# **“COMPARISON OF HUGEMED VIDEO LARYNGOSCOPE AND MCCOY LARYNGOSCOPE FOR ENDOTRACHEAL INTUBATION IN PATIENTS WITH SIMULATED CERVICAL SPINE IMMOBILISATION”**

*A Dissertation submitted to*

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*for the award of the degree*

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**MAY 2021**

## DECLARATION BY THE CANDIDATE

I, **Dr. INDRANI APPIKONDA,** solemnly declare that the dissertation, titled **"COMPARISON OF HUGEMED VIDEO LARYNGOSCOPE AND MCCOY LARYNGOSCOPE FOR ENDOTRACHEAL INTUBATION IN PATIENTS WITH SIMULATED CERVICAL SPINE IMMOBILISATION"**, is a bonafide work done by me during the period of AUGUST 2019 TO JANUARY 2020 at Government Stanley Medical College and Hospital, Chennai under the expert supervision of **Dr.SRIDHAR., M.D.,D.A.,** Professor, Department Of Anaesthesiology, Government Stanley Medical College, Chennai.

This thesis is submitted to The Tamil Nadu Dr. M.G.R. Medical University in partial fulfilment of the rules and regulations for the M.D. degree examinations in Anaesthesiology to be held in May 2021.

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# ABSTRACT

**Background:**

It is difficult to visualise the larynx using conventional laryngoscope in the presence of cervical spine immobilisation. Hugemed allows easy and successful in the neutral neck position

**Objective:**

To evaluate the performance of Hugemed in comparison with Mc Coy for ease of endotracheal intubation in patients with cervical spine immobilisation using manual in line cervical stabulisation (MILS) technique.

**Methods:**

The study is a prospective randomized study was undertaken in 60 ASA I and ASA II in patients aged between 18 -60 years belonging to either gender scheduled to undergo elective procedures, Group A intubated with Mc Coy and Group B with Hugemed video laryngoscope and time taken for intubation, intubation difficulty score and POGO score compared

**Results:**

The mean intubation time was 27.3sec for Mc Coy and 21.5sec for Hugemed (P=0.0007). Intubation difficulty score for Mc Coy 73.33% were intubated in first attempt and 93.33% for Hugemed. The mean POGO score for Mc Coy 71.53 and 87.13 for Hugemed (p= 0.0082)

**Conclusion:**

Hugemed video laryngoscope requires less time for intubation, provided best visualisation of glottis, IDS score was less and less hemodynamic response when compared with group A patients in simulated cervical spine injury

**Key Words:**

Mc Coy, Hugemed, Ease of Intubation

# INTRODUCTION

Cervical spine injuries can happen either due to trauma or diseases. Approximately 2-5% of trauma patients may have cervical spine injury. The consequence of c-spine injury is injury to the spinal cord. The Spinal injury risk increases in presence of head injury, when level of consciousness is decressed and in focal neurological deficit. Patient with c-spine injury may need quick management of airway for airway protection, to avoid hypoxia and hypoventilation.[1]

The gold standard position for laryngoscopy introduction is sniffing position. This position maintains and aligns the oral, the pharyngeal and the laryngeal axis and gives better glottic visualization.[2] This position flexes , the lower cervical spine, extends the upper cervical spine and extends the atlanto – occipital joint.[3] Management of airway in patients with anticipated cervical spine injury may result in higher neurological injury.[4] In order to minimize the risk of cord injury, anaesthetist must have knowledge of anatomical and functional relationship between airway, cervical column and spinal cord.[2]

Trauma life support (TLS)guidelines recommends the usage of Manual In Line Stabilization (MILS) or a hard collar to stabilize the spine in anticipated cervical spine injury patients.[4]MILS avoids the extension of head and flexion of neck which is important for optimal alignment of three airway axis.[5]The presence of hard collar may worsen the laryngoscopic view and there by makes  intubation difficult with a conventional laryngoscope.[4] To overcome the difficulty various devices like direct laryngoscope with  help of gum elastic bougie, fibre-optic bronchoscopy, airway scope, McCoy laryngoscope, Intubating laryngeal mask airway, C-Trach and Bullard laryngoscope was recommended by many authors. [6]

The gold standard instrument for intubation in patients with c-spine injury is fibre-optic bronchoscopy. Use of it is restricted due to lack of expertise,  itsavailability and time requirement.[4]

The McCoy  laryngoscope is a modified version of the standard Macintosh blade.[6] Its tip is hinged tip and the angle of the hinged tip is altered by a lever which is attached to the handle.[7,8]pressing  the lever towards the handle lifts the tip.[8] The hinged tip helps in improving the Cormac and Lehanelaryngoscopic view by 1 grade when compared to Macintosh blade in patient with c-spine injury. The blade is available in  differentsize 3 and 4.[4]

The newer generation video laryngoscope has many distinct improvements,[8] like  external light source and a small digital camera at the tip of the blade, which are connected to a video display monitor.[9] It gives optimum view of the glottis by direct and indirect view.[9]

This study was carried out to compare the efficacy of Hugemed video laryngoscope and McCoy laryngoscope in simulated cervical spine injury by comparing , duration of intubation, total duration of intubation, ease of intubation and haemodynamic responses.

# AIM OF THE STUDY

To compare performace of  Hugemed video laryngoscope and McCoy laryngoscope in simulated cervical spine injury using Manual In Line Stabilisation (MILS) with the following parameters

**PRIMARY AIM:**

Time taken  for intubation

Assessment of the difficulty of tracheal intubation  based on - Intubation Difficulty Scale (IDS score)

POGO score

**SECONDARY AIM:**

Haemodynamic responses.

Number of optimization techniques used( use of bougie,different size blade ,stylet)

# REVIEW OF LITERATURE

**Laurent et al**., has done a study on McCoy laryngoscope and its uses in patients withsimulated cervical spine injuries. 167 patients who had ASA grades 1-3, and who were scheduled for an elective surgery under general anaesthesia who required tracheal intubation were included. Using manual in-line stabilisation laryngoscopy was introduced while their head and necks held in the neutral position and cricoid pressure was given to simulate the patient with a suspected cervical spine injury. Laryngoscopy was done for each patient using both Macintosh and McCoy laryngoscope and the best view obtained in each scope was graded. The results was that the McCoy was better when compared with the Macintosh. McCoy improved the Macintosh grade by 1 grade in 41% and 2 grades in 8% .The study concluded that suspected cervical spine injury patients should be intubated using a McCoy than a Macintosh laryngoscope.[7]

**Jain et al.,** had done a randomised study and the effectiveness of McCoylaryngoscope and video laryngoscope in simulated cervical spine injury is compared. They randomly divided 60 patients who had ASA 1 and 2 into two equal groups. Using a rigid cervical collar the cervical spine was immobilized. The data was compared using the Cormack-Lehane (CL) laryngoscopic view, and IDS(Intubation difficulty score) scale, time taken for glottis visualization,total time to intubate, number of optimizing maneuvers, time taken to pass endotracheal tube, and hemodynamic variables among two groups.IDS score was significantly less in the video laryngoscope group compared to the McCoy group.

