mean	SD		
Before Pre Medication	122.3	15.0	123.9	15.5	-1.6	0.649
After Pre Medication	122.9	14.0	126.1	15.7	-3.3	0.352
At the Time of Induction	123.4	14.7	126.4	21.6	-3.0	0.497
At the time of Laryngoscopy	124.9	22.3	131.5	16.6	-6.6	0.160
At the time of Intubation	127.8	14.4	131.4	15.6	-3.6	0.316
2 mins after Intubation	126.9	12.9	131.0	17.1	-4.1	0.253
4 mins after Intubation	125.8	14.6	128.9	17.1	-3.1	0.409
6 mins after Intubation	122.8	15.8	125.7	15.1	-2.9	0.434

Table 8: Within study groups mean SBP (in mm Hg) Comparison with compare to baseline value according to different time intervals

SBP	Group D		Group F	
	Mean	p value	Mean	p value
Before Pre Medication	122.3	--	123.9	--
At the time of Laryngoscopy	124.9	0.388	131.5	0.003 (Sig)
At the time of Intubation	127.8	0.001 (Sig)	131.4	0.005 (Sig)
2 mins after Intubation	126.9	0.008 (Sig)	131.0	0.014 (Sig)
4 mins after Intubation	125.8	0.113	128.9	0.047 (Sig)
6 mins after Intubation	122.8	0.808	125.7	0.454

Figure E: Mean SBP (in mm Hg) between study groups according to different time intervals

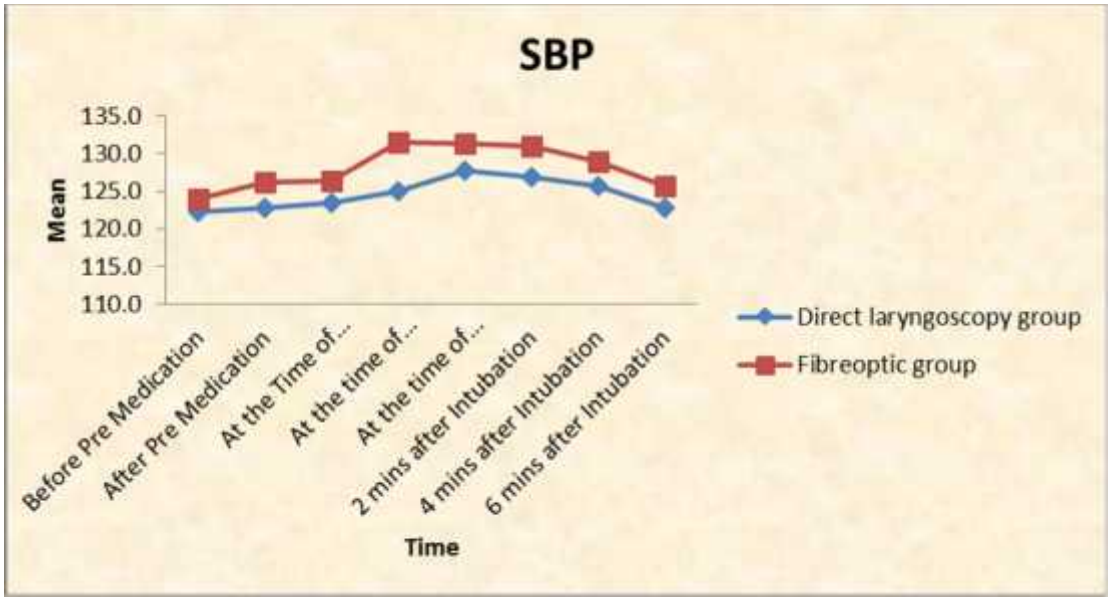


Table 7 shows that difference in the SBP between the two groups is not statistically significant.

Table 8 shows elevation in the SBP in Group D at the time of intubation ($p<0.001$) and at 2 min after intubation ($p<0.008$).

In Group F there is elevation of SBP at the time of laryngoscopy ($p<0.003$), intubation ($p<0.005$), at 2min ($p<0.014$), 4min ($p<0.047$).

Thus the change in SBP is statistically significant within the two groups.

Table 9: Mean DBP (in mm Hg) between study groups according to different time intervals

DBP	Group D		Group F		Mean difference	p value
	Mean	SD	Mean	SD		
Before Pre Medication	79.1	11.6	78.4	10.9	0.6	0.810
After Pre Medication	80.8	12.7	80.5	11.1	0.3	0.929
At the Time of Induction	79.8	12.2	79.4	11.9	0.4	0.891
At the time of Laryngoscopy	82.8	11.5	81.9	11.1	0.8	0.763
At the time of Intubation	83.1	14.7	81.8	10.2	1.4	0.642
2 mins after Intubation	82.1	10.0	80.8	9.4	1.4	0.545
4 mins after Intubation	81.5	10.8	80.9	11.6	0.6	0.834
6 mins after Intubation	81.0	11.9	79.7	10.6	1.3	0.617

Table 10: Within study groups mean DBP (in mm Hg) Comparison with compare to baseline value according to different time intervals

DBP	Group D		Group F	
	Mean	p value	Mean	p value
Before Pre Medication	79.1	--	78.4	--
At the time of Laryngoscopy	82.8	0.006 (Sig)	81.9	0.049 (Sig)
At the time of Intubation	83.1	0.046 (Sig)	81.8	0.069
2 mins after Intubation	82.1	0.075	80.8	0.213
4 mins after Intubation	81.5	0.139	80.9	0.246
6 mins after Intubation	81.0	0.236	79.7	0.513

Figure F: Mean DBP (in mm Hg) between study groups according to different time intervals

