"A COMPARATIVE STUDY OF LARYNGOSCOPIC VIEWS AND BLADE TO TOOTH DISTANCE OBTAINED USING NON-DOMINANT VS DOMINANT HAND FOR LARYNGOSCOPY FOR PATIENTS UNDERGOING SURGERY UNDER GENERAL ANAESTHESIA - A ONE YEAR RANDOMIZED CLINICAL TRIAL"

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ABBREVIATIONS

ASA - American Society of Anaesthesiologists

C-L Grade – Cormack – Lehane Grade

BURP – Backward, upward and Rightward Pressure

ELM – External Laryngeal Maneuver

POGO – Percentage of Glottic Opening

GA- General Anaesthesia

IHD- Ischemic Heart Disease

ADS- Airway Difficult Score

NIBP- Non-Invasive Blood Pressure

ECG- Echocardiography

Group N.D – Group NON-DOMINANT

Group D- Group DOMINANT

ANOVA-Analysis of Variance

MAP- Mean Arterial Pressure

HR- Heart Rate

ABSTRACT

TITLE:

"A COMPARATIVE STUDY OF LARYNGOSCOPIC VIEWS AND BLADE TO TOOTH DISTANCE OBTAINED USING NON-DOMINANT VS DOMINANT HAND FOR LARYNGOSCOPY FOR PATIENTS UNDERGOING SURGERY UNDER GENERAL ANAESTHESIA - A ONE YEAR RANDOMIZED CLINICAL TRIAL"

BACKGROUND: Literature search did not reveal any study comparing the laryngoscopic views using dominant hand vs non dominant hand for laryngoscopy and endotracheal intubation. Hence, we make an attempt to compare laryngoscopic views and blade to tooth distance on laryngoscopy with dominant or non-dominant hand using respective laryngoscope blades for endotracheal intubation in patients undergoing general anaesthesia.

Our null hypothesis is that both dominant and non-dominant hand are equally effective in obtaining glottic view on laryngoscopy.

OBJECTIVES:

Primary objective:

To compare laryngoscopic views and blade to tooth distance on laryngoscopy with non-dominant or dominant hand using respective laryngoscope blades in patients undergoing general anaesthesia.

Secondary objective:

To note the time required for endotracheal intubation on laryngoscopy with non-dominant or dominant hand using respective laryngoscopic blades in patients undergoing general anaesthesia.

METHODS:

In this study, 80 healthy individuals of ASA grade I and grade II, were enrolled. Both dominant as well as non-dominant handed laryngoscopes were used to perform scopy and subsequently intubate the patients who were posted for surgeries under general anaesthesia. The total time taken to intubate, blade-to-tooth distance and Cormack-lehane grade was noted at the time of procedure.

RESULTS

Summary of Findings

1. **Gender Distribution**: Equal distribution of males and females in both groups with no significant difference.
2. **C-L Grades**: Distribution of laryngoscopic grades does not significantly differ between the dominant and non-dominant hand groups.
3. **Age**: difference between the groups not significant.
4. **Blade-to-Tooth Distance**: No significant difference in blade-to-tooth distance.
5. **Intubation Time:** difference between the groups, insignificant

CONCLUSION:

In this study, we did not find any significant statistical difference in using the dominant hand versus the non-dominant hand in terms of gender distribution, laryngoscopic view (C-L grades), age, blade-to-tooth distance, or intubation time. This suggests that both hands can be equally effective for laryngoscopy in patients undergoing surgery under general anesthesia.

KEYWORDS: dominant vs non-dominant, laryngoscopy, Cormack-lehane grading, intubation.

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INTRODUCTION

Direct laryngoscopy is the most commonly used technique for tracheal intubation as a part of general anaesthesia or during resuscitation efforts. Adequate glottic exposure is necessary for endotracheal intubation.

Different types of laryngoscope blades have been used to improve the glottic view and also different maneuvers like Bimanual laryngoscopy, BURP (Backward upward and rightward pressure) and ELM (External laryngeal manipulation) have been used.

Conventional laryngoscopes that are used for endotracheal intubation are designed as such that they have to be used with a left hand irrespective of the fact that which is the dominant hand of the person performing it.

Endotracheal intubation is a procedure which requires considerable amount of strength and skill at the hands of the health care professionals. For a raw recruit in the field of anesthesiology training is given based on a standard procedure which consists of obtaining a view of larynx by manipulation of laryngoscope via left hand and then inserting the tube with the right hand. [(1)]

Nonetheless, when we have to compare in between these two actions (pushing the tube into the larynx vs handling the laryngoscope for intubation), we have

observed that the strength required for scopy is substantially more. Once we have achieved firm position of the blade in the vallecula and been able to visualize the glottis, the tube can be inserted easily into the trachea without a fair amount of skill or strength. [2]

In sharp contrast, is the procedure of doing laryngoscopy in which it is critical that the laryngoscopist should be able to lift the lower jaw and position the blade in the vallecula in a refined manner in order to obtain a clear view of the glottis, which would consequentially assist in pushing the endotracheal tube past the epiglottis.

Hence, use of dominant hand to do laryngoscopy with same handed blade may improve the glottic view as the strength in dominant hand is more compared to non-dominant hand laryngoscopy.

Literature search did not reveal any study comparing the laryngoscopic views using dominant hand vs non dominant hand for laryngoscopy and endotracheal intubation. Hence, we make an attempt to compare laryngoscopic views and blade to tooth distance on laryngoscopy with dominant or non-dominant hand using

respective laryngoscope blades for endotracheal intubation in patients undergoing general anaesthesia.

Our null hypothesis is that both dominant and non-dominant hand are equally effective in obtaining glottic view on laryngoscopy.

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REVIEW OF LITERATURE

For the patients who have to undergo any surgery under General anaesthesia and requiring airway management, Endo-tracheal intubation is considered the gold standard. The procedure of endotracheal intubation requires adequate glottic exposure so as to pass endo-tracheal tube into larynx under vision.

Different types of laryngoscope blades and techniques are used to improve the glottic view.

In a prospective randomized clinical research, Atul P K et al. compared the ease of intubation and glottic views across 120 patients utilizing the Miller, Mc Coy, and Macintosh blades and the true view laryngoscope. They found that the Miller blade and the real view laryngoscope provided the best visualization of the glottis. With the true vision laryngoscope with Mc Coy and Macintosh blades, however, the tracheal intubation was simpler. [(3)]

Das S.A et al from a case series on 10 patients with anticipated difficult airway observed that glottic views were better on laryngoscopy with left-handed curved Macintosh blade compared to right-handed curved Macintosh blade in patient with gross airway pathology. [(4)]

Lee B.J et al after conducting a randomized clinical trial on 40 patients to compare the glottic view on laryngoscope in supine position in 25 back-up position observed that laryngeal view as assessed by POGO scores improved significantly in 25 back-up position when compared with the flat supine position. [5]

Ken Y et al conducted an observational study on 1015 patients to assess the best glottic view obtained on laryngoscopy using Macintosh size 3 or 4 blade by three different views viz, midline, left molar and right molar approaches and observed that left molar approach provides the best glottic view. [6]

The results of a study by Yi-wie Kue et al., which examined 160 patients and attempted to assess the effectiveness of light wand guided endotracheal intubation via the dominant or non-dominant hand, showed that both methods were equally successful. [7]

Comparing vision and dental issues from different types of blades used during tracheal intubation, Seiji Watanabe et al They came to the conclusion that, in

comparison to other types of blades, the Belscope blade, which is a low-heeled angulated straight blade. It offers a noticeably larger field of view between the posterior end of the blade and the upper teeth. Thus, it might help lower the risk of upper dental damage during laryngoscopy. [8]

Miller laryngoscopy and orotracheal intubation performance was examined using previously published airway risk variables, according to William B. Landry et al. With the Miller blade, 941 out of 978 patients (96.2%) were successfully intubated; 8 patients needed three tries, and the remaining 37 patients needed to use different airway instruments. No orotracheal intubations went wrong. Extension of head and neck, modified Mallampati class and height were linked to increasing difficulty with orotracheal intubation, while thyromental distance, ability to prognath, and modified Mallampati class were associated with progressively inferior modified Cormack-Lehane views, according to multivariable analysis.

They came to the conclusion that the Miller blade performs direct laryngoscopy for orotracheal intubation quite successfully. [9]

Bito H. et al. compared three blades - the McCoy, Macintosh, Miller, and Belscope blades in an attempt to measure the distance between the teeth, mainly the upper incisors and the blade during laryngoscopy. The study included twenty-three participants who were scheduled for general anesthesia. When the glottis was most visible, the distance between the tooth and blade measured. The Cormack and Lehane grading system was used to determine visibility. Compared to the Macintosh or the Miller, the McCoy and Belscope were farther away. Compared to other laryngoscope kinds, the Macintosh had a noticeably lower visibility grade.

The findings show that belscope blade offers better visibility and a lower frequency of upper tooth injuries, as opposed to the other two blades i.e Macintosh and Miller. [(10)]

Miceli et al conducted a study to assess a new laryngoscope blade, the Truview EVO2©, in a manikin-based study. The Truview EVO2 uses an optical assembly to illuminate the larynx and provides a wider angular view of the laryngeal inlet (42°) when compared to the conventional Macintosh blade. It features an optical system which has been patented, also called the Viewtube. It consists of a lens as well as a prism which amplify the view beyond distal end of the blade.

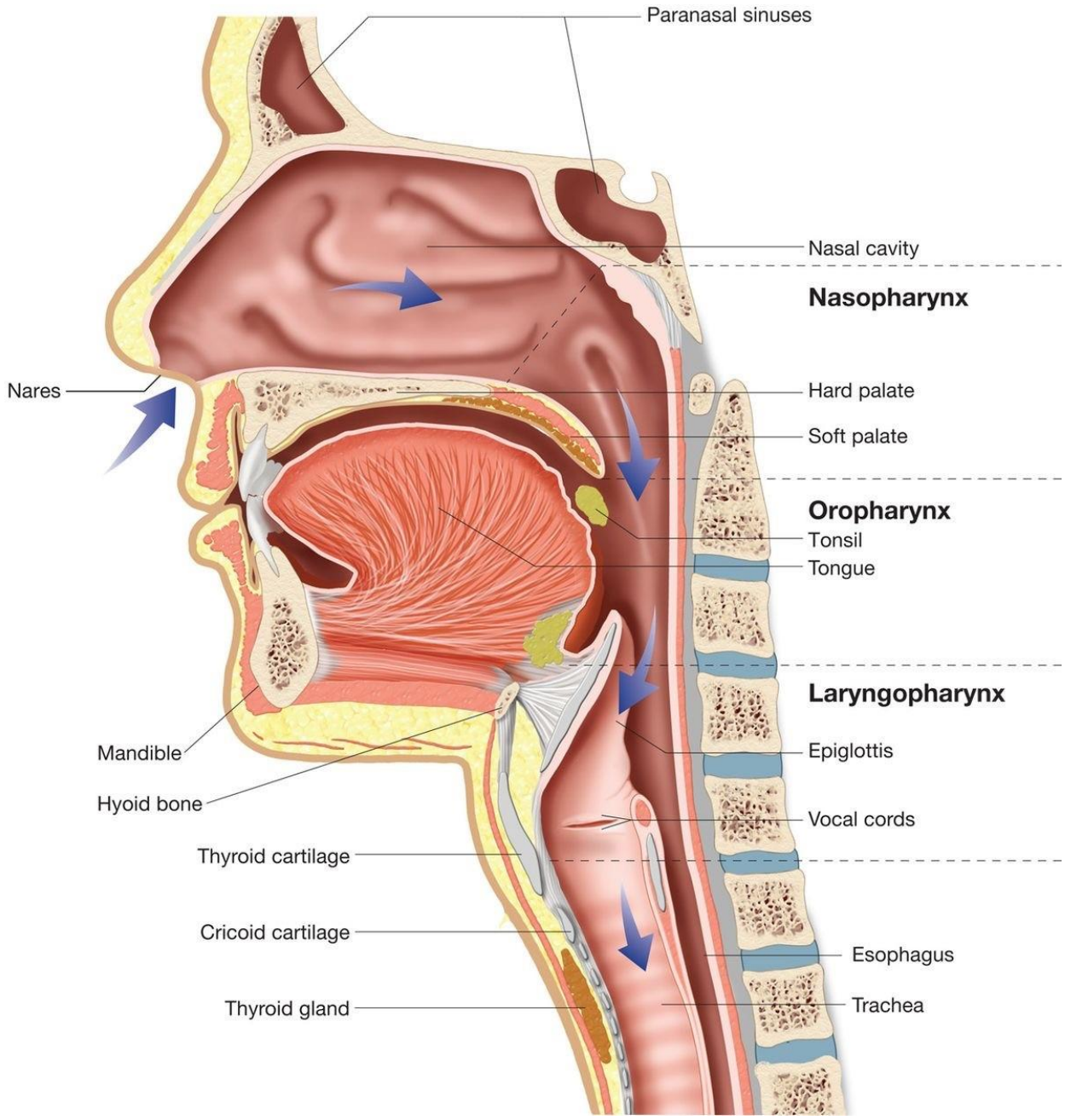
The aim of this study was to compare the Truphatek Truview EVO2© against a traditional Macintosh blade. The main focus was on time of intubation, the quality

of glottic view measured via Cormack-lehane grade and difficulty observed while intubating, all on a manikin.