They concluded that video laryngoscope was more effective inmanagement of the airway in a cervical spine patients with a cervical collar.[4]

**Ali et al.,**compared McCoy, Macintoshlaryngoscopes andKing Vision video laryngoscope, in immobilized cervical spine patients. 90 patients of ASA grade I-II were included in this study whose cervical spine was immobilized using manual inline stabilization(MILS)technique.Patients were divided into 3 groups intubation was done depending on the patient's group to which they were assigned. Once the best possible view of the glottis is obtained, the percentage of glottic opening (POGO) score and the Cormack-Lehane laryngoscopy gradewere assessed. The time taken for intubation, the difficulty score of intubation, the success rate of intubation, haemodynamic parameters and complications of Airway were recorded. They found that King Vision video laryngoscopewhen compared with the McCoy and Macintosh laryngoscopes reduces the intubation difficulty score, improvesthe POGO score and the Cormack and Lehaneglottic view. They concluded that the use of a King Vision video

laryngoscope when compared to Macintosh and McCoy laryngoscopes resulted in better glottis visualization,higher first attempt success rate, easier tracheal intubation in immobilized cervical spine patients.[10]

**Moningi et al**., has done arandomized prospective study and compared Airtraq video laryngoscope andMcCoy laryngoscope in patients who underwent anterior cervical discectomy and fusion (ACDF) surgery. 40 patients of ASA I and II who undergoes single level ACDF surgery was selected. Cervical immobilization was done in all patients with a help of neurosurgeon either witha rigid cervical collar or a skeletal pin traction along with Manual in-line stabilization (MILS) . Patients were randomly divided in two groups Group A(Airtraq video laryngoscope) intubation or Group B intubation(McCoy). The intubation time, IDS (intubation difficulty score) ,comfort grading and hemodynamic parameters were noted after intubation. The result showed that Airtraq minimizes the intubation time with stable haemodynamics and improved the glottic visualization grade with minimal assistance.[11]

**Kilicaslan et al**., has done a randomized study to compare the effectiveness ofMacintosh Laryngoscopes (ML),Conventional C-MAC and C-MAC D-Blade in simulated easy airway and difficult airway. Twenty six experienced anaesthesist performed intubation in a LaerdalSimMan manikin with each of the laryngoscope in three scenarios: (1) normal airway, (2) immobilized cervical spine, and (3) tongue edema. The time taken for intubation , number of attempts taken to intubate,

success rates and severity of dental compression were noted. They concluded that in immobilized cervical spine scenario C-MAC D-Blade was betterthan the conventional C-MAC and ML and caused less dental pressure. In the third scenario the conventional C-MAC performance was better than the C-MAC D-Blade and ML. [12]

**Bharti et al.,** has done a prospective randomised study and compared McCoy laryngoscope,TruView video laryngoscope, and Macintosh laryngoscope in patients with immobilized cervical spine for tracheal intubation. Sixty adult patients of ASA grade I-II who undergoes elective cervical spine surgerywith immobilized cervical spine were included in the study. The patients were randomly divided into 3 groups. The bestview of the glottis was graded with, the Cormack-Lehane laryngoscopy grade and POGO score were assessed. The time taken for intubation,the intubation success rate, the intubation difficulty score,and the hemodynamic parameters and any complications of airway were recorded. They concluded that the TruView laryngoscope had better glottis visualization, easy tracheal intubation, and had increased first attempt success rate when compared with Macintosh and McCoy laryngoscopes in patients with immobilized cervical spine.[13]

# ANATOMY[14]

## Vertebrae and its General Characteristics:

A vertebra consists of an anterior segment, the body, a posterior segment and the neural arch or vertebral arch. All these encloses the vertebral foramen, which forms a canal for the spinal cord protection. The neural arch consists of a pair of laminae,a pair of pedicles, and supports 7 processes – 4 articular process, 2 transverse process, and 1spinous process.The intervertebral foramina is formed between pair of vertebrae, one on either side, which allows the transmission of the spinal vessels and nerves.

## THE CERVICAL VERTEBRAE (VERTEBRAE CERVICALES)

The smallest of the vertebrae are the cervical vertebraes, and can be easilydistinguished by a foramen in each transverse process. The first cervical vertebrae, second cervical vertebrae, and seventh cervical vertebrae has exceptional features and are describedseparately. The following are common characteristics for the remaining four vertebrae.

The body is small and broad from the side .It has a flat anterior and posterior surfaces. Its inferior border of the cervical vertebrae is prolonged downward, to overlap the superior and forepart of the following vertebra. The superior surface is concave transversely, and which has a projecting lip on either side. The inferior surface is convex from sides, concave from backward, andlaterally it has shallow concavities were it receives the corresponding projecting lips of the adjacent vertebra.

The pedicles are placed lateral and backward. The pedicles attaches in the middle of the body between upper and lower border, The superior vertebral notch are as deeper as the inferior and they are narrow. The laminae is thin and narrower above. The vertebral foramen is a large triangular foramen. The spinous process are bifid and short and its divisions are of unequal size. The superior and inferior articular processes fuses on either sides to form an articular pillar. It is directed lateralward from endpoint of the pedicle and lamina. The articulating facets are oval and flat. The superior facet is directed backward, upward and medially and the inferior facetis directed forward, downward and laterally.

The transverse processes are pierced by the foramen transversarium, which allows the passage of the vertebral artery and vertebral vein and a plexus of sympathetic nerves in the upper six vertebrae. Each transverse process has 2 parts an anterior and a posterior . In the thoracic region The anterior part is the homologue of the rib, and hence it is named the costal process. The costal process are formed form the sides of the body and is projected laterally in front is the foramen and ends is a tubercle named the anterior tubercle. The posterior part of the transverse process, which springs from the vertebral arch and behind the foramen and is projected forward and laterally. It ends at a flat vertical tubercle which is known as the posterior tubercle. These 2 parts form a deep sulcus which allows passage of spinal nerve.

**FIRST CERVICAL VERTEBRA:**

The first cervical vertebra(figure 1)is also called as the atlas as it supports the skull. Its peculiar features are - has no body, no spinous process. The first vertebrae is ring-like, and has 2 archsan anterior and a posterior arch and 2 lateral masses. The anterior arch forms about one-fifth of the ring circumference is formed by the anterior arch and two-fifths of the ring circumference is formed by the posterior arch and behind in the posterior tubercle it ends, which forms the rudiment of thespinous process. The size of the first cervical process is small which prevents any movement interference between the atlas and the skull.