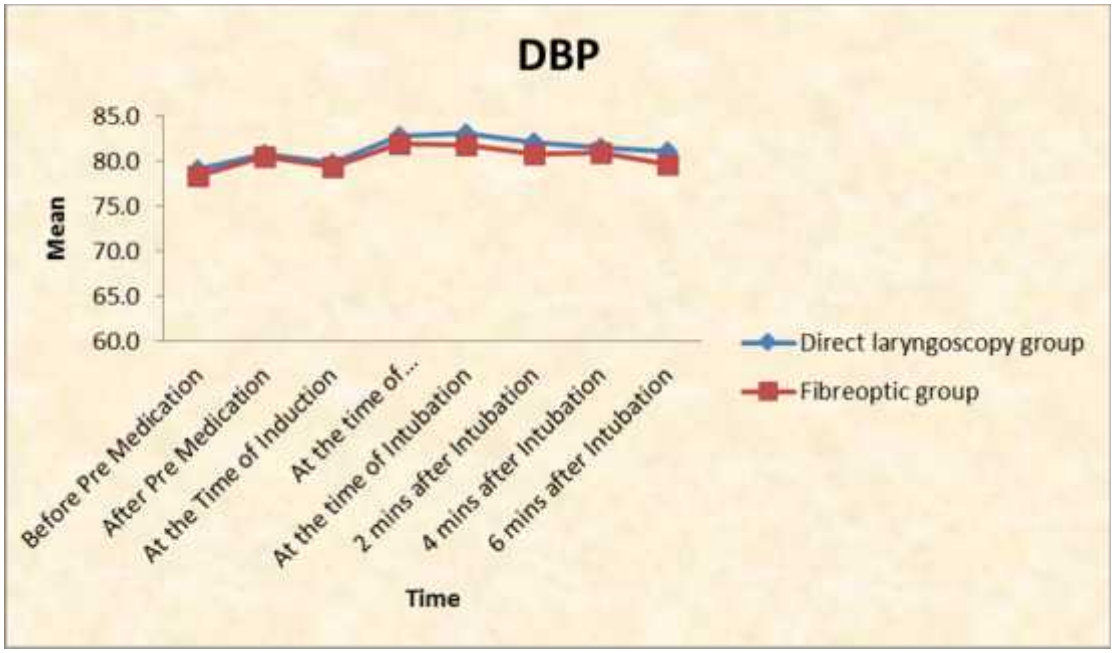


Table 9 shows the changes in mean DBP are not statistically significant between the two groups

Table 10 shows that mean DBP increased at the time of laryngoscopy ($p<0.006$) and at the time of intubation ($p<0.046$) in Group D.

The increase in mean DBP in Group F was however seen only at the time of laryngoscopy ($p<0.049$).

Table 11: Mean MAP (in mm Hg) between study groups according to different time intervals

MAP	GROUP D		GROUP F		Mean difference	p value
	Mean	SD	Mean	SD		
Before Pre Medication	91.4	12.3	94.1	11.4	-2.7	0.339
After Pre Medication	93.0	12.2	95.2	12.1	-2.2	0.440
At the Time of Induction	91.9	13.6	95.0	13.6	-3.1	0.339
At the time of Laryngoscopy	95.5	13.7	98.3	12.0	-2.8	0.368
At the time of Intubation	93.8	12.8	99.1	10.7	-5.3	0.058
2 mins after Intubation	94.8	10.6	96.5	11.3	-1.7	0.514
4 mins after Intubation	95.0	12.4	97.3	12.7	-2.3	0.433
6 mins after Intubation	92.0	12.9	96.0	12.4	-4.0	0.188

Table 12: Within study groups mean MAP (in mm Hg) Comparison with compare to baseline value according to different time intervals

MAP	Group D		Group F	
	Mean	p value	Mean	p value
Before Pre Medication	91.4	--	94.1	--
At the time of Laryngoscopy	95.5	0.013 (Sig)	98.3	0.048 (Sig)
At the time of Intubation	93.8	0.165	99.1	0.017 (Sig)
2 mins after Intubation	94.8	0.039 (Sig)	96.5	0.256
4 mins after Intubation	95.0	0.046 (Sig)	97.3	0.116
6 mins after Intubation	92.0	0.723	96.0	0.317

Figure G: Mean MAP between study groups according to different time intervals

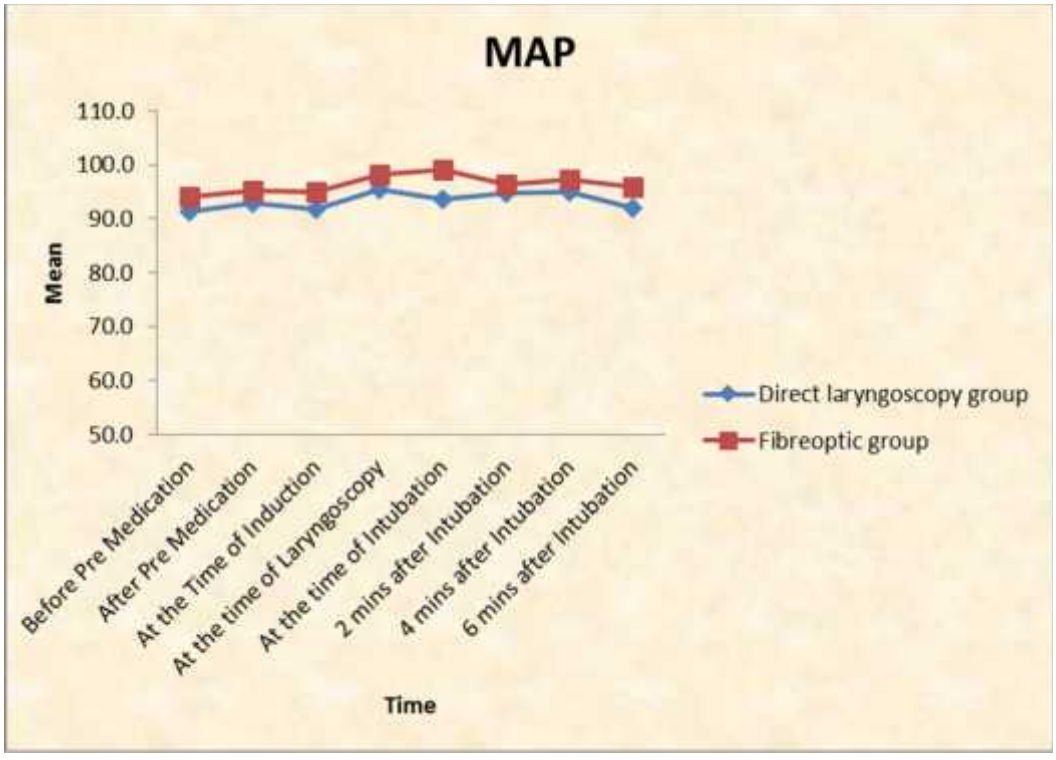


Table 11 shows the changes in the MAP which is not statistically significant between the two groups.

Table 12 shows the changes in the MAP within the two groups, in Group D an elevation in MAP was seen at the time of laryngoscopy ($p<0.013$), at 2min ($p<0.039$) and 4min ($p<0.046$), making it statistically significant.

In Group D there was an elevation in MAP only at the time of laryngoscopy ($p<0.048$) and intubation ($p<0.017$).