Under normal conditions, all these variables, both the blades have similar performance but under interest was tracheal intubation for which participants preferred Macintosh blade. In difficult airway scenario which was simulated, the difficulty for tongue inflation was more and increased time for intubation but lesser Cormack-lehane grading. [11]

BASIC SCIENCES

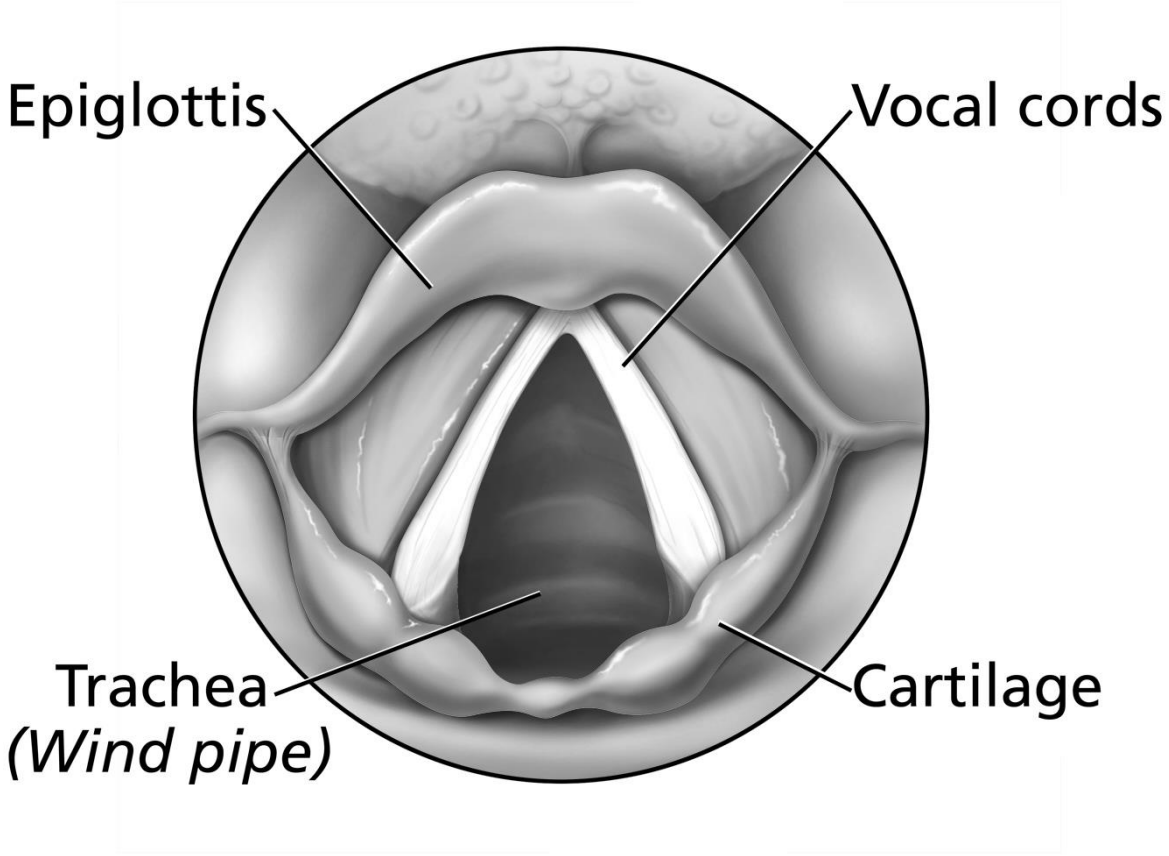
Endotracheal intubation is an essential skill performed by multiple medical specialists to secure a patient's airway as well as provide oxygenation and ventilation. There are multiple techniques available, including the visualization of the vocal cords with a laryngoscope or video laryngoscope, direct placement of the endotracheal tube into the trachea via cricothyrotomy, and fiberoptic visualization of the vocal cords via the nasal or oral route.



The upper airway consists of the oral cavity and pharynx, including the nasopharynx, oropharynx, hypopharynx, and larynx. These structures humidify and warm the air and derive their blood supply from the external and internal carotid arteries. The trigeminal nerve provides sensory innervation to the mucous

membranes of the nasopharynx, while the facial nerve and glossopharyngeal nerve innervate the oropharynx.

The trachea is soft and membranous posteriorly with cartilaginous rings anteriorly. Adult tracheal diameters vary between 15 mm and 20 mm. These features are important clinical markers that differentiate the trachea from the esophagus and allow for the utilization of a bougie for intubation. At the fifth thoracic spine, the trachea bifurcates into the right and left mainstem bronchi. The angle between the trachea and the left mainstem bronchus is more acute, making foreign object dislodgement into the left mainstem less likely. The obtuse angle between the trachea and the right mainstem bronchus makes it more prone to right mainstem intubation if the endotracheal tube is advanced too distally. [12]



The goal of endotracheal intubation in the emergency setting is to secure the patient's airway and obtain first-pass success. There are many indications for endotracheal intubation, including poor respiratory drive, questionable airway patency, hypoxia, and hypercarbia. These indications are assessed by evaluating the patient's mental status, conditions that may compromise the airway, level of consciousness, respiratory rate, respiratory acidosis, and level of oxygenation. In

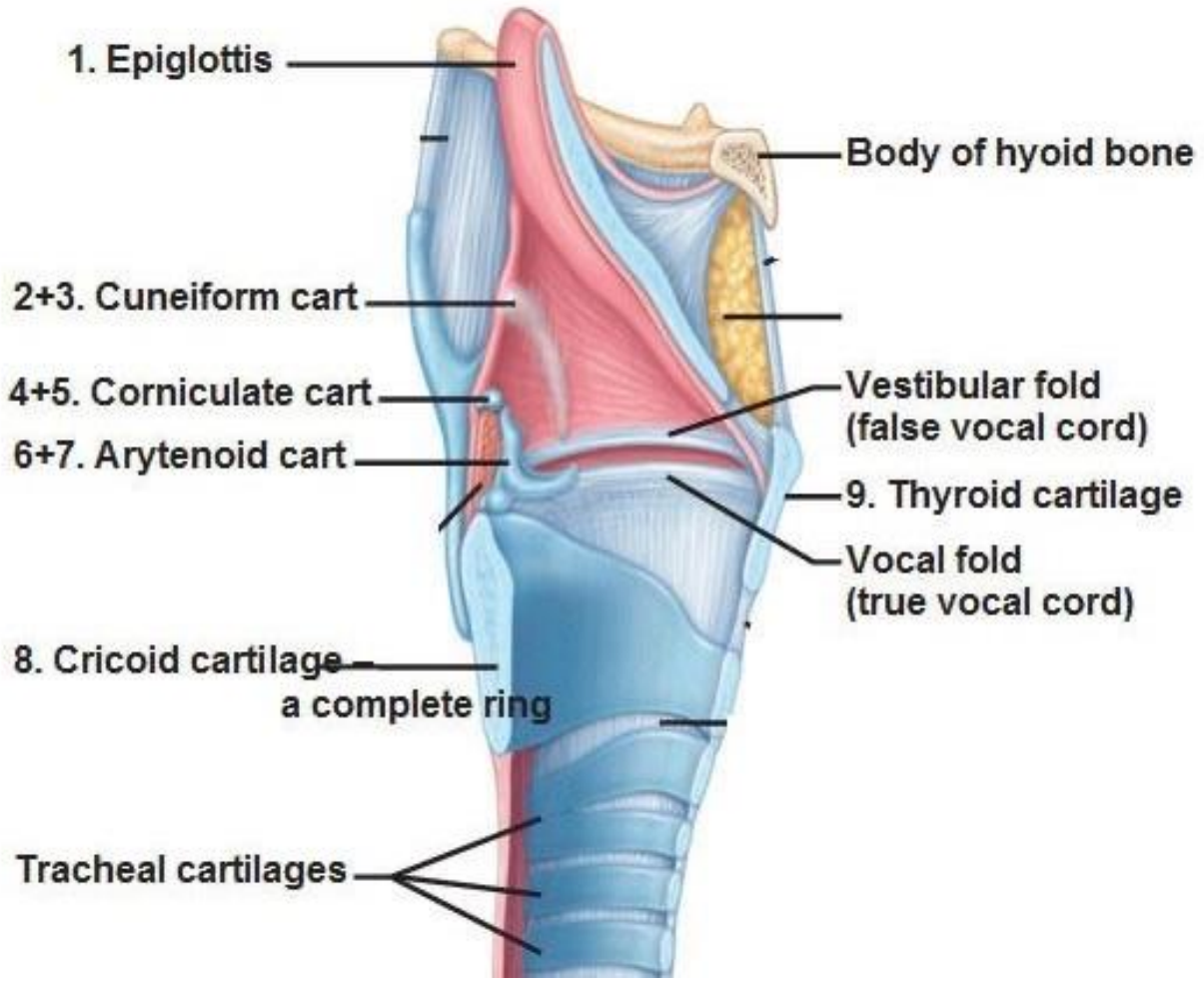
the setting of trauma, a Glasgow Coma Scale of 8 or less is generally an indication for intubation. [13]

The risks and benefits of endotracheal intubation should be assessed as would be done with any other procedure. Patients whose respiratory status might improve with less invasive methods should be tried on modalities such as non-invasive positive pressure ventilation or other modes of oxygenation. Severe orofacial trauma can obstruct oropharyngeal intubation due to significant bleeding or disruption of the facial and upper airway anatomy. Cervical spine manipulation during intubation can be harmful to patients with spine injury and immobility. In the setting of these clinical situations, other modes of ventilation and oxygenation should be undertaken if the clinical condition allows. If a definitive airway is required, providers should be prepared for the potential of a surgical airway. There are no absolute contraindications to intubation, and the decision to place a definitive airway should take into consideration each patient's unique clinical condition. [14]

Anatomy of the larynx

The larynx is a cartilaginous segment of the respiratory tract located in the anterior aspect of the neck. The primary function of the larynx in humans and other vertebrates is to protect the lower respiratory tract from aspirating food into the

trachea while breathing. It also contains the vocal cords and functions as a voice box for producing sounds, i.e., phonation. From a phylogenetic view, the larynx in humans has achieved its highest evolutionary development with the capacity to articulate speech, which is absent in invertebrates and fishes. The larynx is about 4 to 5 cm in length and width, with a slightly shorter anterior-posterior diameter. It is smaller in women than men and larger in adults than children, owing to its growth in puberty. A large larynx correlates with a deeper voice.



The location of the larynx is at the level of the C3 to C7 vertebrae and is held into position by muscles and ligaments. The superior-most region of the larynx is the epiglottis, which is attached to the hyoid bone connected to the inferior part of the pharynx. The inferior aspect of the larynx connects to the superior region of the trachea.