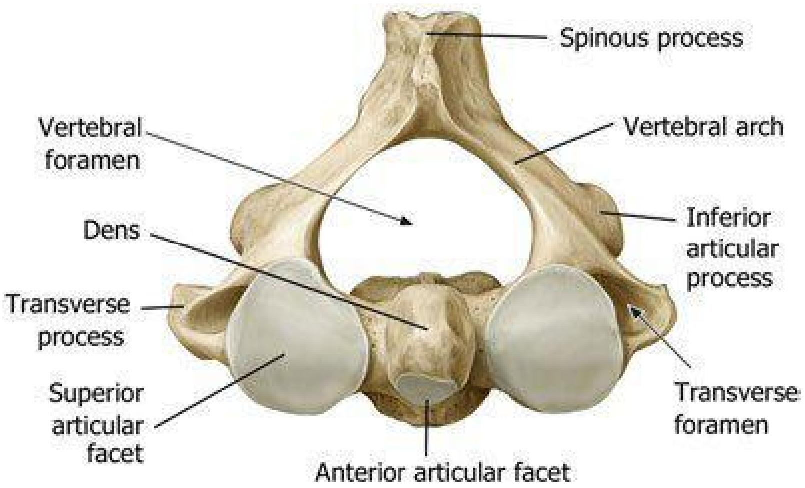



**Figure1: First cervical vertebra**

**SECOND CERVICAL VERTEBRA:**

The $2^{nd}$ cervical vertebra (figure 2) is also known as axis because it acts as a pivot on which the first vertebra which carries the skull rotates. The most characteristic feature of $2^{nd}$ cervical vertebra is the strong odontoid process. From the upper surface of the bodyrises perpendicularlyis the odontoid process. The odontoid process exhibits a cone like constriction at the neck, where it merges with the body. The vertebral foramen is bigger, but smaller when compared to the atlas.

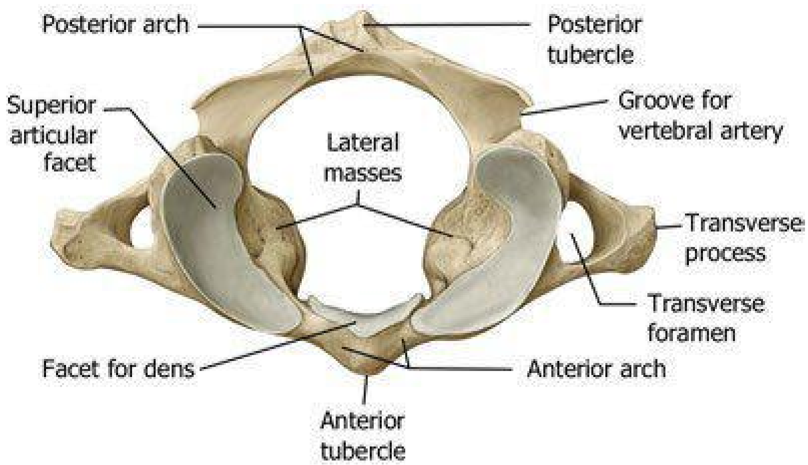



**Figure 2 : Second cervical vertebra**

## THE SEVENTH CERVICAL VERTEBRA:

The 7th cervical vertebra (figure 3) has a long and prominent spinous process which is charcterstic and hence called as vertebra prominens. It is thick and horizontal indirection. It does not divide but ends in a tubercle to where the ligamentumnuchae is attached in its lower end.

The transverse processes of the 7th cervical vertebrae are of considerable size. unusually anterior root of the transverse process is large and it exists as a separate bone which is called as a cervical rib.

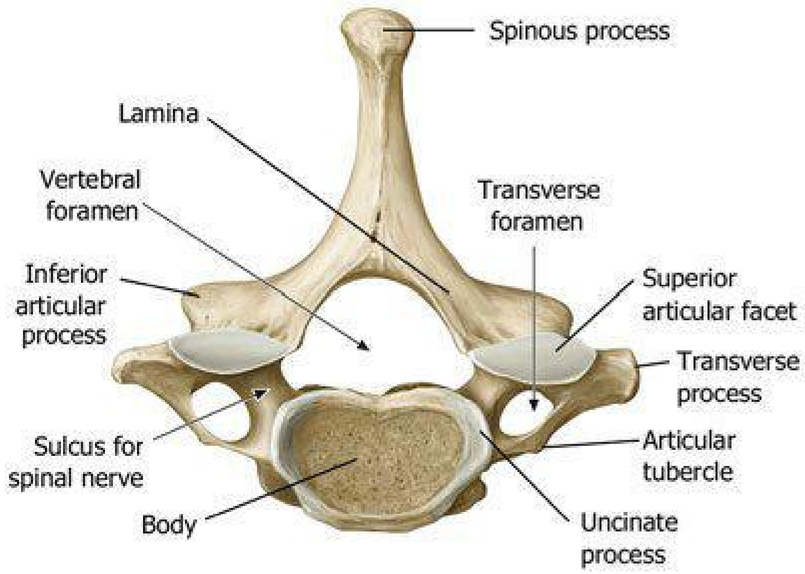



**Figure 3: Seventh cervical vertebra**

## ADULT CERVICAL SPINE: INJURY,STABILITY, AND INSTABILITY[15]

### The Upper Cervical Spine's movement and stability:

Both flexion and extension is permitted bythe atlanto-axial joint and the atlanto-occipital joint in the upper cervical spine. Limitation of flexion is due to the anterior border of the foramen magnumand due to posterior elementsand the odontoid processclose to the atlanto-occipital joint and the tectorial membranespresent atthe level of C1–C2. Limitation of extension is due the occiputs contact, superiorlythe posterior arch of the atlas and inferiorly the arch of the axis.

The ligaments that give stability to the upper complex are theapical,the transverse, alar ligaments and also by superior terminations of anterior and posterior longitudinal ligaments. Normal antero-posterior translation allowedby the transverse ligament is not more than 3 mm between the anterior arch of the atlas andthe dens . The spinal cord's (SAC) space in the vertebral column is reduced if there is any posterior displacement of the dens, this causes compression of neural elements which lead to myelopathy and neurological deficit.

**The Lower Cervical Spine and its Movement and Stability:**

In the lower cervical spine flexion and extension both occurs, with the C5– C7 segments being the largest contributing component. The structures contributing to the stability of lower cervical spine are,1) the anterior and 2)the posterior longitudinal ligaments, 3) the intervertebral discs, 4) the facet joints and their capsular ligaments 5) the intertransverse ligaments, 6)the interspinous and 7) the supraspinous ligaments. The PLL(posterior longitudinal ligament) and the structures lying anterior to it are called as the anterior elements or the anterior column. Those lying behind the PLL are the posterior elements or the posterior column.