Table 13: Distribution of cases according to No of attempts taken to intubate (TI) between study groups

No of Attempts TI	Group D		Group F		p value
	N	%	N	%	
1	35	97.2%	28	77.8%	0.013 (Sig)
2	1	2.8%	8	22.2%	
Total	36	100.0%	36	100.0%	

Figure H: Distribution of cases according to No of Attempts taken to intubate between study groups

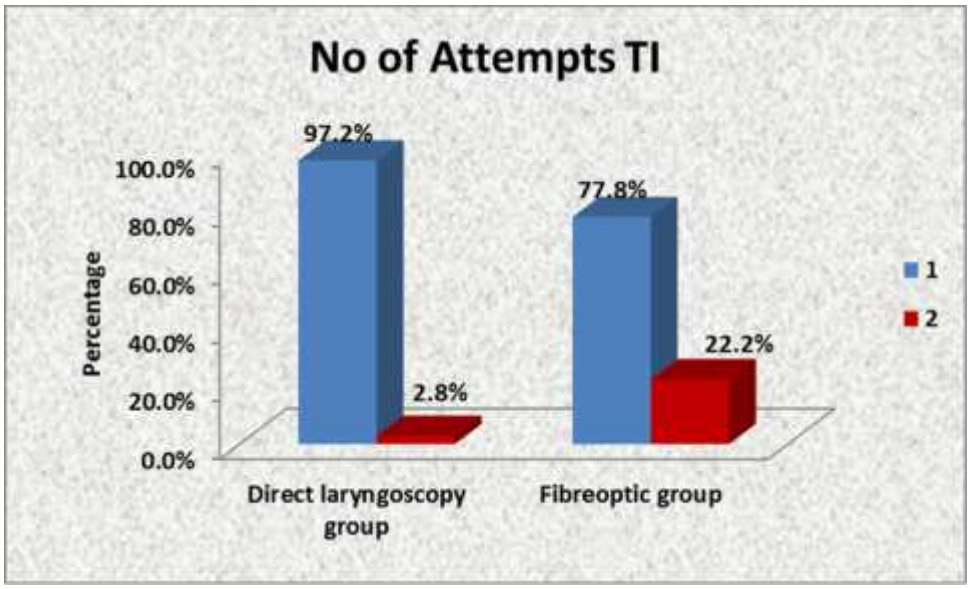


Table 13 shows the mean number of attempts between the two groups.

In Group D 97.2% cases were intubated in one attempt, and in Group F 77.8% cases were intubated in one attempt, 22.2% required a second attempt.

Thus the difference in the number of attempts required to intubate between the groups in statistically significant (P<0.013).

Table 14: Mean Time taken to intubate between study groups

Parameters	Group D		Group F		Mean difference	p value
	Mean	SD	Mean	SD		
Time taken(sec)	14.1	17.9	42.9	31.6	-28.8	<0.001 (Sig)

Figure I: Mean Time taken to intubate between study groups

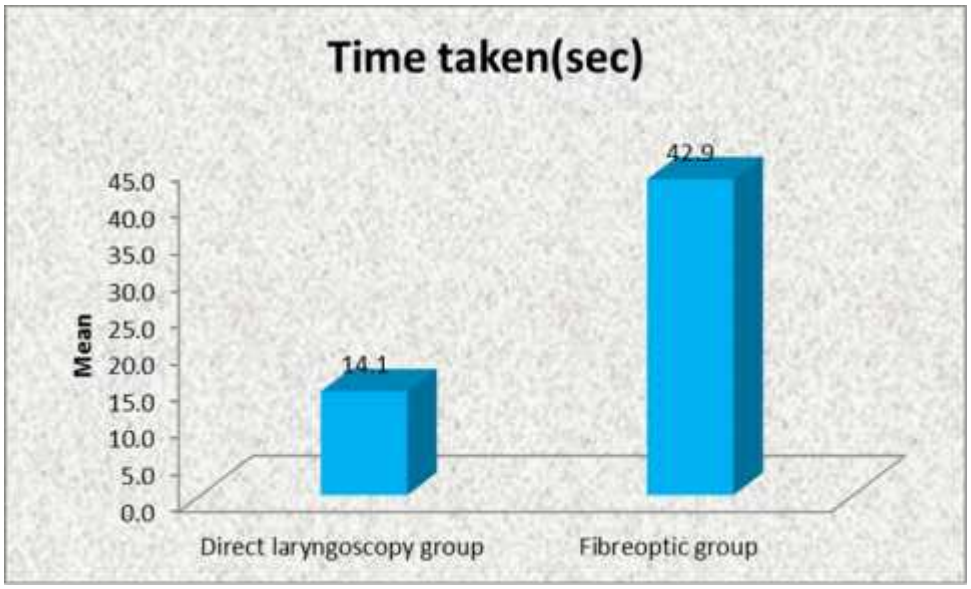


Table 13 shows the mean time taken for intubation between the two groups.

Group D has a mean time of 14.1 seconds while Group F has a mean time of 42.9 seconds, making the mean time taken for intubation statistically significant.

DISCUSSION

In anaesthesia, intubation is an essential artistry for an anaesthesiologist during airway management. With the use of the conventional approach of intubation, exaggerated haemodynamic response occurs which is due to forces exerted by laryngoscope blade for visualization of glottic opening.[57] These haemodynamic changes manifest as increase in HR, arterial blood pressure, and arrhythmias which can cause detrimental cardiovascular and neurological effects specially in vulnerable patients e.g., those with ischemic heart disease, cerebrovascular disease, etc.[37]

Any technique for intubation requires lesser lifting force would proportionally reduce the sympathetic discharge, and hence changes in HR and BP. For obtundation of this haemodynamic response, various interventions (pharmacological and non-pharmacological) have been tried.

In fact, tracheal intubation methods, which exclude or decrease oropharyngeal stimulation, should reduce stress response and decrease the number of cardiovascular and pulmonary complications. However, in the studies published there is only a slight or controversial experience as to the effect of various intubation techniques on patient stress response.[49]

In our study we analysed the hypothesis that FOI under GA may produce lesser stress response in comparison to DLS under GA in 72 patients in age group of 18-60 years with ASA grade 1 or 2.

Patients were allocated randomly to two groups.

Group D – underwent DLS

Group F – underwent FOB

In our study there were no significant differences in the two groups regarding patient age, gender and type of surgery.

Comparison of mean HR

There was an increase in HR in both groups at the time of laryngoscopy. In group D there was an increase in HR with a mean value of 85.7 beats/min during laryngoscopy, at the time of intubation 86.5 beats/min , 2 minutes after intubation 86.7 beats/min, 4 minutes after intubation 86.3beats/min and 6 minutes after intubation 86.6 beats/min with $p<0.001$, making it statistically significant.