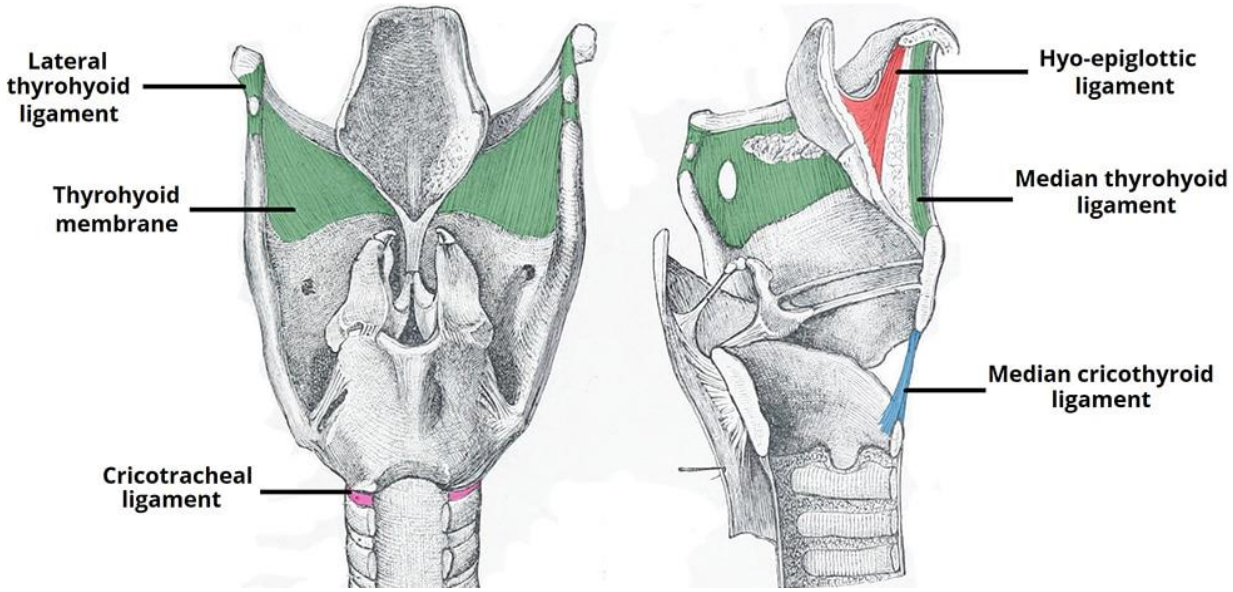
The larynx is a cartilaginous skeleton, some ligaments and muscles that move and stabilize it, and a mucous membrane.

The laryngeal skeleton has nine cartilages: the thyroid cartilage, cricoid cartilage, epiglottis, arytenoid cartilage, corniculate cartilage, and cuneiform cartilage. The first three are unpaired cartilages, and the latter three are paired cartilages.

The thyroid cartilage functions as a protective shield surrounding the anterior part of the larynx and spans vertically from the superior to the inferior regions. It is the largest of all six cartilages and has the form of a half-opened book with the back facing the front, with the two halves meeting in the middle, forming a protrusion called the laryngeal prominence, popularly known as Adam's apple.

The cricoid cartilage is also known as the cricoid ring or signet ring, as it is the only cartilage to encircle the trachea completely. It sits in the inferior part of the larynx, at the level of the C6 vertebra, and has two parts: the anterior part, also

called the arch, and the posterior portion, much wider than the anterior, referred to as the lamina.



The epiglottis is an elastic cartilaginous leaf-shaped flap covering the opening of the larynx. It is attached to the internal surface of the thyroid cartilage and projects over the pharynx, allowing the passage of air into the larynx, trachea, and lungs. As the hyoid bone rises, it draws the larynx upwards during swallowing to allow food or drink into the esophagus and to prevent food from entering the trachea.

As for the second set of cartilages, there are three paired cartilages.

Arytenoid cartilages are a pair of small, hard, but flexible pyramid-shaped cartilages that sit over the posterior portion of the cricoid cartilage. The base of each cartilage has two processes: the anterior angle is the vocal process, and the lateral angle is known as the muscular process.

The corniculate cartilages or cartilages of Santorini are small elastic cone-shaped cartilages that articulate with the apices of the arytenoid cartilages.

The cuneiform cartilages, also known as the Wrisberg cartilages, are two elongated fibrous pieces of yellow cartilage placed on either side in the aryepiglottic fold. They have no direct attachment to other cartilages but serve to support the vocal folds and the lateral aspects of the epiglottis.

The laryngeal cartilages move thanks to several joints between them. The cricothyroid joint connects the thyroid cartilage to the cricoid arch. The cricoarytenoid joints connect each arytenoid cartilage to the cricoid cartilage, and the arycorniculate joint connects the arytenoid cartilage to the Santorini cartilage.

Larynx Ligaments

There are two types of ligaments: extrinsic ligaments that attach the larynx to other structures, such as the hyoid or the trachea, and intrinsic ligaments that connect the larynx cartilages between them.

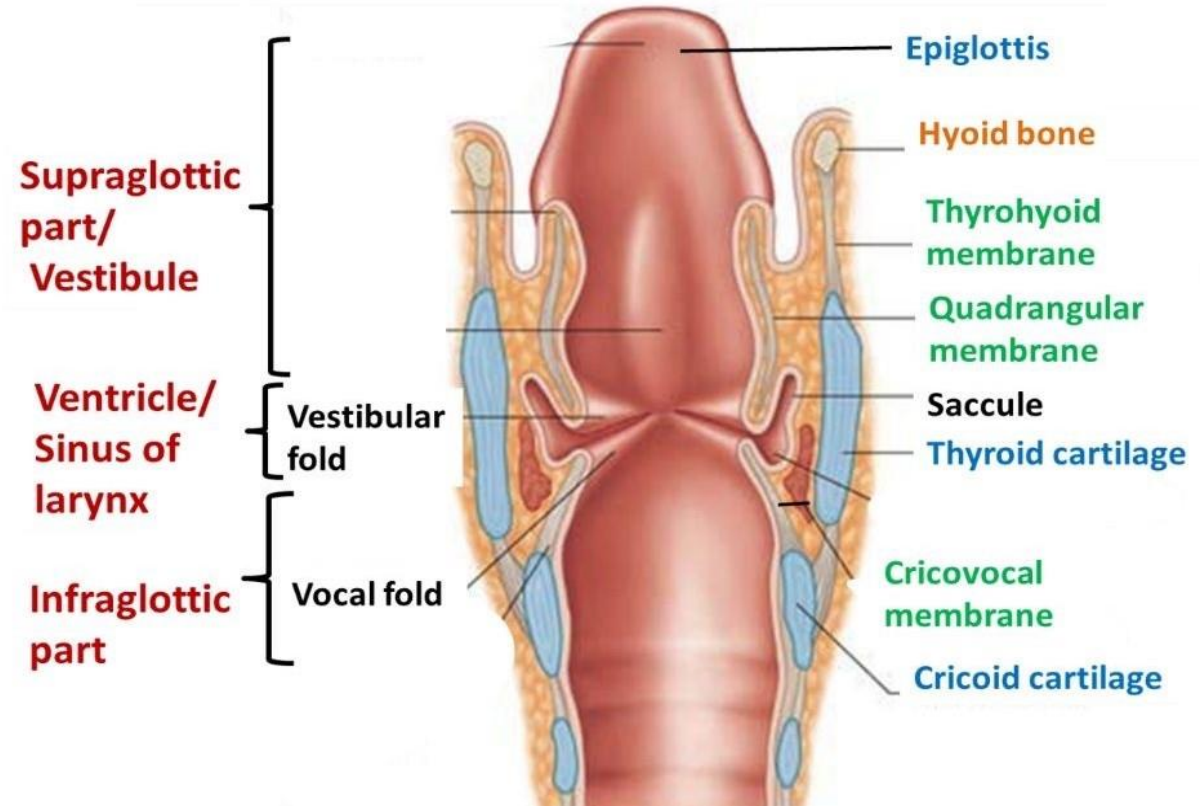
The intrinsic ligaments are the cricothyroid, cricocorniculate, thyroepiglottic, thyroarytenoid, and the arytenoidepiglottic ligaments. The cricothyroid ligament or cricothyroid membrane is pyramid-shaped, with its apex in the middle of the thyroid cartilage and its base in the superior border of the cricoid cartilage. The

cricocorniculate ligaments are two fibrous bands linking the cricoid cartilage to the Santorini cartilage. The thyroepiglottic ligament connects the thyroid ligament to the epiglottis. The thyroarytenoid ligaments extend from the external part of the arytenoid cartilages to the middle part of the thyroid cartilage and subdivide into the superior ligament that sits next to superior vocal cords and the inferior ligament that sits on the inferior vocal cords. The arytenoidepiglottic ligaments connect the arytenoid cartilages to the epiglottis.

The extrinsic ligaments are the thyrohyoid, hyoepiglottic, and cricotracheal ligaments. The thyrohyoid ligament or membrane attaches the posterior surface of the body of the hyoid bone and the upper border of the thyroid cartilage. The hyoepiglottic ligament connects the surface of the epiglottis with the upper border of the hyoid bone. The cricotracheal ligament connects the cricoid ligament with the first ring of the trachea.

Laryngeal Cavity

The internal space of the larynx extends along the laryngeal inlet to the lower border of the cricoid cartilage. It is pyramid-shaped, with its superior base pointing to the tongue and its apex to the trachea. It has a base, an apex, and three parts: one posterior and two laterals.



The posterior part of the internal space of the larynx is part of the anterior wall of the pharynx and has two vertical recesses referred to as the piriform sinus. The form of the lateral aspects is determined by the larynx cartilage and consists of three parts: a superior one that matches the thyroid cartilage, an inferior one that matches the cricoid cartilage, and a middle one called the cricothyroid space. The Larynx apex forms a hole that joins to the trachea. The base of the larynx is oval-shaped and communicates with the pharynx.

The internal space of the larynx is wide in the superior and inferior parts but narrows in the middle, forming a section named glottis and dividing all the spaces into three sections: supraglottic, glottis, and infraglottic.

The vocal cords, the glottis, and the larynx ventricles comprise the glottic space.

The vocal cords are four folds of fibro-elastic tissue, two superior and two inferior ones, anteriorly inserted into the thyroid cartilage and posteriorly in the arytenoid cartilage. The superior vocal cords are thin, ribbon-shaped, and have no muscle elements, while inferior vocal cords are wider and have a muscular fascicle covering their entire length. The space between the superior vocal cords is larger than the space between the inferior vocal cords, and viewed from above, four vocal cords are present in the larynx space. The inferior vocal cords are the only ones capable of approaching each other; thus, they are considered to be true vocal folds, while the superior ones are referred to as false vocal cords or folds.

The glottis is the portion of the laryngeal cavity formed by the four vocal folds and the opening between the folds.

The laryngeal ventricles or Morgagni sinus are a fusiform fossa between the inferior (true vocal folds) and the superior vocal cords (vestibular folds).

The subglottic section is the space below the glottis and has an inverted bottleneck shape limited by the vocal cords and the trachea.

The supraglottic section forms an oval cavity, extending along the free edge of the epiglottis and the aryepiglottic folds down to the arytenoid cartilages, the hyoepiglottic ligament is usually considered the roof of this cavity.

Blood supply and lymphatics-The blood supply to the larynx comes from the superior and inferior laryngeal arteries. The superior laryngeal artery is a superior thyroid artery branch supplying the epiglottis, supraglottic region, and superior vocal cords. The inferior laryngeal artery is also a branch of the superior thyroid artery and supplies the subglottic region and the inferior vocal cords. The inferior laryngeal artery sometimes has a small branch of the superior thyroid artery supplying the posterior cricoarytenoid and arytenoid muscles.

The laryngeal veins accompany the arteries and take the same names, i.e., the superior and inferior laryngeal veins. These veins drain into superior thyroid and inferior thyroids veins, which drain into internal jugular and subclavian veins, respectively.

Larynx lymph drainage is subdivided into supraglottic and infraglottic lymphatics. The supraglottic lymphatic nodes are very dense and drain into deep cervical lymphatics. The subglottic lymphatics are less dense and drain into the lower deep cervical nodes through pre and paratracheal nodes and prelaryngeal nodes. The vocal folds (glottic region) have no lymphatics.

Nerve supply-The larynx receives innervation from the inferior laryngeal nerve, the recurrent laryngeal nerve, and the superior laryngeal nerve.

The superior laryngeal nerve is a branch of the vagus nerve (X cranial nerve) arising from the inferior ganglion of the vagus nerve. It also receives branches from the superior cervical ganglion of the sympathetic nervous system and descends between the carotid vessels and pharynx, reaching the larynx just below the hyoid bone, where it divides into two branches, the internal and the external. The external laryngeal nerve supplies the cricothyroid muscle. The internal laryngeal nerve descends to the thyrohyoid membrane along with the superior laryngeal artery, spreading out across the epiglottis and supplying the mucous membrane surrounding the entrance of the larynx.

The inferior laryngeal nerve or recurrent nerve is the principal nerve responsible for the innervation of all intrinsic muscles of the larynx, except for the cricothyroid muscle. The right and left recurrent nerves are not symmetrical.