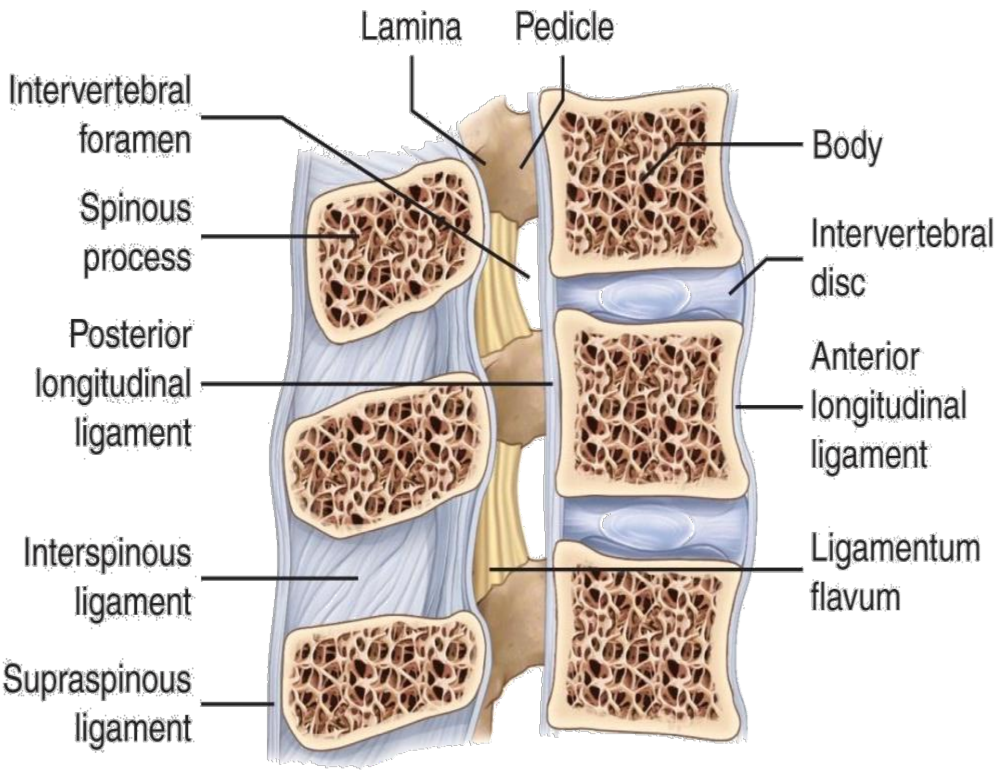



**Figure 4 :The ligaments of the lower cervical spine, sagittal section.**

**Cervical Spine Instability following a Injury:**

**Mechanisms and Consequences:**

**White AA et al.,**[16] defined stability as “the spines ability tolimit its displacement under physiological loads so that it doesn’t allow any damage or irritation to the spinal cord or the nerve roots.”

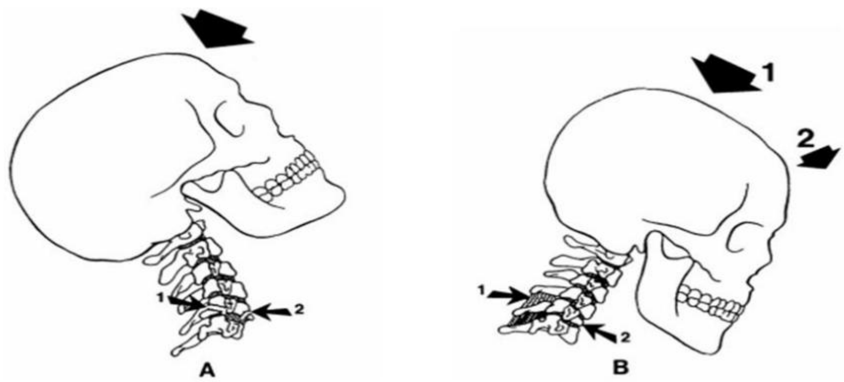



***Figure 5: Mechanism of*** **injuring force and resulting lesions. A) Acompressive hyperextension force resulted in distraction of the anterior column and compression of the posterior column. B) A flexion (large arrow 2),and compression (large arrow 1) force produces a wedge fracture of the body (small arrow 2) and an incomplete disruption of interspinous and supraspinous ligaments (small arrow 1)**

The anterior column gives more stability to the cervical spine in extension, and asthe posterior column gives stability in flexion. So, the anterior elements gets disrupted and injured in hyperextension, while the posterior elements gets disrupted and injured in hyperflexion. In extreme extension or flexion both columns may get disrupted and injured (figure).

**Movements of Cervical Spine during a Direct Laryngoscopy of Normal Patients:**

**Sawin PD et al.,**[17]has studied the extent, nature and the segmentalcervical motion that occur during a direct laryngoscopy and tracheal intubation in normal individuals. 10 patients who underwent direct laryngoscopy during general anesthesia were included in this study. The Sequence of intubation was divided into stages and the fluoroscopic images were recorded. There was a minimal displacement of the base of skull and movement of cervical vertebral bodies were noted during laryngoscope insertion. Laryngeal visualization during direct laryngoscope causes rotation of the occiput and C1superiorly in the sagittal plane and minimal inferior rotation of the C3–C5 vertebrae. The displacement pattern showed extension at each segment with the most notable motion being happening in the atlanto-occipital and the atlanto-axial joints. The study showed that during tracheal intubation the cranio-cervical junction had slight additional superior rotation but minimal alteration at C3–C5 segments.

**Horton WA et al.,**[18]**has** conducted a similar study in individualsusingtopical anesthesia alone. voulnteers underwent direct laryngoscopy in a supine position, at point full glottic exposure, a lateral x-ray of the head and neck was done. The radiographs showed extension that occurs at the cranio-cervical junction was maximam and he also noted that the extension was progressively increasing from C4 vertebrae to the base of the skull during a direct laryngoscopy.

**Determination of the Stability of the C- Spine aftera Injury:**

Instability of spine often results in displacementof the vertebrae and it is noted in radiograph in many instances. **White and Panjabi**[19] has studied the maximum limit of displacement of vertebrae and noted that it is beyond the physiologic range. The result concluded that a normal adult cervical spine will allow horizontal motion not more than 2.7 mm between the vertebrae. So, if horizontal displacement more than 3.5 mm or if displacement was 20% of the vertebral body width is seen on lateral x-ray of the neck, the spine is considered unstable. In an angular displacement, the maximum limit of physiologic angular displacement is 11°, If more angulation is noted than the physiologic displacement, the spine is termed unstable at the site of maximum rotation of vertebra.