Group F however had an increase in the HR during laryngoscopy (87.9 beats/min), $p<0.007$ and intubation (88.4 beats/min), $p<0.011$ only. The maximal increase was seen in this group during intubation. There was no significant increase thereafter unlike that observed in group D.

Our study showed that there was no significant difference in the mean HR in between both the study groups from the baseline values up to 6 minutes post intubation.

This finding is in co-relation with Amir Murad Khudad and Hoshiyar Najeeb Karem. [1] who studied haemodynamic changes in FOB versus DLS with orotracheal intubation. HRs at intubation and 2 minutes after intubation were significantly higher than the post induction ($p = 0.001$ in FOB and $p = 0.007$ in DLS groups) and baseline values ($p = 0.001$ in FOB and $p = 0.007$ in DLS). There was no significant differences between the two groups in response to laryngoscopy or tracheal intubation.

Xue FS *et al*. [45] in their study of comparing haemodynamic responses to FOB vs DLS. HRs at intubation and at 1 minute after intubation were significantly higher in the FOB group than in the DLS group, but the maximal values of HRs were similar in both groups.

Yushi U Adachi *et al*.[43] in their study of comparison of stress responses in DLS vs FOB orotracheal intubation also found that although FOB is minimally

invasive there was singnificant increase in HR from baseline values and increased significantly on intubation.

Xue FS *et al.*[48] compared haemodynamic responses in nasotracheal intubation with FOB vs DLS. Their study also showed that HR at intubation was significantly greater in the FOB group than in the DLS group. However, the maximum values of HRs in the two groups were not significantly different.

Comparison of SBP, DBP and MAP

There was no significant decrease in the SBP, DBP and MAP after induction, but compared to post induction values there was significant increase in SBP, DBP and MAP at the time of laryngoscopy and intubation in both Group D and Group F.

In Group D there was an elevation in mean SBP. It was 127.8 mm Hg ($p<0.001$) the time of intubation and 126.9 mm Hg ($p<0.008$) at 2 minutes after intubation, DBP in mm Hg was 82.8 ($p<0.006$), and 83.1 ($p<0.046$) at the time of laryngoscopy and intubation respectively. The MAP was elevated at time of laryngoscopy, 95.5mm Hg no increase was seen during intubation but there was an elevation at 2 minutes and 4 minutes post intubation.

Group F showed an increase in SBP at the time of laryngoscopy, 131.5 mm Hg ($p<0.003$), at the time of intubation ($p<0.005$), at 2 ($p<0.014$) and 4 (0.047) minutes after intubation. The increase in DBP was seen only during bronchoscopy 81.9 mm Hg ($p<0.049$), no significant difference seen at the time of intubation or after that. The MAP was elevated both during laryngoscopy ($p<0.048$) and intubation ($p<0.017$).

Although these parameters are significantly elevated in individual groups, there is no significant difference between the two groups.

All these parameters were elevated in comparison to the baseline values. And similar findings have been reported by Amir Murad Khudad and Hoshiyar Najeeb Karem. [1] Yushi U Adachi *et al*.[43] Barak M *et al*.[44] Xue FS *et al*.[45] in their studies and have found that there is significant increase in SBP, DBP and MAP at the time of laryngoscopy and intubation. But there is significant difference in these parameters between the two groups.

Time taken for intubation

The mean time taken for intubation group D was 14.1 seconds in comparison to group F which was 42.9 seconds ($p<0.001$) which is statistically significant.

This observation is similar to Yushi U Adachi *et al*. [43] FOB intubation time is longer than DLS and intubation (102±32 sec vs 46±23 sec).

Zhang GH, FS Xue *et al*.[46] showed FOB intubation time (34.9±8.5 seconds) more than DLS (27.8±10.7 seconds), $p<0.005$.

Xue FS *et al*.[48] intubation time in FOB was significantly longer (52.3±6.2seconds) than DLS (47.2±6.6 seconds).

Barak M *et al*.[44] also concluded that the mean length of time for successful endotracheal intubation was shorter in the DLS group compared with the FOB group, 16.9 ±7.0 seconds (range 8 to 40) versus 55.0±22.5 seconds (range 29 to 120) seconds, respectively ($p <0.001$).

One advantage of the FOI is that it can avoid the mechanic stimulus to the base of tongue, epiglottis and the receptors in pharyngeal muscles exerted by direct laryngoscope.[46] Some studies have shown that the cardiovascular responses to tracheal intubation are greatly inhibited by attenuating or avoiding the oropharyngolaryngeal stimuli.[61-65] In addition, under topical anaesthesia of the airway and sedation management, the FOB can produce less of a cardiovascular response

during the nasotracheal intubation compared to the DLS.[61] However, our study shows that under general anaesthesia orotracheal intubation using the FOB and DLS caused similar increases in BPs and HRs. This suggests that the FOB cannot attenuate the cardiovascular responses to orotracheal intubation compared to the DLS.

The results of our study correspond with those of other previous studies.[1, 43-48,

The possible reasons of our results are that FOI produces other nociceptive stimulus to the airway, which invalidates its benefit of avoiding pharyngolaryngeal structures.[66]

First, it has been shown that the longer the intubation time the more likely is it to develop hypercapnia, which can result in hypertention and tachycardia.[67] In our study, the mean intubation time is significantly longer in the FOB group than in the DLS group. Consequently, the cardiovascular response to fibreoptic intubation is possibly enhanced.

Second, fibreoptic intubation necessitates the lifting of the jaw upward to make a clear passage for the FOB and for the tracheal tube to enter the glottis. The previous study[68] demonstrated that the lifting of the jaw upwards itself was sufficient to cause a cardiovascular response similar to those observed in the laryngoscopic intubation. In addition, the advancement of the tracheal tube over the FOB is often impeded when the Murphy's tip catches on the downward sagging epiglottis, arytenoid cartilage, vocal cords and anterior tracheal wall. On such occasions, the successful intubation often requires some specific manoeuvres e.g. rotating the tracheal tube, further lifting jaw upward and adjusting the patient's head-neck position. In our study 22 cases required jaw thrust and 11 cases required both jaw thrust and lingual traction. All these procedures are blind and invasive, and may further stimulate pharyngolaryngeal structures and the trachea.