The left recurrent nerve arises from the vagus nerve bellow into the thorax, looping around the aortic arch (whereas the right recurrent nerve loops around the subclavian artery) and passes upwards to the trachea and esophagus before entering the larynx just posterior to the cricothyroid joint underneath the inferior constrictor muscle.

The right recurrent nerves branch off the vagus in the base of the neck, looping the subclavian artery, go upward lateral to the trachea, and enter the larynx between the cricoid and thyroid cartilages.

Normally, the internal and inferior laryngeal nerves connect in the Galen anastomosis.

The laryngeal muscles divide into intrinsic muscles, the primary function of voice production, and extrinsic muscles that move the larynx. We shall proceed to examine the former before the latter. [15]

Intrinsic Muscles

The cricothyroid muscle has two concave surfaces, the superior and inferior; it attaches to the cricoid arch and the lower lamina of the thyroid to the superior belly and the inferior cornu to the inferior belly. These muscles produce elongation of the vocal folds, resulting in higher-pitch phonation.

The posterior cricoarytenoid muscle attaches to the posterior cricoid cartilage to the arytenoid cartilage. These muscles abduct (open) the vocal cords, the opposite action to the lateral cricoarytenoid muscles.

The lateral or anterior cricoarytenoid muscles extend from the lateral cricoid cartilage to the muscular process of the arytenoid cartilage. These muscles adduct the vocal folds, the opposite action to the posterior cricoarytenoid muscles.

The thyroarytenoid muscles arise from the thyroid cartilage and the middle cricothyroid ligaments and insert into the arytenoid cartilage. These muscles relax and approximate the vocal folds.

The aryepiglottic muscles attach to the arytenoid cartilages and extend to the epiglottis. These muscles adduct the aryepiglottic folds.

The arytenoid muscles extend to the transverse and oblique portions between the arytenoid cartilages. The transverse arytenoid muscle is the only impaired intrinsic muscle of the larynx. These muscles adduct the vocal folds.

Extrinsic Muscles

The extrinsic larynx muscles are paired and allow the movement of the larynx.

The thyrohyoid muscle inserts on the thyroid cartilage and the body of the hyoid bone. The receives innervation from the first cervical nerve, along with the hypoglossal nerve. Its primary function is to depress the hyoid bone, thus elevating the larynx.

The sternothyroid muscles are situated beneath the sternohyoideus muscle; they arise from the sternum and first rib, go to the lamina of the thyroid cartilage, and are innervated by the ansa cervicalis. These muscles depress the larynx.

The inferior pharyngeal constrictor muscles extend from the cricoid and thyroid cartilages to the pharyngeal raphe. These muscles are innervated by the vagus nerve via branches of the pharyngeal plexus and recurrent laryngeal nerve and narrow the pharynx diameter to contribute to swallowing.

The stylopharyngeus muscles stretch from the styloid process in the temporal bone to the thyroid cartilage. These muscles receive their nerve supply from the glossopharyngeal nerve, and their function is to elevate the larynx and the pharynx.

The palatopharyngeus muscles stem from the palatine aponeurosis and pterygoid processes and inserts into the thyroid cartilage. They are part of the soft palate and are innervated by the pharyngeal branch, and their action is to elevate the larynx and pharynx.

Other muscles that are not strictly considered laryngeal, as they do not insert in the larynx or any of its parts, may also contribute to the movement of the larynx, such as the geniohyoid, mylohyoid, digastric, or stylohyoid muscles that elevate the larynx, while the omohyoid and sternohyoid muscles cause laryngeal depression. (16)

History of laryngoscopy- In 1895, Alfred Kirstein of Germany developed the autoscope, which consisted of an esophagoscope and an electroscope, to perform the first direct laryngoscopy—which may have been inspired by Kaiser Frederick's death from laryngeal cancer in 1888. Kirstein later combined a proximal electrical light source within the handle of the autoscope to move the epiglottis and bring the vocal cords into view.

In 1913, Chevalier Jackson, professor of laryngology at Jefferson Medical College in Philadelphia, Pennsylvania, designed a blade with a distal light source. He also incorporated a sliding floor, allowing room for an endotracheal tube or bronchoscope.

In the same year, Henry Janeway, an anesthesiologist at Bellevue Hospital in New York City, developed a laryngoscope that allowed anesthesiologists to perform tracheal intubation using a distal light source that contained battery power within the handle. He also added a central notch in the blade and a curve to the distal tip of the blade. While Janeway's laryngoscope did not gain popularity, he can be credited for making the laryngoscope an instrument fundamental to the field of anesthesiology by allowing for intratracheal anesthesia during surgery, a process that became even more refined by other physicians during World War I.

Since Janeway, continuous modifications have been made to the blade in order to provide better intubating conditions. In 1941, Robert Miller of Pennsylvania designed a blade with a curve on the bottom and a curved distal tip. In 1943, Robert Macintosh designed a blade with a continuous curve to protect the patient's upper teeth. Since then, more modifications have led to the tools used today, as well as video laryngoscopy.

Types of blades used in laryngoscopy

In direct laryngoscopy, different types of blades are used to facilitate visualization of the vocal cords and insertion of the endotracheal tube. The choice of blade can vary based on the patient's anatomy, the clinician's preference, and specific clinical circumstances. Here are the main types of blades used in direct laryngoscopy:

1. **Macintosh Blade**: This is a curved blade that is one of the most commonly used in adult patients. The Macintosh blade is designed to fit into the vallecula, a space at the base of the tongue, lifting the epiglottis indirectly to expose the vocal cords.
2. **Miller Blade**: This is a straight blade that is often used in pediatric patients but is also suitable for adults. The Miller blade is designed to go directly under the epiglottis and lift it to expose

the vocal cords. This direct lifting can be particularly useful in patients with difficult airways.

3. **Wisconsin Blade**: Similar to the Miller blade, the Wisconsin blade is a straight blade but with a slight curve at the distal end. It provides a different angle that can help with visualizing the vocal cords in certain patients.

4. **McCoy Blade**: This is a modified version of the Macintosh blade that features a lever-controlled tip. This tip can be adjusted during intubation to lift the epiglottis more effectively if needed, offering enhanced visualization and ease of tube insertion in challenging cases.

5. **Robertshaw Blade**: Designed for use in neonatal and infant patients, the Robertshaw blade is shorter and has a slight curve. Its size and shape are optimized for the smaller anatomy of young patients.

6. **Phillips Blade**: This blade combines features of both the Macintosh and Miller blades. It has a slight curve like the Macintosh but a straighter overall design like the Miller, making it versatile for various anatomical considerations.

These blades are typically made of stainless steel or durable plastic and are part of a laryngoscope, which also includes a handle with a light source to illuminate the throat during the procedure. The selection of the appropriate blade is crucial for successful intubation, minimizing trauma, and reducing the risk of complications.

Here's a step-by-step overview of how the procedure of endotracheal intubation typically unfolds:

1. **Preparation**: Before performing intubation, anaesthesiologists administer medications to sedate the patient and may use a muscle relaxant to facilitate easier tube insertion.
2. **Positioning**: The patient is placed with their head tilted back slightly to align the oral, pharyngeal, and laryngeal axes for easier visualization of the larynx.
3. **Insertion of the Laryngoscope**: A laryngoscope, which is a device with a light and a small camera or a mirror, is inserted into the mouth and gently moved down the throat to visualize the vocal cords and the entrance to the trachea.
4. **Tube Placement**: Once the vocal cords are visible, the endotracheal tube is guided through the cords into the trachea. Correct placement is critical to ensure that air is entering the lungs and not the stomach or esophagus.

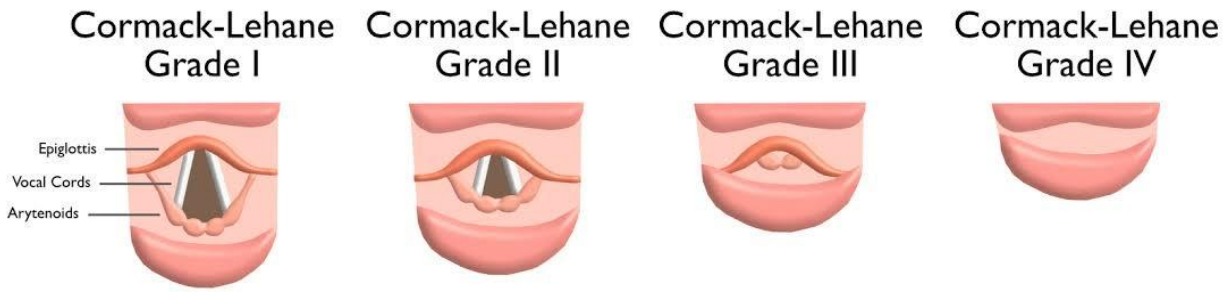
5. **Confirmation**: Placement is typically confirmed with a combination of methods including direct visualization, listening for breath sounds over the chest, checking for rising chest movements, and using devices that measure exhaled carbon dioxide levels.
6. **Securing the Tube**: Once the tube is confirmed to be in the right place, it is secured to the patient's face with tape or a strap to prevent movement.
7. **Monitoring**: After intubation, continuous monitoring is necessary to ensure that the tube remains correctly positioned and that the patient is receiving adequate ventilation.

Cormack-lehane grading-

The Cormack-Lehane grading system is a classification used in anesthesiology to describe the view of the glottis visualized during direct laryngoscopy. This system helps anesthesiologists assess the difficulty of intubation. It was first described by R.S. Cormack and J. Lehane in 1984. The system categorizes the view obtained during laryngoscopy into several grades, each indicating the extent of visibility of the vocal cords, which directly relates to the expected ease or difficulty of the intubation procedure.

Here are the grades as originally defined:

1. Grade 1: Full visibility of the vocal cords. This grade suggests that intubation should be straightforward.
2. Grade 2: Partial visibility of the vocal cords. The anterior commissure might not be visible, but the posterior aspect of the glottis is seen. This may indicate a potentially more challenging intubation, but it is usually manageable.
    - Grade 2a: More than half of the glottis can be seen.
    - Grade 2b: Less than half of the glottis can be seen.
3. Grade 3: Only the epiglottis is visible, none of the glottis can be seen. This grade indicates a difficult intubation scenario, requiring advanced techniques or tools.
4. Grade 4: Neither the epiglottis nor the glottis can be seen. This is the most challenging scenario for intubation, often requiring specialized equipment and techniques such as a fiberoptic bronchoscope or video laryngoscope.



This grading system is essential for planning intubation strategies, particularly in anticipating and managing difficult airways. It allows clinicians to communicate effectively about the degree of laryngeal exposure and to prepare for potential complications during anesthesia induction.

The left and right sides of the brain are specialised to attend to different information, to process sensory inputs in different ways and to control different types of motor behaviour. This is referred to as hemispheric specialization or simply as brain lateralization. [17]

Theory of brain lateralization:

The relationship between left-handedness, right-handedness, and brain dominance (also referred to as brain lateralization) is a fascinating area of study in neuroscience.

Brain Dominance (Lateralization)

Left Hemisphere: Typically associated with logical reasoning, analytical thinking, language, and fine motor control (especially in right-handed individuals).

Right Hemisphere: Generally linked to creativity, spatial abilities, facial recognition, and processing of music and art.

The reasons why some people are left-handed are multifaceted, involving a combination of genetic, environmental, and developmental factors. Here are the main theories and factors contributing to left-handedness:

Genetic Factors

1. **Genetic Influence**:

There is evidence that handedness can run in families, suggesting a genetic component. However, no single "left-handed gene" has been identified. Instead, multiple genes likely contribute to determining handedness.

Studies have shown that if both parents are left-handed, their children have a higher probability of being left-handed compared to the general population.

Prenatal and Developmental Factors

Prenatal Environment:

Factors in the prenatal environment, such as hormone levels, may influence handedness. For example, exposure to higher levels of testosterone in the womb has been linked to a higher likelihood of being left-handed.

The position of the fetus in the womb and birth-related factors might also play a role in determining handedness.

Brain Lateralization

Brain Development:

Handedness is related to the dominance of one hemisphere of the brain over the other. While most right-handed individuals have left-hemisphere dominance, the pattern is more variable in left-handed individuals.

Differences in brain lateralization and the way neural circuits develop can influence whether a person becomes left- or right-handed.

Evolutionary and Adaptation Theories

Evolutionary Perspective:

Some theories suggest that left-handedness persisted through evolution because it provided certain advantages in specific contexts, such as combat or sports. Being left-handed could give individuals an element of surprise against predominantly right-handed opponents.