The NEXSUS(National Emergency X-Radiography Utilization Study) has listed the following injuries 1)fracture of spinous process,2) wedge compression fracture with loss of 25%or less vertebral body height 3) type 1 fracture of odontoid,4) fractures of vertebral end plates,5)isolated avulsion fractures of the vertebrae without ligamentous injury, 6) trabecular fractures and,7)Osteophyte fracture and isolated fractures of transverse process as not clinically significant.20

The Canadian Computed Tomography of the Head and Cervical Spine Study has listed the following injuries as not significant 1) simple fractures of osteophyte , fractures of thespinous process, fractures of transverse process and compression fractures were loss of vertebral body height is less than 25% as not clinically significant.[21]

**Mechanism of Spinal Cord Injuries:**

Injury of spinal cord can be primary or secondary. Primary injuries are due to shear, distraction or compressive forces, which usually avulse and devitalize the tissues. Persistent compression of the spinal cord due to fracture and dislocation leads to ischemia. The spinal cord is injured by a bony fragment or missile injury which resulted in a spinal cord laceration or contusion.[22] Secondary spinal cord injuries which are progressive , may be due to result of local perfusion deficits,which can be due to vascular compression like edema or due to compromise of global perfusion due to systemic hypotension. In addition to above cause, tissue hypoxemia due to hypoventilation, which is due to head or cord injury or due to primary lung trauma may lead to secondary spinal cord injury. Lastly, at the cellular and subcellular level there are various mechanisms that may lead to exacerbation of the injury which resulted in an extension of the deficit clinically.[23]

**Biomechanics of the Spinal Canal and the Spinal Cord:**

For the normal functioning of the spinal cord, a minimal canal lumen is needed at its rest and during the movement. Compromise of the cord occurs when the canal space that is required for the normal cord function is less. Neurologic injury occurs when there is a persistent reduction in the canal space and sustained mechanical pressure on the cord, which leads to deformation of anatomy and ischemia. Thespinal canals functional size can reduces further with movement. The spinal column has relatively fixed volume.[24]As the spinal canal lengthens, its cross-section area is reduced, and asspinal canal is shortened, its area will increase; this phenamon is called the Poisson effect. During flexion, the length of the canal increases and its area reduceses; and the cord stretches. The Poisson effect is that the lumens of both the spinal canal and the spinal cord narrows as they lengthen. The spinal cord can tolerate a certain degree of elastic deformation and there by maintaining thenormal neurologic function. During extension, length of the spinal canal decreases and the area increases;while the spinal cord is shortened. Canal widening happens as dictated by The Poisson effect.

**Methods of cervical spine immobilisation:**

**PodolskySet al.,**[25]has done the efficacy study of cervicalspine immobilizationtechniques. Hard foam and plastic collars were found to be better than soft collars in immobilization of cervical spine motion. The collars alone has not restrictedthe spinal motion effectively. The useage of sandbag-tape immobilization has been more effective in reducing spine movement than any other immobilization technique. Philadelphia collar in addition to the sandbag–tape reduces neck extension and was effective than anyother method of immobilisation.

**Bednar DA**[26]assessed the effectiveness of immobilisation using different collars like soft, semi rigid andrigid collars on a destabilized elderly cadaver . when these collars were used to restrict the neck movements and when subjected to unrestrained gravitational forces and found that the collars were not so effective in reducing spine movement.

**Goutcher and Lochhead**[27]has done a study and measured the maximum mouth opening distance (interincisor distance) in 52 individuals using 3 different semi rigid collars, beforeand after its application. Three collars were 1) the Stifneck collar(Laerdal Medical Corp., Wappinger's Falls, NY), 2**)** The Miami J collar (Jerome Medical, Moorestown, NJ) and 3) The Philadelphia collar (Philadelphia Cervical Collar Co., Thorofare, NJ). There was a huge variation and significant reduction of interincisor distance to less than 20 mm after application of the collar. The mouth opening was reduced to 25% in stifneck collar ,while it was 21%in Miami J collar and Philadelphia collar. They result concluded that a semirigid collar will significantly reduces the mouth opening and would interfere in its airway management. The study suggests removal of the anterior portion of the collar while attempting a tracheal intubation.

**Manual In-line Stabilisation (MILS)**

The aim of Manual In-Line Stabilisation(MILS) technique is to give effective force to restrict the movement of the head and neck during medical interventions, primarily during airway management. MILS is a technique which typically needs an assistant positioned at the headend of the bed or either at the side facing the head of the bed. The patient should be positioned in supineposition,whilethe position of head and the neck is kept in neutral position. The Assistant will assist by grasping the mastoid process with their fingers and support the occiput with their palms (head-of-bed assistant) or the assistant supports the mastoids while grasping the occiput with fingers(side-of-bed assistant). While applying MILS technique , the anterior portion of rigid cervical collar is removed so that it allows maximum mouth opening,there by facilitating easy airway interventions. During a direct laryngoscopy, the assistant should give forces which areequal and opposite in direction to the force generated by the laryngoscopist to maintain the head and neck in its neutral position. It is important to avoid traction forces while performing MILS technique, when there is a gross spinal instability due to a serious ligamentous injury.