Third, during the fibreoptic intubation, the insertion cord of the FOB must be placed into the trachea for guidance followed by advancing the tracheal tube over the insertion cord into the trachea and then the FOB is removed. This can cause repeated friction and irritation to the trachea. In contrast, with the direct laryngoscopic intubation, only the tracheal tube is inserted into the trachea under direct vision. This might be the main reason why the hemodynamic responses were more profound in the FOB group than in the DLS group. The laryngoscopy produces a balanced stimulation of vagal and cardiac accelerator fibres, whereas the intratracheal manipulation produces less vagal stimulation.[37] Fourth, some studies showed that the tracheal tube insertion itself was the most invasive stimulus and may be the major cause of cardiovascular responses to the tracheal intubation.[44, 46, 68]

CONCLUSION

In our study we aimed to evaluate if there is any advantage of using FOB over conventional DL in terms of attenuating haemodyamic responses. Our study showed that there is no significant difference between FOB and DL and that increase in pressor response is seen during laryngoscopy and intubation irrespective of the method used.

FOB has no special role in attenuating stress response in normal healthy patients with a normal airway. But one cannot ignore the numerous other benefits that it offers it terms of difficult airway management.

FOB if available can be used in routine cases to help train ourselves for better management of difficult airway. To conclude, FOI may not have had any added benefits in our study but it is a skill that needs to be mastered and should be in the armamentarium of all anaesthetists.

SUMMARY

The present study entitled "**COMPARISON OF HAEMODYNAMIC CHANGES WITH LARYNGOSCOPY AND OROTRACHEAL INTUBATION, USING FIBREOPTIC LARYNGOSCOPE WITH ON SCREEN MONITORING AND DIRECT LARYNGOSCOPE – A CLINICAL TRIAL**" was carried out at BLDE UNIVERSITY Shri.B.M.Patil Medical College, Hospital and Research Centre, Vijayapur, from December 2014 to June 2016. The study population consisted of 72 patients divided in two groups.

1. Group D – underwent DLS.

2. Group F– underwent FOI.

The demographic parameters, age and sex were comparable in both the groups.

Statistical evaluation between both the groups showed that the increase in HR was significant at the time of laryngoscopy and intubation ($p<0.05$). However, there was no significant difference between the two groups.

The SBP in group D was elevated at the time of intubation and 2 minutes after intubation and in group F it was elevated at the time of laryngoscopy, intubation at 2 and 4 minutes after intubation. But significant difference between the two groups.

The DBP in both groups was elevated at the time of laryngoscopy. DBP in group D was elevated during intubation as well.

The MAP was elevated in both groups at the time of laryngoscopy and intubation. In group F it was increased at 2 ($p<0.048$) and 4 ($p<0.017$) minutes after intubation.

97.2% cases in Group D were intubated in a single attempt whereas only 77.8% cases were intubated in a single attempt in Group F. The difference in the

number of attempts required to intubate between the two groups is statistically significant.

The mean time taken for intubation is 14.1 seconds in Group D and 42.9 seconds in Group F, with $p<0.001$.

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ANNEXURE-I

ETHICAL CLEARANCE CERTIFICATE

B.L.D.E. UNIVERSITY'S
SHRI.B.M.PATIL MEDICAL COLLEGE, BIJAPUR-586 103
INSTITUTIONAL ETHICAL COMMITTEE

INSTITUTIONAL ETHICAL CLEARANCE CERTIFICATE

The Ethical Committee of this college met on 22-11-2014 at 3:30pm to scrutinize the Synopsis of Postgraduate Students of this college from Ethical Clearance point of view. After scrutiny the following original/corrected & revised version synopsis of the Thesis has been accorded Ethical Clearance.

Title "Comparison of Haemodynamic changes with Laryngoscopy and Orotracheal Intubation Using Fibreoptic Laryngoscope with on Screen Monitoring and Direct Laryngoscope-A clinical Trial"

Name of P.G. student Dr. Meghana Mallanna Hipparagi
Dept of Anaesthesiology.

Name of Guide/Co-investigator Dr Vidya Patil Professor.
Dept of Anaesthesiology

for
DR.TEJASWINI. VALLABHA
CHAIRMAN
INSTITUTIONAL ETHICAL COMMITTEE
BLDE(D)'S, SHRI.B.M.PATIL
MEDICAL COLLEGE, BIJAPUR.

Following documents were placed before E.C. for Scrutinization
1) Copy of Synopsis/Research project.
2) Copy of informed consent form
3) Any other relevant documents.

ANNEXURE-II

INFORMED CONSENT FORM

B.L.D.E.U.'s SHRI B.M. PATIL MEDICAL COLLEGE, HOSPITAL AND RESEARCH CENTRE, VIJAYAPUR – 586103, KARNATAKA

TITLE OF THE PROJECT:

"COMPARISON OF HAEMODYNAMIC CHANGES WITH LARYNGOSCOPY AND OROTRACHEAL INTUBATION, USING FIBREOPTIC LARYNGOSCOPE WITH ON SCREEN MONITORING AND DIRECT LARYNGOSCOPE – A CLINICAL TRIAL"

PRINCIPAL INVESTIGATOR: Dr MEGHANA MALLANNA HIPPARAGI
Department of Anaesthesiology

PG GUIDE **:** Dr. VIDYA PATIL
Prof ,Dept of Anaesthesiology
B.L.D.E. University's Shri B.M. Patil Medical College Hospital & Research Centre,

PURPOSE OF RESEARCH:

I have been informed that this study is **"**COMPARISON OF HAEMODYNAMIC CHANGES WITH LARYNGOSCOPY AND OROTRACHEAL INTUBATION, USING FIBREOPTIC LARYNGOSCOPE WITH ON SCREEN MONITORING AND DIRECT LARYNGOSCOPE – A CLINICAL TRIAL**"**

I have been explained about the reason for doing this study and selecting me/my ward as a subject for this study. I have also been given free choice for either being included or not in the study.

PROCEDURE:

I understand that I will be doing **"**COMPARISON OF HAEMODYNAMIC CHANGES WITH LARYNGOSCOPY AND OROTRACHEAL INTUBATION, USING FIBREOPTIC LARYNGOSCOPE WITH ON SCREEN MONITORING AND DIRECT LARYNGOSCOPE – A CLINICAL TRIAL**"**

RISKS AND DISCOMFORTS:

I understand that I/my ward may experience some pain while giving anesthesia and I understand that necessary measures will be taken to reduce these complications as and when they arise.