Cultural and social factors have also influenced the prevalence of left-handedness. In some cultures, left-handedness was discouraged, while in others, it was accepted or even revered.

Ambidexterity and Plasticity

Neuroplasticity:

The brain's ability to reorganize and adapt (neuroplasticity) might be more pronounced in left-handed individuals. This adaptability could contribute to the development of handedness based on early experiences and practice. Some individuals are ambidextrous (able to use both hands equally well), indicating that handedness is not always strictly one-sided and can be influenced by training and practice.

Conclusion

Left-handedness is the result of a complex interplay between genetic predispositions, prenatal and developmental influences, brain lateralization, and possibly evolutionary factors. While genetics play a significant role, environmental factors and neuroplasticity also contribute to whether a person becomes left-handed.

MATERIALS AND METHODS

Duration of study and study population:

Patients aged 18-60 year old age group, of either gender, belonging to ASA grade 1 and II, scheduled to undergo elective surgery under general anaesthesia, in supine position and endotracheal intubation at KLE's Dr.Prabhakar Kore Hospital And Medical Research Centre, Nehru Nagar, Belagavi-10'

Type of study: randomized clinical trial

CRIETERIAS FOR SELECTION:

Inclusion criteria:

- ASA grade I and grade II
- Age group in range of 18 to 60 years
- Scheduled to undergo surgery under GA with endotracheal intubation
- Provides consent

Exclusion criteria:

- Individuals suffering from heart conditions such as IHD and arrhythmias.
- Patients with traumatic facial anomalies
- patients with a known history of gastric reflux,
- patients having history of cervical spine fractures or instability, and
- patients with dentures or edentulous bodies.

Sample size: total sample size is 80.

Ethical clearence: Before initiation of the study, approval was obtained from institutional ethical and research committee, Jawaharlal Nehru Medical College, Belagavi.

Informed consent: type of research and the intervention being done was explained to all of the patients who met the selection criteria. Prior to enrollment, we acquired written informed consent from each patient.

Calculation of the sample size:

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

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

where zα represents the significance level and zβ represents the test power. At the 5% significance level, zα = 1.96 and zβ = 0.84 correspond to 80% test power.

$\bar{X}_1$ mean of first group (4.1), and $\bar{X}_2$ mean of second group (2.3).

The standard deviation of first group (s1) is 2.6, whereas standard deviation of second group (s2) 1.7. The sample size that results from using these values is 19. In order to obtain corroborated findings, the sample size will be expanded to 40. There will be two groups, each containing forty instances.

Methodology:

After the approval of the ethical committee was obtained and written informed consent was taken, 80 Patients under study who have met the inclusion criteria were included. One day before the surgery, a thorough airway assessment and pre-anesthetic evaluation was done, Mallampati grading and ADS (Airway difficult Score) recorded. Pre-op orders including nil per oral advise given.

On the day of the surgery after confirming the nil per oral status and obtaining written informed consent a wide bore 18G iv cannula secured and iv fluids started. Patients were shifted to operation theatre and the standard monitors attached including spo2, NIBP and ECG and base line readings were recorded. Using computer generated randomization table, the patients were divided in between two groups Group N.D (Non-Dominant) and Group D (Dominant).

Patient were pre-oxygenated for a span of 3 min with 100% oxygen and then for pre-medication patient was given Injection Glycopyrolate--0.004mg/kg, Injection Midazolam--0.05mg/kg and Fentanyl--2mcg/kg.

Patient were induced with injection propofol 1.5-2.0 mg/kg and injection succinylcholine 2mg/kg. After receiving adequate skeletal muscle relaxation, laryngoscopy was performed for each patient. The patients were divided into two groups depending on computer generated randomization table.

Group N.D (Non-Dominant)- patients in group N.D (Non-Dominant) laryngoscopy was done with non- dominant hand (i.e laryngoscopy is done by left hand of a right-handed person using the conventional left-handed laryngoscope blade Macintosh size 3/4)

Group D (Dominant)- patients in group D (dominant hand) laryngoscopy was performed with dominant hand i.e laryngoscopy done with the right hand of a right-handed anesthesiologist using right-handed laryngoscopic blade Macintosh size 3/4)

When the person doing the procedure, performed laryngoscopy and visibility of glottis was obtained the following parameters were noted

- The best glottic view obtained was graded according to Cormack lehane grading as follows

- Grade 1: Vocal cords- visible
- Grade 2: arytenoids or posterior commissure of the vocal cords visible, only
- Grade 3: epiglottis is visible, only
- Grade 4: None of the glottic structures are visible

An assistant measures the perpendicular distance between maxillary-central incisors to the blade flange with the help of a ruler and the time taken from insertion of laryngoscopic blade to tube insertion and auscultation to determine the correct placement of tube thereafter.

If needed, we provided with external laryngeal pressure for facilitating endotracheal intubation and noted as well. If adequate laryngeal view and endotracheal intubation are not possible after two attempts then it was considered as failure, the patient excluded from study and the difficult airway algorithm was be followed to secure the airway.

Once intubated, bilateral equal air entry was confirmed and secured with tapes. Also, time required for E.T Intubation defined as time between passing of laryngoscope tip through oral cavity to confirmation of bilateral air entry (in sec) noted. O_2 + N_20 + vecuronium 0.08mg-1mg/kg was used for intraoperative maintenance of anaesthesia. Once the surgery got over, reversal was given injection Glycopyrolate 0.008mg/kg alongwith injection Neostigmine 0.05mg/kg. once thorough oropharyngeal suctioning was done, patient was extubated.

Statistical analysis:

Since the comparison of 2 groups is the main focus of this study, the mean and standard deviation for continuous quatitative variables were computed. The unpaired student's t test and other appropriate statistical methods were utilized to compare the intergroup continuous variables. With the student's paired 't' test, 2 quantitative variables within a group were compared. Rates, ratios and percentages were used to express the categorical data. Using Fisher's exact test or Chi square test, the relationship between the outcome and clinical plus demographic charecteristics was examined.

Other appropriate methods such as ANOVA, co-relation regression and so forth were employed in accordance with this need. The median was used to represent discrete variables. Appropriate graphs were used to represent comparison. A p-value of less than 5% (0.05) was considered significant for all the tests.

RESULTS

Study design: randomized clinical trial

80 adult patients of ASA grade I and II, in between age group of 18 – 60 years old, of either gender, scheduled for undergoing elective surgery under general anesthesia were comprehended in our study.

In our study, the Cormack-Lehane grading, time required for endo tracheal intubation and blade to tooth distance was noted and corelated. The attained data was chartered and transcribed into Microsoft excel spread sheet. The data was explored using various tests like unpaired student's t test and results obtained were charted and tabulated as below.

TABLE 1: Gender distribution of the volunteers studied

			GROUP		Total
			Dominant	Non-dominant	
GENDER	Female	Count	19	19	38
		%	47.5%	47.5%	47.5%
	Male	Count	21	21	42
		%	52.5%	52.5%	52.5%
Total		Count	40	40	80
		%	100.0%	100.0%	100.0%

Chi square = 0.000, P value = 1.00 (NS)

52% of the samples are males and remaining Females.

GRAPH 1: bar chart depicting gender distribution of the patients studied

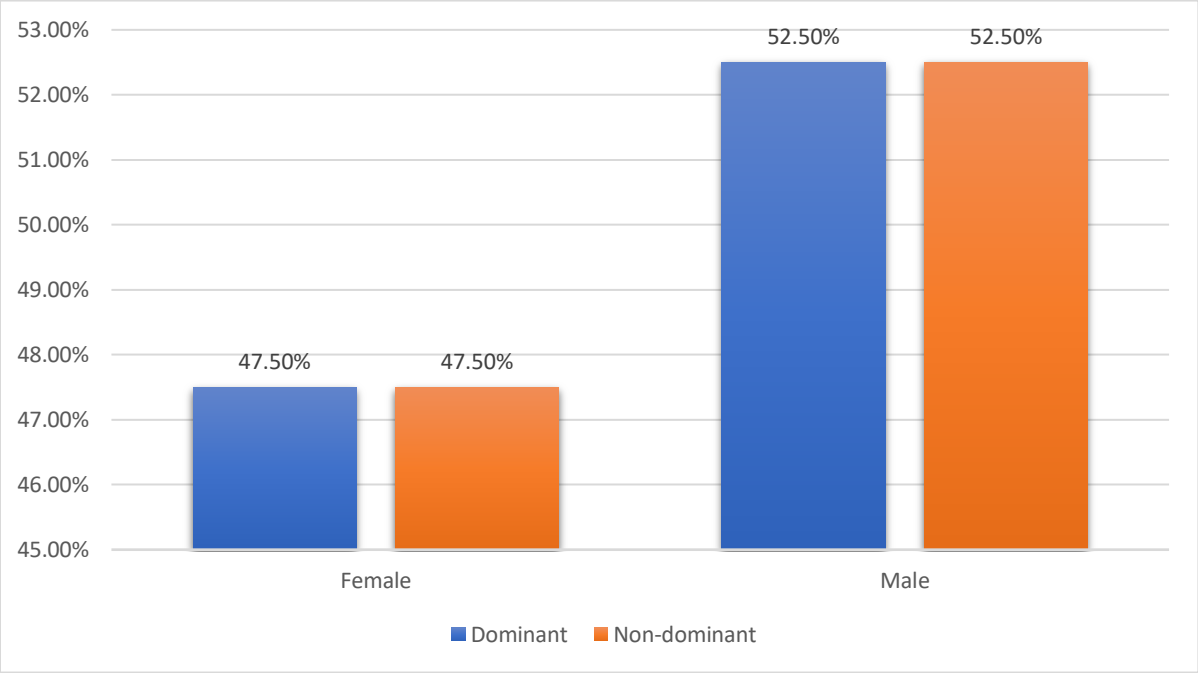


TABLE 2: Mean age of the volunteers studied

Variable	Dominant		Non-dominant		P value
	Mean	SD	Mean	SD	
Age	41.73	11.467	40.70	14.031	0.722

GRAPH 2: Bar chart representation of the mean age in dominant vs non-dominant group

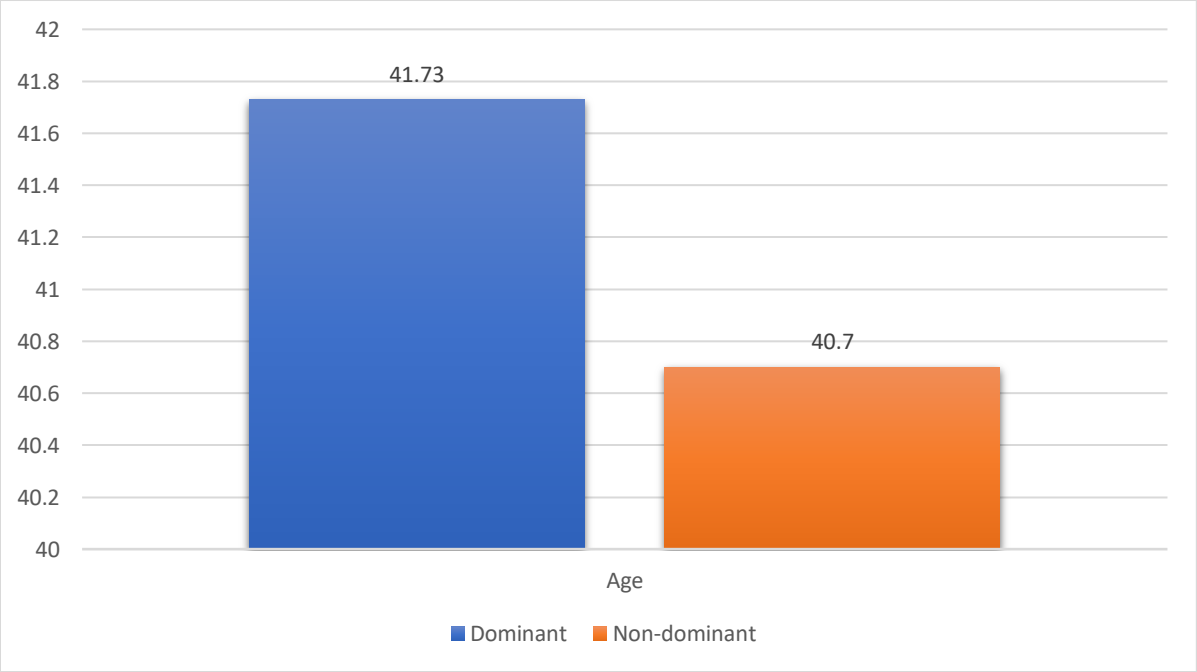


TABLE 3: Cormack-lehane grading of the volunteers studied

			GROUP		Total
			Dominant	Non-dominant	
C-L grade	i	Count	13	19	32
		%	32.5%	47.5%	40.0%
	ii	Count	24	15	39
		%	60.0%	37.5%	48.8%
	iii	Count	3	6	9
		%	7.5%	15.0%	11.3%
Total		Count	40	40	80
		%	100.0%	100.0%	100.0%