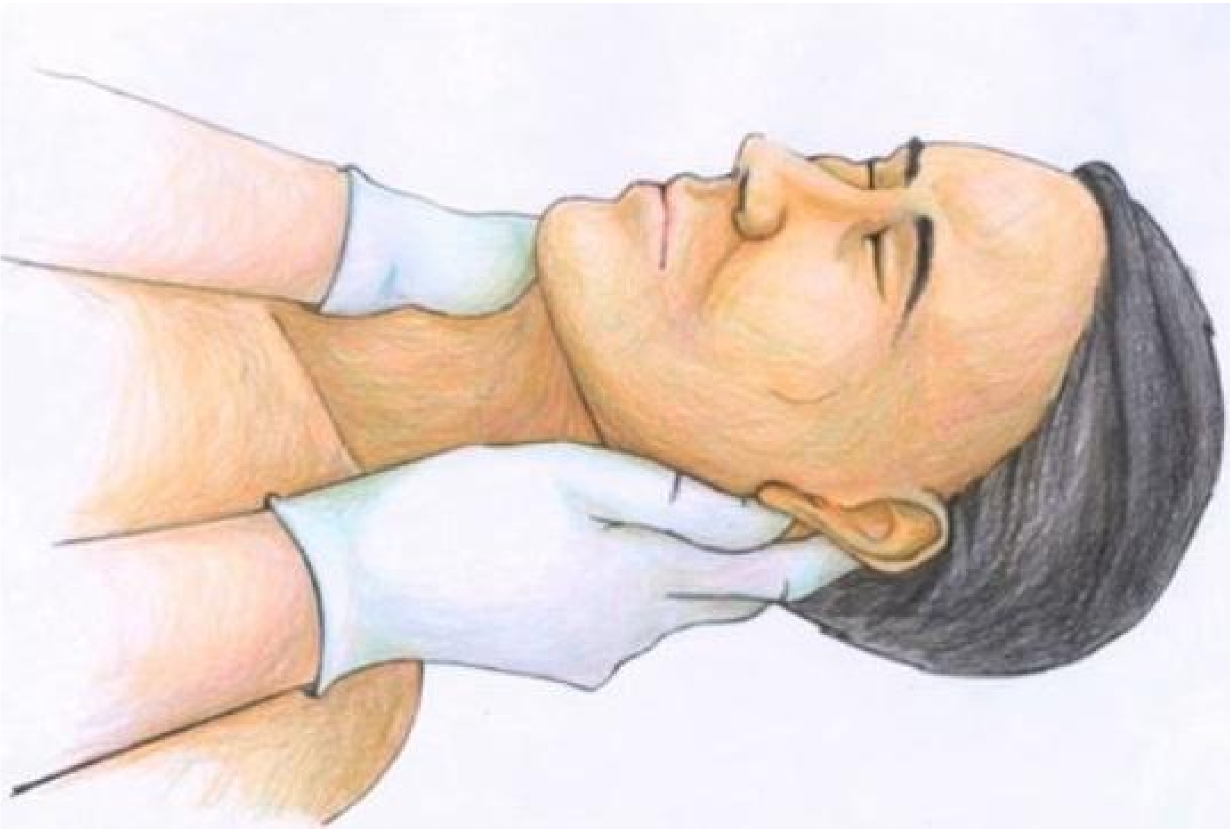


**Figure 6 : Manual In Line Stabilisation (MILS)**

**Majernick et al.,**[28]assessed the movements of cervical spine in normal patients during trachealintubation with laryngoscopy. They found that MILS technique reduces the movement of spine significantly during the direct laryngoscopy andorotracheal intubation. However the collar were not effective as MILS in reducing the movements of spine.

**Watts AD J et al.,**[29] has done a study on the spinal movements and measuredthe amount of reduction in movement of spine on performing MILS technique during orotracheal intubation in normal spine individuals during general anesthesia.

**Lennarson PJ et al.,**[30]has studied in a model with complete segmental instability of C4-C5 and assesed the efficacy of MILS and Gardner-Wellstraction. They have done a study on the segmental angular rotation, distraction and subluxation at the level C4-C5 injury. Measurement of movements were recorded using a video fluoroscopy. Traction method significantly increases distraction but reduces angular rotation and eliminated subluxation effectively . MILS method eliminated distraction effectively and minimized the angulation while subluxation increased considerably. Orotracheal intubation done without MILS or Gardner-Wells traction techniquehad intermediate results were distraction is less than traction, subluxation is less than immobilisation, but angulation increased compared on either intervention.

**Gerling MC et al.,**[31] evaluated in a cadaver model with unstable C5-C6 and studied the effect of immobilisation using MILS and cervical collar during direct laryngoscopy. MILS method allowed minimal displacement (2mm) when compared toimmobilisation with cervical collar, The amount of movement was minimal and within the physiological limits. MILS also had a improved laryngeal visualisation.

**Impact of MILS on the View Obtained at Laryngoscopy:**

MILS method during airway maneuvers had minimal impact on the view obtained, when a direct laryngoscopy is performed thananyother immobilization techniques like axial skeletal traction or a cervical collar immobilisation, tape and sandbags. **Heath KJ et al**.,[32] studied the effect of laryngoscopyin 50 patients with 2 different immobilization techniques. The C-spine was immobilised with a rigid hard collarand with tapes across the forehead and on either side of the neck with sand bags. Patients immobilized with a rigid collar, tape and sandbags, 64% had a CL grade 3 or 4 laryngoscopic viewcomparetively patients stabilized with MILS had 22%.When MILS technique was performed other than any other methods like the rigid collar, tape and sandbags the laryngeal view significantly improved by one grade in 56% and by two grades in 10% of patients.The main contributing factor for difficult laryngoscopy in patients wearing cervical collars was minimal mouth opening.

**Hastings RH and Wood PR**[33]evaluvated the degree extension of head neededfor exposure of the arytenoid cartilages and glottis and accounted the impact of MILS method applied. 31 patients with normal c-spines and who had Mallampati score 1 mouth opening were involved in this study. Immobilization was done using two methods, Either axial traction was given, where the assistant pulls the head from caudal to cephalad direction or traction was given to the head in a downward direction and held the head onto the table. The best glottis viewwithout stabilization was achieved on 10°–15° of head extension,while with immobilization extension angles were only 4°–5° and it was more effective than axial traction immobilization in limiting extension. Therefore, it was found that use of MILS method reduces the head extension which was necessary for direct laryngoscopy but had poor view of glottis.

**Wood et al.,**[34]determined the effectiveness of cervical stabilization maneuvers by theview obtained during laryngoscopy in 78 elective posted patients and concluded that laryngoscopic view worsened on cervical immobilization . The impact of MILS method on laryngeal view were the same as reported by Hastings but was more common in Wood’s study. Anterior laryngeal pressure or cricoid pressure often improves the laryngeal view when the neck was immobilized.

**Laryngeal view:**

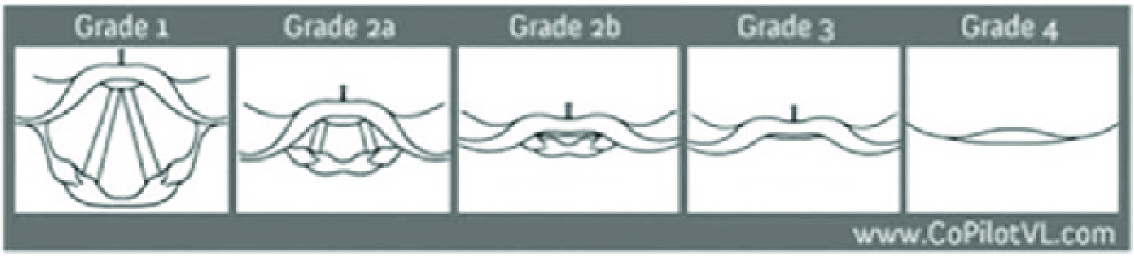
**Cormack and Lehane**[35] in 1984 has described a scoring system which was four grade scoring method to report the laryngeal view acquired with the Macintosh laryngoscope. Several other authors have mentioned the modification of four grade Cormack-Lehane grading to 5 grade. Yentis and Lee has suggested a modification and made a change with the subdivision to grade 2 of the original grading and with no other changes in the rest of the grades[36] .