BENEFITS:

I understand that me/my wards participation in this study will help in finding out **"**COMPARISON OF HAEMODYNAMIC CHANGES WITH LARYNGOSCOPY AND OROTRACHEAL INTUBATION, USING FIBREOPTIC LARYNGOSCOPE WITH ON SCREEN MONITORING AND DIRECT LARYNGOSCOPE – A CLINICAL TRIAL**"**

CONFIDENTIALITY:

I understand that medical information produced by this study will become a part of this Hospital records and will be subjected to the confidentiality and privacy regulation of this hospital. Information of a sensitive, personal nature will not be a part of the medical records, but will be stored in the investigator's research file and identified only by a code number. The code key connecting name to numbers will be kept in a separate secure location.

If the data are used for publication in the medical literature or for teaching purpose, no names will be used and other identifiers such as photographs and audio or video tapes will be used only with my special written permission. I understand that I may see the photograph and videotapes and hear audiotapes before giving this permission.

REQUEST FOR MORE INFORMATION:

I understand that I may ask more questions about the study at any time. Dr.Meghana is available to answer my questions or concerns. I understand that I will be informed of any significant new findings discovered during the course of this study, which might influence my continued participation.

If during this study, or later, I wish to discuss my participation in or concerns regarding this study with a person not directly involved, I am aware that the social worker of the hospital is available to talk with me.

And that a copy of this consent form will be given to me for careful reading.

REFUSAL OR WITHDRAWL OF PARTICIPATION:

I understand that my participation is voluntary and I may refuse to participate or may withdraw consent and discontinue participation in the study at any time without prejudice to my present or future care at this hospital.

I also understand that Dr.Meghana will terminate my participation in this study at any time after she has explained the reasons for doing so and has helped arrange for my continued care by my own physician or therapist, if this is appropriate

INJURY STATEMENT:

I understand that in the unlikely event of injury to me/my ward, resulting directly to my participation in this study, if such injury were reported promptly, then medical treatment would be available to me, but no further compensation will be provided.

I understand that by my agreement to participate in this study, I am not waiving any of my legal rights.

I have explained to _____ the purpose of this research, the procedures required and the possible risks and benefits, to the best of my ability in patient's own language.

Date: Dr. Vidyapatil Dr.Meghana

(Guide) (Investigator)

STUDY SUBJECT CONSENT STATEMENT:

I confirm that Dr.Meghana Mallanna Hipparagi has explained to me the purpose of this research, the study procedure that I will undergo and the possible discomforts and benefits that I may experience, in my own language.

I have been explained all the above in detail in my own language and I understand the same. Therefore I agree to give my consent to participate as a subject in this research project.

_____ _____

(Participant) Date

_____ _____

(Witness to above signature) Date

ANNEXURE-III

PROFORMA

STUDY:

Patient Name :	I.P. No:
Age :	Weight:
Height :	Gender:
Date of Operation:	Occupation:
Address :	Anaesthesiologist:

Pre-anaesthetic evaluation

Chief Complaints

Past History

a. HTN / DM / Asthma / Epilepsy / Drug allergy

b. Drug therapy

c. Previous exposure to anaesthesia

Family history

General Physical Examination

Pallor / Icterus / Clubbing / Lymphadenopathy / Odema

P.R.: B.P.:

R.R.:

Musculoskeletal disorders

Jaw movements	Teeth:
Mallampati grade:	Spine:

Systemic examination

R.S.	CNS
CVS	GIT

Investigations

Hb%:	Total count:
Differential count:	Bleeding time:
Clotting time:	PT:
aPTT:	INR:
Urine routine	
Any others	

Preoperative physical status: ASA Grade I II III IV V

Diagnosis:

Proposed surgery:

Preoperative baseline:

HR:	BP:

Monitors attached

Pulse oximetry	Non-invasive blood pressure:
ECG	

1. Group: Group D/ Group F

2. Vital parameters

Time	Heart rate	Systolic blood pressure	Diastolic blood pressure	Mean arterial pressure
Before pre medication				
After pre medication				
At the time of induction				
At the time of laryngoscopy				
At the time of intubation				
2 minutes after intubation				
4 minutes after intubation				
6 minutes after intubation				