Chi square = 4.202, P value = 0.122 (NS)

GRAPH 3: graph representing Cormack-lehane grading of the volunteers studied

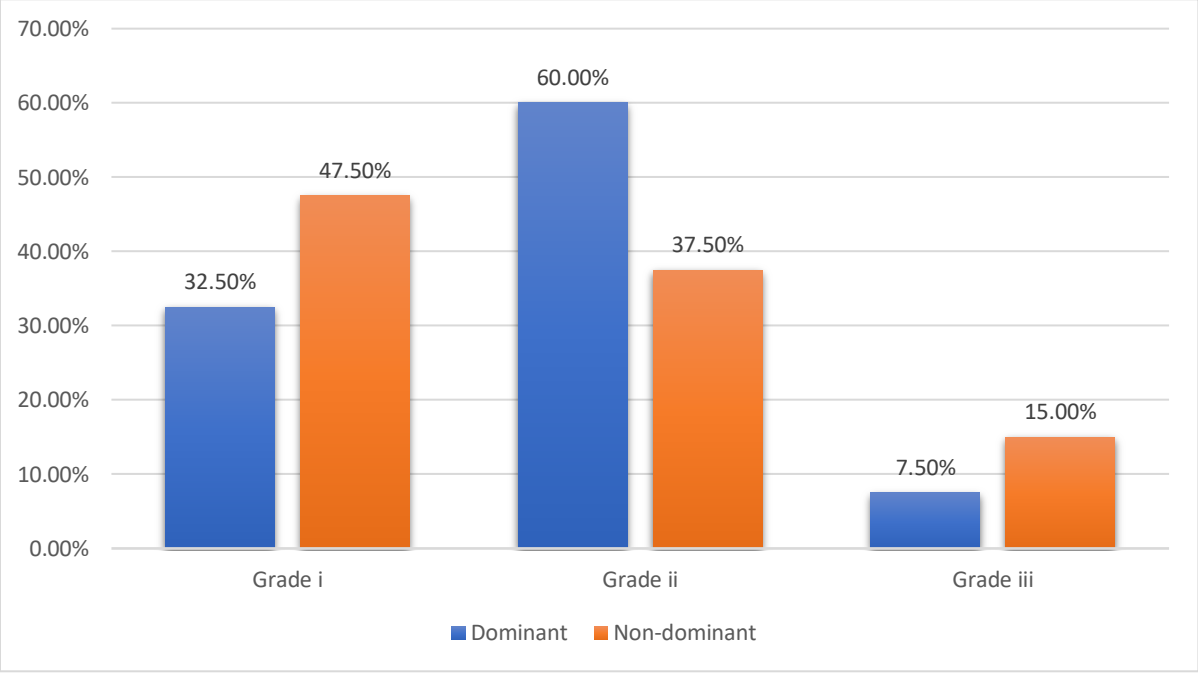


TABLE 4: Blade-to-tooth distance of the volunteers studied

Variable	Dominant		Non-dominant		P value
	Mean	SD	Mean	SD	
Blade-to-tooth distance	3.893	.6639	4.130	.7079	0.126

GRAPH 4: Bar chart of the blade-to-tooth distance in dominant vs non-dominant group

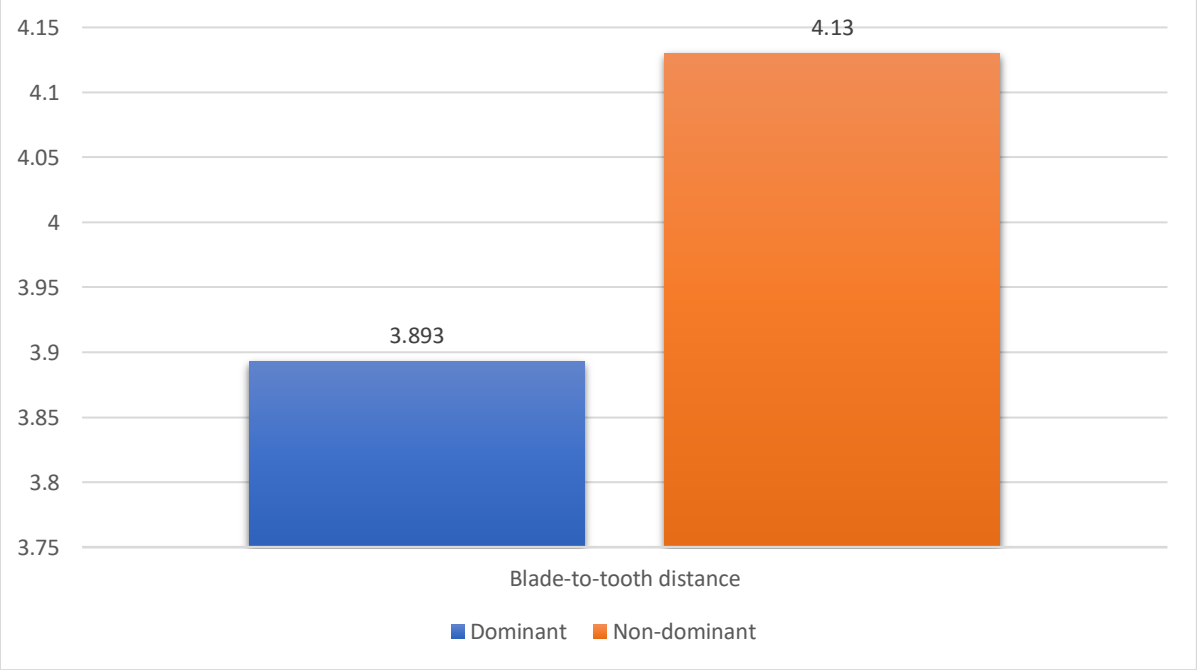
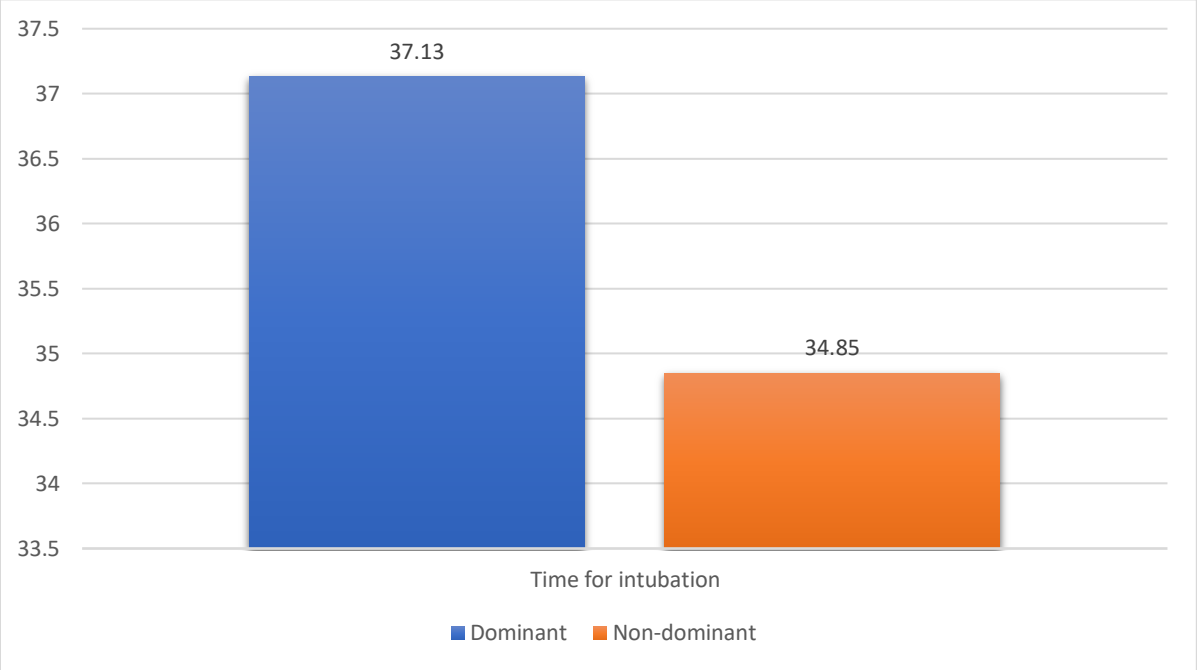


TABLE 5: Total time required for intubation in the volunteers studied

Variable	Dominant		Non-dominant		P value
	Mean	SD	Mean	SD	
Time for intubation	37.13	7.717	34.85	7.675	0.190

GRAPH 5: Bar chart of the total time taken for intubation in dominant vs non-dominant group



DISCUSSION

Endotracheal intubation is the medical procedure in which a tube is inserted past the mouth or nose into the trachea (windpipe) to help maintain an open airway and ensure adequate oxygenation and ventilation. This procedure is commonly performed in various medical settings, including surgery, emergency situations, and critical care, to secure the airway of patients who are unable to breathe on their own or who require mechanical ventilation. The tube, known as an endotracheal tube, is usually guided into place using a laryngoscope, which helps visualize the vocal cords and trachea. [18]

The goal of direct laryngoscopy is to produce a direct line of sight from the operator's eye to the larynx. This requires creation on new anatomic visual axis. Two blades, each with a unique manner of application, are in common use. The Macintosh blade is used to displace the epiglottis out of line of sight by placement of distal tip in the vallecula and tensing of glosso-epiglottic ligament. The blade includes a flange along the left side of its length which is used to sweep the tongue to the left. Blades with right-sided flange are also available but are not used in common practice. [19]

Current laryngoscopes for tracheal intubation must be used with the left hand, regardless of the operator's dominant hand. Unlike many daily tools and devices designed to be used for both left and right hand, most medical instruments—especially those that are critical to patient care, like laryngoscopes—lack this consideration. [20]

This oversight in design remains an unresolved issue. Despite many healthcare professionals being right-handed, the design of the laryngoscopes are such that it is only designed for left-hand use, presenting certain challenges.

The standard procedure for tracheal intubation entails using conventional laryngoscope in the left hand in order to see the glottis clearly and then push the ET tube inside via right hand. This practice is followed in all the medical institutions universally. [21]

We had established a hypothesis that both conventional left-handed laryngoscope as well as right-handed scope can be equally effective in achieving adequate glottic view for laryngeal exposure.

Our study was a randomized clinical trial in the Department of Anesthesiology, KLE'Ss Dr Prabhakar Kore Hospital and Medical Research Centre starting from

March 2022 to April 2023 which comprised of 80 adult patients aged between 18 to 60 years of age, posted for surgeries under GA. The present study's objective was to compare efficacy of using dominant vs non-dominant hand for laryngoscopy to obtain adequate glottic view for endotracheal intubation.

In the present study, among the total 80 enrolled patients, there were 38 females accounting for 47.5% of the total population and 42 male patients accounting for 52.5% of the same. Among the enrolled individuals age groups were comparable. Mean age was found to be 41.73 in the dominant age group and 40.70 in non-dominant hand group with the minimum age of 18 years and maximum age of 60 years.

In the present study, we also utilized the airway difficult scoring (ADS) system between the two groups of non-dominant vs dominant hand laryngoscopy and arrived at the conclusion that results are statistically insignificant.

In the present study, Although, there are slight differences in the distribution of C-L grades, these differences are not statistically significant. (p value=0.122)

Grade I (easiest view) is slightly more frequent (47%) with the non-dominant hand, while Grade II (moderate difficulty) is more frequent (60%) with the dominant

hand. Clinically, this suggests that while the distribution of laryngoscopic views varies slightly, the hand used does not significantly affect the laryngoscopic grade obtained. However, this result was inconsistent with study conducted by Serin lee et al where the glottic view was better with right-handed scope when it is held in the dominant hand.

The results of our study could be attributed to the fact that performing laryngoscopy and obtaining adequate view can be achieved by developing strength and sufficient practice.

In the present study, however, the comparison of blade-to-tooth distance in dominant hand group was concluded to be 3.893 cm with a standard deviation of 0.6639 while in the non-dominant group the mean distance was 4.130 with a standard deviation of 0.7079. (p value=0.126).