This small modification gives less confusion for anaestheteist who uses the Cormack-Lehane scores and yet MCLS gives better knowledge about increased difficulty in laryngoscopy and intubation.

**Grading was as follows:**

- Grade I : Full view of vocal cords
- Grade 2A : Partial view of the vocal cords
- Grade 2B: Only arytenoids seen
- Grade III : Only epiglottis visible
- Grade IV : Neither glottis nor epiglottis visible

**MODIFIED CORMACK-LEHANE GRADING:**




**Grade 1:A full view of glottis**

**Grade 2: 2a.part of the cords are visible**

**2b:only the arytenoids or very posterior origin of the cords are visible**

**Grade 3:Only the epiglottis is visible**

**Grade 4: No glottis structure visible.**

**Figure 7: Modified Cormack and Lehane classification of laryngoscopic view**

The MCLS(Modified Cormack and Lehane Score) grading not only gives more information on laryngoscopic views, it identifies a sub-division from the Cormack-Lehane Grade 2 which was difficult to manage. This grading is thus more useful to identify a potential difficult intubation.

## THE INTUBATION DIFFICULTY SCALE (IDS)[37]

**Frederic Adnet et al.,**in 1997 studied and reported an Intubation Difficulty Scale (IDS) score marking the complexity of orotracheal intubation in both the pre-hospital and operating theatre setup. The IDS score is used to ascertain the degree of difficulty.

The Intubation Difficulty Scale (IDS) score is a combination of seven parameters, resulting in a increasing, quantitative evaluvation of intubation complexity.

The seven variables are :

**$N^1$-** Number of intubation attempts.

An attempt is defined as single advancement of the tube to the glottis in its direction during direct laryngoscopy.

$N^1 = 0$ if only one attempt.

Every extra attempt adds to one point.

**$N^2$-**The number of assistants required.

It represents the number of extra persons directly performing intubation.

$N^2 = 0$ if only one operator.

Every extra individual adds one point.

**$N^3$-**The number of different techniques used.

Change in approach method - oral intubation or blind nasotracheal intubation, change in material – laryngoscope blade, endotracheal tube, additional use of stylette. Each diferent technique adds one point.

**$N^4$-**Glottic exposure as explained by the Cormack grade minus one.

Grade I ($N^4 = 0$)

Grade II ($N^4 = 1$)

Grade III ($N^4 = 2$)

Grade IV ($N^4 = 3$)

Glottic view is assesed by the first operatorduring the first attempt .

**$N^5$**- Lifting force given during laryngoscopy.

$N^5 = 0$ if little effort is necessary

$N^5$ = 1 if subjectively increased lifting force is necessary.

**$N^6$-** External laryngeal pressure applied for optimized glottic exposure.

$N^6$ = 0 if no external pressure is applied.

$N^6$ = 1 if external laryngeal pressure is necessary.

**$N^7$-** Vocal cords position during intubation.

$N^7$ = 0 if vocal cords are in abduction.

$N^7$ = 1 if the vocal cords are in adduction.

The degree of difficulty is explained according to IDS score as follows

| IDS SCORE | DEGREE OF DIFFICULTY |
|---|---|
| 0 | Easy |
| 1 – 5 | Slightly difficult |
| >5 | Moderate to major difficulty |
| Infinity | Impossible intubation |

## LARYNGOSCOPE

Sir Robert Macintosh and Sir Ivan Magill in 1940 familiarized the visualization of the vocal cords during intubation using laryngoscope. Laryngoscopes are categorised broadly into 2 categories:

1. Direct line of sight devices – hard lighted retractors which retracts the tissues to create direct view. It is known as Direct laryngoscope.

2. Indirect line of sight devices – optical laryngoscopes which has fibreopticbundle,lens, prism or miniature camera that transmits image. It is known as Indirect laryngoscope. It is subdivided as follows :

    a. Rigid optical laryngoscopes – The image transmitting system is wrapped in a rigid structure.
    b. Flexible endoscopes – The visualization bundle, light transmitting bundle and an optical channel are enclosed in a flexible casing.[38]

Rigid laryngoscope has a detachable handle and a blade. The light source is either in the handle with a light guide in the blade or a lightattached to the blade. A hook shape is used to hinge the connection between the handle and the blade . A single piece laryngoscope has a switch on the handle to control the power to lamp.

**Handle**

Handle is the part that is held with hand during laryngoscopy. The power for the light is supplied by the handle. The source of power is either non-rechargeable or rechargeable batteries. Illuminated-fiberoptic laryngoscopes use a distant electrically operated light source. Most handles are designed to accept eitheronefibreoptic-illuminated or lamp-in-bulb blades, but some handles can accept both. Handles designed to insert blades which have a light bulb in it will have a metal contact, which forms an electrical circuit when the handle and the blade are at working position. Handles which had batteries and use fibreoptic illumination had a halogen lamp bulb. When the handle and the blade are locked at working position, an activator switch which illuminates the light will be depressed. It will provide a connection between the bulb and the batteries. Handles of variable sizes are available. The surface of handle is usually rough for better grip.

Short handles can be advantageous for patients in whom the chest or breasts comes in contact with the handle during use, when applying external cricoid pressure or when the patient in a body cast. Other technique is to introduce the blade laterally into the mouth, and then to advance and rotate it until the blade is in a mid-line. Most of the blades form a 90 degree angle to the handle when it is ready for use, while acute or obtuse angle is also possible. An adapter may be fitted between the handle and the blade to allow the angle to be altered.

**Blade**

The blade is the portion that is inserted into the mouth. Blades are available in different sizes, number of the blades increaseswith size. The blade compraisesof several parts, which are the base, heel, tongue, flange, web, tip and light source. The base is the one which gets attached to the handle. It has a slot which engages the hinge pin to the handle. The termination of the base is called the heel.

The tongue (spatula) is the shaft and it compresses and manipulate the soft tissues like lower jaw and tongue. The long axis of the tongue can be straight or curved in part or throughout its length. Blades are designed straight or curved, depending on the shape of the tongue.

The flange are the one that projects off the side of tongue. It connects to the tongue by the web. It helps to guide instrumentation and also by deflecting the tissues from the line of vision. The flange determines the cross-sectional shape of the blade. The vertical height of the cross-sectional shape of a blade is so referred to as the step.

The tip contacts the epiglottis or the vallecula and by so directly or indirectly elevates the epiglottis. The tip is blunt and thick to decrease trauma. The blade has a fibre-optic bundle or a illuminator that transmits light from a source in the handle. The illuminator fits into a screw socket which has a metallic contact.[39]

**McCoy blade[40]**

The McCoy blade vary from the usual curved blade in 4 features. It tip is hinged , has a lever at its proximal end, a spring loaded drum and a connecting shaft.