3. Ease of intubation

Group	NO OF ATTEMPTS TAKEN TO INTUBATE	TIME TAKEN TO INTUBATE
D		
F		

KEY TO MASTER CHART

IP – Indoor patient number

Sl no – Serial Number

TT – Time taken for intubation

MASTER CHART GROUP D																																				
Sl No	IP No	Age/ Sex	Before Pre Medication				After Pre Medication				At the Time of Induction				At the time of Laryngoscopy				At the time of Intubation				2 mins after Intubation				4 mins after Intubation				6 mins after Intubation				No of Attempts TI	TT (sec)	Complications PI
			HR	SBP	DBP	MAP	HR	SBP	DBP	MAP	HR	SBP	DBP	MAP	HR	SBP	DBP	MAP	HR	SBP	DBP	MAP	HR	SBP	DBP	MAP	HR	SBP	DBP	MAP	HR	SBP	DBP	MAP			
1	17854	44/F	102	112	76	91	106	113	81	90	110	106	75	81	101	114	84	81	102	120	95	81	100	106	75	81	99	107	67	83	99	109	81	83	1	12	no
2	17488	44/F	88	132	79	101	98	131	70	89	98	130	78	71	100	132	79	88	102	131	79	88	102	131	82	106	100	141	88	104	99	130	84	98	1	10	no
3	20603	28/F	79	117	75	89	84	119	75	93	88	125	78	96	90	126	82	98	92	128	83	97	90	125	91	100	88	136	90	104	90	136	87	92	1	11	no
4	20593	45/F	90	136	90	104	92	136	87	92	93	142	89	101	90	149	89	95	94	140	92	106	90	135	89	106	88	130	81	97	90	132	79	88	1	9	no
5	21353	40/M	78	120	87	96	78	122	81	97	80	115	84	98	82	124	111	114	88	125	91	100	80	130	84	95	82	149	89	95	88	140	92	106	1	10	no
6	21797	19/M	80	149	89	95	84	140	92	106	85	130	84	95	79	161	90	126	79	157	138	79	78	150	93	104	80	135	95	115	78	140	90	97	1	11	no
7	22666	60/F	66	114	77	89	67	118	72	86	69	112	72	85	70	111	72	85	71	101	62	75	72	104	62	76	68	103	63	76	66	115	67	83	1	12	no
8	22587	25/F	78	98	71	80	78	106	78	87	77	109	79	89	78	120	86	97	80	123	87	88	82	126	89	101	82	111	70	84	86	106	67	80	1	13	no
9	20945	23/M	82	131	90	104	80	131	90	104	85	138	88	105	86	129	88	102	88	126	87	100	82	124	85	100	82	122	85	97	82	120	84	96	1	9	no
10	23477	38/F	90	96	73	81	92	95	72	90	90	98	74	82	94	105	77	88	96	107	78	88	92	106	67	80	90	111	70	84	99	98	71	80	1	11	no
11	24497	37/F	88	105	68	78	88	116	76	85	85	109	69	79	84	113	72	84	83	113	74	85	82	113	73	85	88	108	71	80	82	108	68	79	1	10	no
12	25048	40/M	65	128	79	96	69	116	75	90	70	127	87	96	72	33	88	105	76	129	80	101	77	125	87	96	74	121	77	91	73	122	90	101	1	11	no
13	25490	20/M	72	153	102	119	70	155	98	117	72	154	99	117	78	160	97	118	80	159	96	117	82	155	95	115	83	154	100	118	84	150	92	111	1	8	no
14	25540	20/F	84	131	77	94	88	129	88	101	86	121	80	90	88	128	83	95	88	130	88	102	88	124	77	90	86	128	83	95	84	129	88	101	1	9	no
15	25196	30/M	96	118	72	86	92	119	75	90	95	122	76	90	98	123	79	92	96	128	88	101	98	128	86	101	97	116	82	93	96	112	80	91	1	14	no
16	26104	40/M	75	119	77	87	76	118	76	87	78	115	72	80	77	114	73	86	76	122	79	94	77	111	67	81	78	120	76	86	77	118	73	83	1	11	no
17	26710	19/M	86	121	80	90	88	123	102	106	88	121	80	90	86	129	88	101	86	131	77	94	88	124	77	90	83	128	83	95	88	140	97	101	1	10	no
18	26078	40/F	78	108	60	73	77	109	56	71	75	103	42	56	76	107	53	65	77	112	59	70	78	114	69	80	77	115	68	79	76	93	38	47	1	9	no
19	26170	20/F	73	112	78	89	79	117	82	94	78	120	78	92	78	121	76	91	77	125	77	93	77	126	78	94	76	129	77	94	76	117	89	98	1	12	no
20	27220	34/F	68	138	88	100	72	121	85	95	73	130	86	95	72	130	83	92	76	133	78	96	80	137	80	99	85	122	81	95	82	118	82	94	1	13	no
21	27724	23/F	110	97	67	77	114	97	68	78	112	97	68	78	116	98	70	79	114	98	71	80	115	118	73	82	116	101	73	82	118	102	75	84	1	15	no
22	27967	50/F	92	128	86	97	94	129	89	99	93	132	86	96	94	132	87	96	93	134	88	102	92	129	89	99	99	117	75	88	98	113	75	88	1	11	no
23	26856	55/M	86	125	83	94	88	125	91	101	88	133	87	101	88	133	88	100	85	141	85	109	86	133	98	107	88	146	95	111	82	142	90	107	1	12	no
24	27559	35/F	90	141	97	112	93	150	103	116	90	153	101	117	92	162	100	118	93	129	74	92	94	127	75	90	90	125	84	104	93	125	91	100	1	9	no
25	29879	20/F	89	128	61	88	88	125	79	97	94	125	84	104	88	132	86	101	90	123	73	86	92	122	83	94	92	121	83	96	90	115	76	88	1	10	no
26	30235	26/M	71	105	53	64	76	103	45	61	75	106	51	69	77	104	63	73	78	107	51	67	79	114	70	82	79	116	68	80	80	94	66	75	1	12	no
27	31957	50/F	82	106	63	73	83	108	66	77	88	112	68	77	88	115	67	77	87	105	68	76	86	112	74	82	89	108	69	78	90	108	73	81	1	11	no

28	32073	22/M	60	110	71	80	62	110	73	82	69	110	73	83	64	129	84	98	66	138	91	113	66	132	90	103	62	153	104	121	62	154	97	112	1	16	no
29	32090	23/M	80	124	79	90	80	125	76	84	82	122	81	91	88	126	78	88	86	127	74	83	88	137	85	97	83	133	76	90	87	124	79	90	1	11	no
30	33404	41/F	86	140	98	112	84	144	99	114	88	143	98	113	88	149	99	116	88	146	98	114	86	142	98	113	88	143	96	112	88	138	92	107	1	14	no
31	34851	24/M	77	136	95	105	77	136	90	102	78	136	84	96	79	138	91	105	80	143	90	102	82	146	90	100	84	140	94	104	82	146	92	109	1	11	no
32	34804	30/F	83	132	85	95	81	130	89	96	85	139	96	109	88	139	95	107	89	141	96	107	90	144	95	107	95	141	92	114	96	130	83	92	1	10	no
33	35809	45/F	82	149	99	110	80	149	101	111	83	148	99	111	88	147	96	108	90	151	103	114	94	150	99	110	88	146	101	111	90	140	98	108	1	9	no
34	35071	53/F	90	111	71	79	93	117	81	91	91	125	80	93	92	125	80	93	94	128	85	95	95	129	86	98	95	117	81	91	93	118	71	81	1	11	no
35	25923	52/M	64	123	78	92	69	120	79	88	72	120	76	99	73	125	79		72	126	86	97	76	117	79	89	73	113	75	86	74	112	75	84	2	118	no
36	36278	40/F	99	110	72	80	102	121	67	80	104	116	71	83	102	115	66	80	103	123	72	83	104	121	67	80	100	122	72	86	101	128	85	97	1	12	no