The mean blade-to-tooth distance is slightly higher with the non-dominant hand, but this difference is not statistically significant. This indicates that the hand used does not significantly affect the inter blade-tooth distance, during laryngoscopy.

A Comparable study was undertaken by Serin lee et al in 2017, where they were evaluating the efficacy of using a right-handed laryngoscopic blade in order to obtain a clear glottic view as well as adequate inter blade-tooth distance. It was observed that view of laryngeal inlet was considerably better, distance between

blade and tooth increased and possibility of dental injury when a right-handed anaesthetist used right-handed blade, also decreased.

Serin lee et al also came across the findings that when a conventional laryngoscope was used by left-handed professional the occurance of poor visibility came up to be 4.5% which became way worse, i.e 22.5%, when the same set of people used a right-handed scope. In a sharp contrast, in a right-handed professional using a conventional scope, the occurrence of poor visibility was 12% and 4% with a right-handed scope.

This study was in line with previously conducted similar studies which indicated that a left-handed professional lacks absolute strength which is needed to use right-handed blade causing inadequate lifting of jaw and improper positioning of blade tip on the vallecula.

In November 2018, A study was conducted by Seyed-Mohammad Mireskandari et al where he modified the conventional Macintosh blade, called it The Callender blade in order to lessen the risk of dental injury which is a most likely complication of laryngoscopy.

The modification was such that at the proximal end of the blade, heel was shortened which indeed was helpful in increasing blade-to-tooth distance. (22)

In the present study, the mean time taken for intubation with the dominant hand was 37.13 seconds with a standard deviation of 7.717 while for the non-dominant hand the mean was 34.85 seconds with a standard deviation of 7.675. (p value=0.190). This result indicates that even though mean of total time for intubation is slightly more for the dominant hand but the difference is inconsiderable statistically.

Henderson J.J et al conducted a study on 10 cases in the year 1997. He observed that on using MacIntosh blade for tracheal intubation, unexpected difficulty was encountered but when a miller blade was positioned laterally to the tongue, clear glottic views could be obtained and therefore, it enhanced tracheal intubation under direct vision.

So, it can be concluded that in case of an unexpected difficult intubation, it may be beneficial to use para-glossal straight blade over conventional Mac blade. (23)

Yi-Wei Kuo et al conducted a study in the year 2007 here they tried to evaluate the effectiveness of endotracheal intubation using a Light-wand via either dominant or non-dominant hand. The variables under study included total time taken to intubate, number of times intubation was attempted and haemodynmic alterations, if any alongwith the side effects after intubation. Irrespective of which hand that was used for intubation LWEI (Light-Wand guided endotracheal intubation) group required less time than the laryngoscope group. During the first intubation attempts itself, success rate was well above 95%. Among the three groups, any alterations observed in Mean arterial pressure (MAP) and (HR) heart rate were inconsiderable. Therefore, this study was helpful in arriving at a conclusion that endotracheal intubation using a Light-Wand could be a feasible alternative to conventional laryngoscopic technique. [24]

CONCLUSION

Laryngoscopic views and blade-to-tooth distance with non-dominant vs dominant hand using respective laryngoscope blades were comparable in patients undergoing general anaesthesia. Also, the time taken for endotracheal intubation was comparable in both the groups, supporting the feasibility of using either hand for endotracheal intubation.

LIMITATIONS

One major limitation of this study was that we have compared dominant vs non-dominant hand laryngoscopy in different patients and not the same patient.

Our study was single was single center clinical trial with a smaller sample size leading to a statistically insignificant result.

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ANNEXURE-I – CONSENT FORM

INFORMED CONSENT FOR PARTICIPATION IN RESEARCH STUDY

Mr/Mrs/Miss._____ we are requesting you to get enrolled in the study trial titled "A COMPARATIVE STUDY OF LARYNGOSCOPIC VIEWS AND BLADE TO TOOTH DISTANCE OBTAINED USING NON-DOMINANT VS DOMINANT HAND FOR LARYNGOSCOPY FOR PATIENTS UNDERGOING SURGERY UNDER GENERAL ANAESTHESIA - A ONE YEAR RANDOMIZED CLINICAL TRIAL" conducted by Reg.No. BA0121003 Post Graduate in M.D Anaesthesiology under the guidance of Dr_____,Professor, Department of Anaesthesiology, J.N Medical college, Belagavi.

Objective: To compare laryngoscopic views and blade to tooth distance on laryngoscopy with non-dominant or dominant hand using respective laryngoscope blades in patients undergoing general anaesthesia.

Introduction: The present study is conducted among adult patients scheduled for various elective surgeries under general anaesthesia in the department of Anesthesiology at KLE's Dr. Prabhakar Kore Charitable Hospital and Medical Research Centre, Belagavi. You are requested to participate in the study and your participation is completely voluntary.

Explanation of procedure: If you agree to enroll in my study, I will ask u present and past medical history. Then you will be clinically examined in detail. On the day of the surgery, you will be allocated into one of the two groups using computer generated software. Group Non-dominant will be intubated using conventional left handed laryngoscope blade and group dominant will be intubated using right handed laryngoscope blade. Hence it will be helpful in assessing as to which procedure offers better view of the larynx.

Withdrawal from participation in the study: Participation in this study is voluntary. You will be free to decide whether to participate in this study or continue participation once enrolled. In case you decide to withdraw your participation, you are free to do so. However, please convey the decision to the principal investigator.

Possible benefits from participating in the study: You will/will not have nor get any benefits by participating in this study. The data gathered will help the population at large.

Possible risks from participating in the study: There are no risks involved in participating in this study.

Privacy and confidentiality: The information collected from you will be coded, to prevent any person from identifying you. Your identity will never be revealed. The data collected from you will be kept confidential and only processed or aggregated data will be used for publication.

Financial incentives: You will not receive any payment for participating in this study.

Authorization for publication of aggregated data: Results obtained after processing of the aggregated data will be published for scientific purposes and or presented to scientific groups. However, your identity will never be revealed.

Questions: In case of any questions with regard to this study, you are free to contact Dr._____, Department of Anasthesiology, J.N Medical college, Belagavi or Dr._____, Professor, Department of Anaesthesiology, J.N Medical college, Belagavi.

If you have any question or complaints with regard to your right as study participant you may contact Dr Harsha Hegde, Chairperson, Ethical committee of JNMC, 0831-2473777 Extension 4052.

Legal rights: By signing this consent form, we are not waving any of your legal rights.

INFORMED CONSENT FOR PARTICIPATION IN RESEARCH STUDY

I am making a voluntary decision to participate in the study A COMPARATIVE STUDY OF LARYNGOSCOPIC VIEWS AND BLADE TO TOOTH DISTANCE OBTAINED USING NON-DOMINANT VS DOMINANT HAND FOR LARYNGOSCOPY FOR PATIENTS UNDERGOING GENERAL ANAESTHESIA — A ONE YEAR RANDOMIZED CLINICAL TRIAL. My signature below indicates that I have decided to participate and I have read the information provided above or the information provided above has been read to me in the language that I understand best. I was given the opportunity to ask questions and that they have been answered to my satisfaction.

Name of the participant: _____

Signature or left thumb impression of the participant: _____

Name of the witness: _____

Signature or left thumb impression of the witness: _____

Name of the investigator: _____

Signature of the investigator: _____

ANNEXURE-II PROFORMA

"A COMPARATIVE STUDY OF LARYNGOSCOPIC VIEWS AND BLADE TO TOOTH DISTANCE OBTAINED USING NON-DOMINANT VS DOMINANT HAND FOR LARYNGOSCOPY FOR PATIENTS UNDERGOING SURGERY UNDER GENERAL ANAESTHESIA — A ONE YEAR RANDOMIZED CLINICAL TRIAL AT DR. PRABHAKAR KORE CHARITABLE HOSPITAL, BELAGAVI"

Serial number:

Name : Age:

Gender: Weight:

Height: Date of Examination:

Address: Occupation:

Pre examination evaluation

Past History

- HTN ☐ DM ☐ IHD ☐ Arrhythmia ☐ Valvular heart diseases ☐

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

General physical examination

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

Cyanosis: Pedal edema: Clubbing:

PR: BP: RR:

Musculoskeletal disorders:

Teeth: Jaw movements:

Airway assessment: Spine:

Investigations

Hb%: Platelet Count:

TLC: INR:

FBS:

Systemic examination:

CNS: RS:

CVS: GIT:

Preoperative physical status American society of anesthesiologist I ☐

II ☐

Airway difficult score (ADS)

Criteria	**Score 1**	**Score 2**	**Score 3**
Thyromental distance	>6	5-6	**<**5
Mallampatti score	I	**II**	**III & IV**
Mouth opening	>4	2-3	<1
Neck mobility	Normal	Reduced	Fixed flexion
Upper incisors	Absent	Normal	Prominent

Diagnosis:

Proposed surgery:

Monitors attached:

	Pre-operative period	**Intraoperative period (5minutes after intubation)**
Pulse oximetry		
NIBP		
Pulse rate		

Group Non-Dominant:

Cormack – Lehane grade:

Blade-to-tooth distance:

Duration for endotracheal intubation:

Group Dominant:

Cormack – Lehane grade:

Blade-to-tooth distance:

Duration for endotracheal intubation:

Methodology:

After the approval of the ethical committee is obtained and written informed consent is taken, 80 Patients under study who have met the inclusion criteria will be included. One day before the surgery, a thorough airway assessment and pre-anesthetic evaluation will be done, Mallampati grading and ADS (Airway difficult Score) recorded. Pre-op orders including nil per oral advise will be given.

On the day of the surgery after confirming the nil per oral status and obtaining written informed consent a wide bore 18G iv cannula will be secured and iv fluids will be started. Patients will be shifted to operation theatre and the standard monitors attached including spo2, NIBP and ECG and base line readings recorded. Using computer generated randomization table, the patients will be divided in between two groups Group N.D (Non-Dominant) and Group D (Dominant).

Patient will be pre-oxygenated for a span of 3 min with 100% oxygen and then for pre-medication patient will be given Injection Glycopyrolate—0.004mg/kg, Injection Midazolam—0.05mg/kg and Fentanyl—2mcg/kg.

Patient will be induced with injection propofol 1.5-2.0 mg/kg and injection succinylcholine 2mg/kg. After receiving adequate skeletal muscle relaxation, laryngoscopy will be performed for each patient. The patients will be divided into two groups depending on computer generated randomization table.

Group N.D (Non-Dominant)- patients in group N.D (Non-Dominant) laryngoscopy will be done with non- dominant hand (i.e laryngoscopy is done by left hand of a right-handed person using the conventional left-handed laryngoscope blade Macintosh size 3/4)

Group D (Dominant)- patients in group D (dominant hand) laryngoscopy will be performed with dominant hand i.e laryngoscopy done with the right hand of a right-handed anesthesiologist using right-handed laryngoscopic blade Macintosh size 3/4)

When the person doing the procedure, performs laryngoscopy and visibility of glottis will be obtained the following parameters will be noted

- The best glottic view obtained will be graded according to Cormack lehane grading as follows