MASTER CHART GROUP F																																			
Sl No	IP No	Age/Sex	Before Pre Medication				After Pre Medication				At the Time of Induction				At the time of Laryngoscopy				At the time of Intubation				2 mins after Intubation				4 mins after Intubation				6 mins after Intubation				No of Attempts TI	time in sec	Complications PI
			HR	SBP	DBP	MAP	HR	SBP	DBP	MAP	HR	SBP	DBP	MAP	HR	SBP	DBP	MAP	HR	SBP	DBP	MAP	HR	SBP	DBP	MAP	HR	SBP	DBP	MAP	HR	SBP	DBP	MAP			
1	16839	25/M	90	119	74	89	94	118	72	95	92	118	78	92	93	123	79	92	96	121	85	97	99	126	78	93	93	132	89	102	90	128	83	97	2	46	no
2	17262	35/M	88	143	78	107	92	148	78	96	90	148	75	100	90	149	78	101	91	141	74	103	90	142	72	98	102	167	104	133	100	161	90	126	2	122	no
3	17264	35/M	78	112	76	88	80	111	77	88	82	126	85	99	84	124	111	114	84	120	98	106	85	119	85	96	89	122	81	97	80	115	84	98	1	38	no
4	17564	42/F	79	132	92	114	80	147	91	115	85	142	104	118	90	150	93	104	92	141	89	99	86	140	90	97	86	150	93	104	88	135	95	115	1	23	no
5	19122	46/F	90	125	72	86	92	125	75	79	88	122	81	97	87	130	84	95	88	128	87	90	88	123	86	94	90	123	75	86	91	127	84	89	2	58	no
6	28194	40/F	90	137	91	100	91	143	85	117	92	145	87	103	93	145	93	119	94	135	90	99	92	134	83	90	90	132	82	92	92	130	90	98	1	26	no
7	27943	24/M	103	113	64	78	102	113	63	77	83	116	61	73	102	145	76	103	92	139	75	114	80	168	92	117	84	150	93	104	93	114	73	86	2	78	no
8	28810	32/M	84	131	78	109	82	131	74	101	84	131	74	101	86	127	77	97	91	118	72	92	98	106	69	88	88	115	75	93	86	115	72	85	1	18	no
9	28756	28/M	98	119	86	97	107	103	77	86	101	104	77	86	112	109	78	88	118	106	72	89	116	109	72	92	110	100	65	77	106	108	57	82	1	32	no
10	25395	60/F	101	103	66	80	97	104	65	76	92	100	59	71	97	103	64	76	86	100	64	77	88	105	65	76	85	102	58	82	77	101	63	77	1	28	no
11	28930	40/F	82	106	65	77	84	118	83	84	82	108	71	86	86	118	73	90	88	118	72	95	84	118	78	92	82	119	74	90	80	98	64	75	1	19	no
12	29366	35/F	87	104	70	88	92	116	79	92	101	122	84	98	105	130	84	96	104	130	90	108	100	125	75	79	98	126	82	98	101	119	86	97	1	23	no
13	30042	42/F	88	104	77	86	86	102	76	85	88	99	75	83	90	108	74	85	90	110	72	85	88	108	72	84	88	108	70	83	86	110	70	84	1	26	no
14	30721	30/F	82	103	70	81	89	100	75	83	84	97	63	74	89	122	75	91	98	127	78	94	97	122	75	91	87	102	74	83	97	132	88	109	1	42	no
15	30740	23/M	96	155	100	103	98	150	98	101	92	148	98	99	80	142	96	98	83	124	88	96	80	126	80	94	82	119	86	89	80	106	76	81	1	33	no
16	30952	30/F	96	114	81	93	109	116	84	95	90	137	88	102	86	147	101	123	87	138	88	101	82	127	81	96	84	131	91	121	82	130	83	104	1	27	no
17	31093	45/F	72	107	60	76	81	141	117	125	82	117	68	84	84	161	94	116	85	156	93	114	97	147	87	107	87	121	75	90	82	118	73	88	2	104	no
18	31031	32/F	94	121	85	105	107	131	80	97	104	141	79	93	102	127	85	105	103	142	65	103	102	150	68	86	98	149	71	105	100	131	80	109	2	88	no
19	30950	40/F	76	113	65	80	80	118	74	86	80	119	76	90	82	110	61	79	88	118	69	86	78	112	76	88	80	111	77	88	88	126	86	99	1	26	no
20	31825	22/F	69	128	82	97	70	128	82	97	72	120	77	91	74	135	79	98	72	138	79	99	74	119	76	90	72	118	76	90	78	119	86	97	1	25	no
21	32345	35/F	80	108	61	77	82	109	61	77	82	109	62	78	85	115	67	83	86	118	69	85	80	118	72	87	82	118	73	88	82	121	72	88	1	22	no
22	33842	60/M	77	125	69	88	79	126	71	89	75	77	66	85	78	121	72	88	76	137	86	103	80	138	86	103	80	125	100	108	80	119	79	92	1	30	no
23	1894	30/F	70	103	71	82	74	101	72	82	72	104	72	83	72	107	73	84	70	107	73	84	72	113	77	89	72	116	76	89	72	117	78	91	1	16	no
24	18021	28/F	80	120	80	93	80	121	80	94	82	123	81	95	83	131	85	100	84	131	85	100	85	125	82	96	80	126	82	97	78	127	82	97	1	22	no
25	18271	29/F	92	146	72	97	94	144	70	95	96	141	71	94	94	140	70	93	94	138	69	92	96	139	69	92	96	142	64	90	98	139	64	89	1	26	no

26	18386	56/M	82	119	78	92	84	120	78	92	86	115	76	89	88	114	75	88	89	118	78	91	88	121	79	93	90	124	76	92	90	121	74	90	1	28	no
27	18637	36/M	70	126	78	94	76	128	80	96	76	128	82	97	78	130	80	97	78	131	79	96	76	132	80	97	76	126	74	91	78	122	78	93	1	22	no
28	6440	40/F	68	133	76	95	72	134	79	97	70	134	82	99	71	133	78	96	73	134	78	97	70	130	72	91	71	129	75	93	70	128	77	94	1	35	no
29	20648	38/M	81	151	73	99	80	149	76	100	84	142	76	98	86	142	78	99	88	140	80	100	86	139	84	102	88	138	82	101	86	130	79	96	1	27	no
30	20961	38/	93	128	78	95	94	127	87	98		126	88	101	88	124	84	97	87	131	89	103	88	134	90	105	89	134	88	103	88	130	80	97	1	31	no
31	21795	24/M	76	142	97	112	78	144	94	111	77	143	92	109	76	142	89	102	78	155	100	118	82	159	102	121	88	142	98	113	82	140	89	106	1	21	no
32	23171	45/M	90	138	86	103	92	143	94	110	104	200	113	142	100	177	101	126	102	176	102	127	101	175	102	126	103	169	100	123	100	160	98	119	1	122	no
33	25531	35/M	98	114	89	97	96	118	92	101	99	120	73	89	96	123	79	94	98	128	83	98	92	126	82	97	90	119	92	101	92	120	88	99	1	32	no
34	26870	34/M	103	156	103	121	104	152	100	117	102	158	99	119	108	159	99	119	105	156	100	1119	103	158	102	121	102	161	104	123	92	168	108	128	2	118	no
35	28985	47/M	63	138	92	107	61	140	86	104	65	143	88	106	64	142	89	107	63	148	90	109	66	150	90	110	76	143	72	96	67	133	78	96	2	84	no
36	17619	31/F	87	126	88	101	82	122	73	89	80	128	78	95	84	130	76	94	82	131	82	98	80	132	78	96	78	131	67	88	79	127	62	84	1	26	no