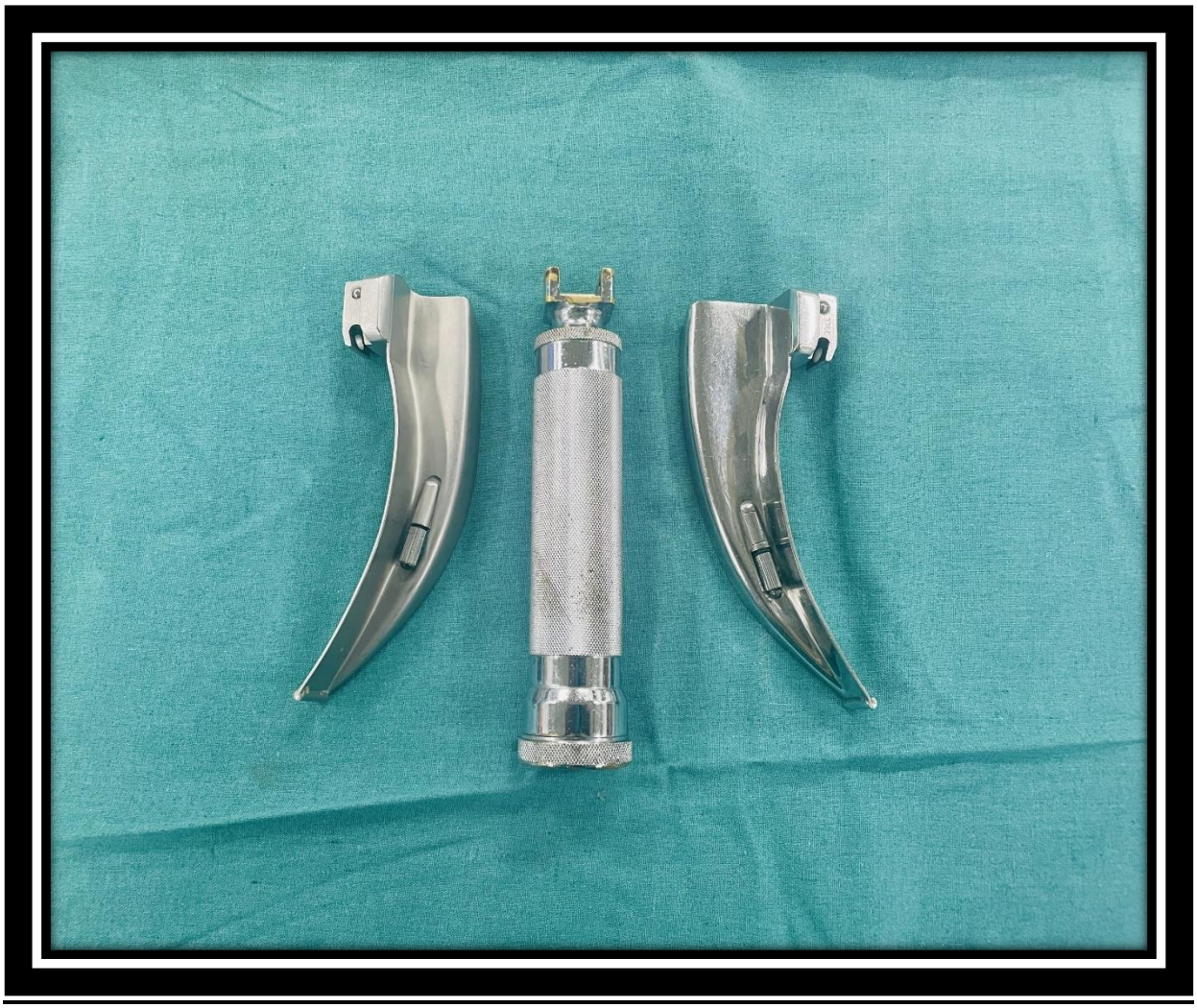
    - Grade 1: Vocal cords- visible
    - Grade 2: arytenoids or posterior commissure of the vocal cords visible, only
    - Grade 3: epiglottis is visible, only
    - Grade 4: None of the glottic structures are visible

An assistant will measure the perpendicular distance between maxillary-central incisors to the blade flange with the help of a ruler and the time taken from insertion of laryngoscopic blade to tube insertion and auscultation to determine the correct placement of tube thereafter.

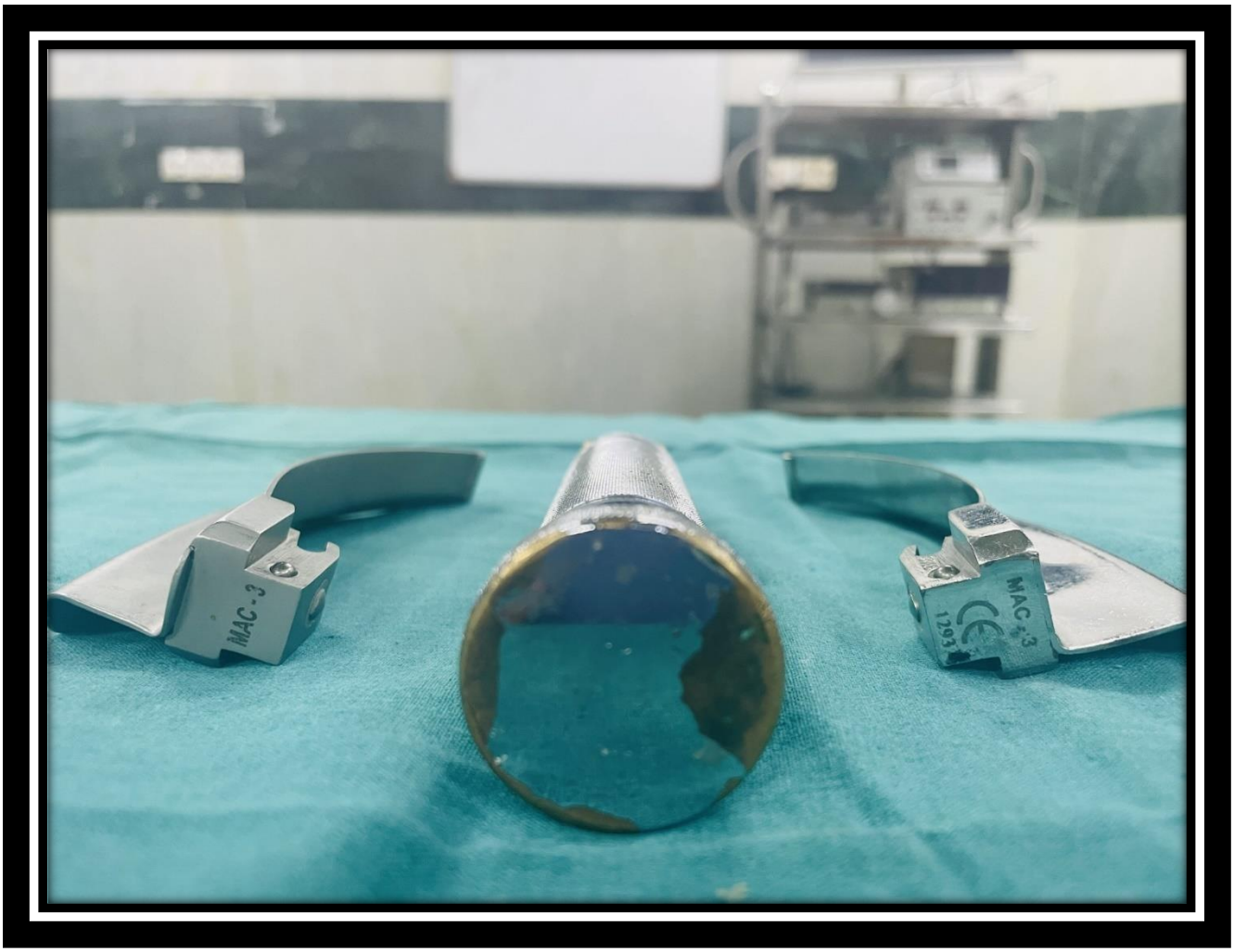
If needed, we will provide with external laryngeal pressure for facilitating endotracheal intubation and noted as well. If adequate laryngeal view and endotracheal intubation are not possible after two attempts then it will be considered as failure, the patient excluded from study and the difficult airway algorithm is be followed to secure the airway.

Once intubated, bilateral equal air entry will be confirmed and secured with tapes. Also, time required for E.T Intubation defined as time between passing of laryngoscope tip through oral cavity to confirmation of bilateral air entry (in sec) will be noted. O_2 + N_20 + vecuronium 0.08mg-1mg/kg will be used for intraoperative maintenance of anaesthesia. Once the surgery got over, reversal will be given injection Glycopyrolate 0.008mg/kg alongwith injection Neostigmine 0.05mg/kg. Once thorough oropharyngeal suctioning is done, patient will be extubated.

ANNEXURE III – PHOTOGRAPHS



PHOTOGRAPH 1



PHOTOGRAPH 2

ANNEXURE IV - MASTERCHART

NAME	AGE	GENDER	C-L grad	BLADE TO TOOT	DURATION FOR INTUBATION
Shekhar Patil	29 years	male	I	5mm	30 seconds
mahadevi	42yrs	female	ii	4.2mm	40seconds
ramaling	32years	male	i	4.0 mm	40 seconds
yallabai	50 years	female	iii	4.0mm	35seconds
sushila p	45years	female	ii	3.5mm	30 seconds
mallavva s	56 yrs	female	ii	4.2mm	40seconds
gangavva m	57yrs	female	iii	3.2mm	50seconds
manoj lakkundi	23years	male	i	4.8mm	25seconds
manohar	62years	male	ii	3.0mm	40seconds
mahadev p	44years	male	ii	4.2mm	35seconds
shantavva	65yrs	female	iii	4.5mm	45seconds
malu	50years	male	ii	5.2mm	35seconds
jayashree s	46yrs	female	ii	4.3mm	35seconds
shoukatali	50years	male	iii	3.2mm	45seconds
fazalu shaikh	28years	male	i	3.4mm	30seconds
santil santosh	26yrs	male	i	4.6mm	25seconds
fayaz	37years	male	i	5.0mm	30seconds
bonaventure p	62years	female	ii	4.5mm	45seconds
sunanda s	63years	female	ii	4.0mm	30seconds
saraswati s	21years	female	i	5.0mm	25seconds
mahadevi m	38years	female	ii	3.5mm	45seconds
sidappa m	47yrs	male	iii	4mm	50seconds
fakirappa	52yrs	male	ii	3.2mm	42secondsr
rudrappa	50yrs	male	iii	3.5mm	40seconds
arpita	20years	female	ii	3.5mm	35seconds
rohan sarkar	19years	male	i	3mm	25seconds
geeta y	40yrs	female	i	6mm	30seconds
suleman k	22years	male	i	5mm	25seconds
vivek	60years	male	i	4mm	30seconds
mallikarjun	35years	male	i	4mm	40seconds
ashwini p	40yrs	female	ii	3.5mm	35seconds
mohini mohan	27yrs	female	i	4.2mm	30seconds
shweta kiran	26yrs	female	ii	4.0mm	42seconds
siddharth s	22years	male	i	4.5mm	35seconds
shanta g	40years	female	i	5mm	20seconds
saroja p	47years	female	i	5mm	20seconds
sambaji naik	50yrs	male	ii	4.5mm	35seconds
ramajsaab	26yrs	male	i	4mm	40seconds

NAME	AGE	GENDEI	C-L grad	BLADE-TO-TOOTH distan	TIME FOR INTUBATION
Basavraj G	61years	female	ii	3.5mm	30seconds
dundappa b	50yrs	male	ii	4mm	35seconds
arjun	30years	male	ii	3.5mm	30seconds
laxmi	42years	female	ii	4mm	45seconds
sandeep	40yrs	male	ii	3mm	40seconds
manjula p	46yrs	female	ii	3.2mm	25seconds
shreya usha	45yrs	female	ii	3mm	35seconds
basayya	35yrs	male	iii	4.2mm	42seconds
satevva	60years	female	i	4.3mm	35seconds
somu c	20yrs	male	i	4mm	30seconds
toufiq pathan	33yrs	male	ii	3.5mm	44seconds
limbevva mudhol	60yrs	female	ii	4.2mm	36seconds
aminabi	55years	female	ii	4.5mm	55seconds
shrishail h	20years	male	i	3.5mm	40seconds
altaf	47years	male	ii	4mm	35seconds
shanti g	53years	female	ii	5mm	50seconds
maruti	30years	male	i	4.5mm	46seconds
shaivya s	52years	female	i	4mm	45seconds
kadavgol	45years	male	ii	4.7mm	40seconds
gangavva	49years	female	i	4.2mm	36seconds
renuka g	43years	female	ii	5mm	30seconds
hanmanth	55years	male	i	4mm	47seconds
shankar	42years	male	ii	4.5mm	40seconds
shantavva	45years	female	ii	4mm	35seconds
anita arjun	50 years	female	i	4.2mm	33seconds
nawab shah	30years	male	ii	4mm	40seconds
raja	45years	male	ii	3.5mm	37seconds
prashasti	23years	female	ii	4.6mm	50seconds
harish rani	37years	male	ii	4mm	35seconds
rishabh	52 years	male	i	3.5mm	25seconds
parvati k	40years	female	iii	2mm	30seconds
pallavi s	35 years	female	ii	2.6mm	50seconds
majunath k	27years	male	i	3mm	46seconds
shivapp	34years	male	i	3.2mm	34seconds
devappa	20years	male	ii	3.5mm	25seconds
sphoorti b	30years	female	iii	4mm	30seconds
shravana	59years	female	ii	4.6mm	35seconds
krishnakant m	42years	male	i	5mm	34seconds
ramappa b	40years	female	i	4.3mm	30seconds