**The hinged tip -** Thehinge is placed at 25 mm proximal to the tip of normal blade. The flange is curved, so the adjustable tip rests with the blade in resting position. So the pressure exerted at the tip will be transmitted down to the long axis of the flange and not to the hinge.

**The proximal lever** – is 15.5 cm in length and 1 cm wide and is inthe proximal end of the blade. The lever is connected to a spring loaded drum by a pin through the flange.Thespring loaded drum lies within the left side of flange. The spring works in a clockwise manner when seen from the left side.

**The connecting shaft -** It links the spring loaded drum and the hingedtip. It is 10 cm in length. It is concave upwards and cut so that it doesnt impinge on the bulb. At the distal part it is linked to the hinge tip with a 1.5 cm wire, soldered to the shaft connecting proximally, bent distally to 90" and inserted into a hole in flange of the hinge. The connecting shaft joins proximally the spring loaded drum through a second hinge. The modified blade weighs 170 g. The blade fits to a standard Penlon handle.


**Figure 8: McCoy blade Laryngoscope**

**Use -** The blade fits to a standard laryngoscope handle. The handle isgrasped usually with the lever, it lies posterior to the thumb and the thumb can be moved posterior to the lever to its long axis. Pressing the lever towards the handle makes the spring-loaded drum to rotate anticlockwise direction. This rotational movement allows the connecting shaft to move forwards along the blade. At the tip, the forward movement of the connecting shaft pushes the wire forwards which results in elevation of the hingetip. Release of the lever permits the spring loaded drum to return the connecting shaft and thereby the hinge tip rest in position.

**VIDEO LARYNGOSCOPES**

A video laryngoscope functions by attachment of a video system to a flexible fiberscope or an optical stylet.

The advantages are

- Display magnifies the structures and viewing angle is increased.
- The operating person and assistant can coordinate their movements easily.
- The laryngoscopic view obtained can be projected , which allows the supervisor to monitor the intubation process and its been a good teaching tool.
- The process of intubation can be recorded.
- It helps in placement of bougie , movement of vocal cord can be observed post thyroid surgery, verify the position of tracheal tube.[39]

## HUGEMED VIDEO LARYNGOSCOPE

Hugemed video laryngoscope was designed and manufactured by the Hugemed, co.ltd (Shenzen , china) in 2000.HugeMed video laryngoscope is developed with advanced technology, has high resolution screen with 2 millon mega pixel compared to similar products, view clearly, safe operation , more flexible; anti fog function without preheating can; body is made up of lightweight material, simple to operate, easy to hold, safe and efficient, can get the optimal view of glottis, while reducing the probability of injury to larynx caused during intubation;

**Clinical advantage:**

- It gives clear visualisation of the glottis and reduce the damage caused to the laryngeal tissue during operation
- It has Unique anti fog function, without preheating, and saves time during emergency intubation operation
- It has three LED light source lighting, which is unique and gives more clear vision
- Battery capacity is 3200mAh; which gives usage for more than 200 minutes;

**Product features:**

- It has 3.5 inches LCD high-definition display full view ; screen rotates around 90 degrees backlight LED; resolution of screen 640*480

- High-definition anti fog camera, field of view 66 degrees, without dead angle Illuminance upto 800LUX
- Handle is ergonomically designed to feel comfortable to handle, has antibacterial coat, and light source;
- The battery is made of high quality lithium-ion rechargeable battery, which can be used contiously for more than 200 minutes.
- One touch quick camera; continuous display camera; data can be stored.
- The lenses are high-definition polymers,which are medical PC material

**Figure 9 :Hugemed  laryngoscope**

**Intubation procedure with hugemed video laryngoscope**

When it is used as direct laryngoscopy, the intubation procedure with Hugemed video laryngoscope is same as the conventional Macintosh laryngoscope. The laryngoscope is entered into the right side of the mouth, the blade flange moves the tongue to the left , the blade tip is pushed in upto valecula, and then the video laryengoscope is lifted to view the larynx .If a the laryngeal view obtained is poor, optimization maneuvers like external criciod pressure and adjustment of blade position are done. According to operators preference tracheal tube is inserted and when required uses a stylet and the bend angles of the styletted tube.

A midline insertion technique without moving tongue can give an unobstructed view of the larynx. Stylete is not required every time but it helps in bringing tip of the tube up to the glottis, especially in difficult airway.

**VanZundert A et al**.,[41]compared Macintosh laryngoscope blade with differentvideo laryngoscopy in patients who had normal airway. The study resulted that a stylet is required in 10% C-MAC, 76% in MCGrathand 60% inGlidescopevideo laryngoscopes.

**Gupta N et al.,** assessed C-MAC video-laryngoscope,use with or without astylet for tracheal intubation in immobilized cervical spine patients. Theresults showed that patientswho underwent elective cervical spine surgery in whom head and neck was stabilized by MILS technique, the stylet use significantly reduces the IDS score, the time taken for intubation and the use of gum-elastic bougie[42]

**Performance of video laryngoscope versus direct laryngoscopy**

**Normal airways**

The video laryngoscope was mainly designed to overcome difficult intubation with direct laryngoscopy. Use of a video laryngoscopy in all patients, would increase experience and skill, the number of attempts of intubation and complications due to multiple attempts would decrease and care of patient would improve.[43-44] comparing the benefits of direct laryngoscope and video laryngoscope in one device ,which make video laryngoscope as a standard intubation tool for airway management.

3 observational trials were made comparing direct and indirect (video monitor) laryngeal visualisation using a V-MAC or C-MAC video laryngoscope in a normal airway adult patients. These studies conculeded that compared with direct laryngoscope, video-assisted laryngoscopy had an improved laryngeal view.[41,45,46]

**Cavus E et al.,**[47] has done a randomized, controlled study and compared the video laryngoscope with direct laryngoscopy in during routine induction of anaesthesia in 150 patients. They opined that video laryngoscope provide better laryngeal views than a direct laryngoscope. The intubation time was comparatively less in video laryngoscope than in between direct.

**Sarkılar G et al.,**[48] compares hemodynamic responses to oro-trachealintubation done with video and direct laryngoscope in patients who were scheduled for major cardiac surgery. The study compared Macintosh laryngoscope and video laryngoscope and demonstrated that video device offers a better laryngeal view and a longer time of intubation, but the number attempts has decreased.

**Purugganan RV et al**.,[49] retrospective analysis comparing videolaryngoscopy and a direct laryngoscope for intubation with double-lumen endotracheal tube . They assesed using Macintosh laryngoscope and video laryngoscope in patients without any predictors of difficult intubation and concluded that video device provided a satisfactory laryngeal view and improved the ease of procedure.

**Difficult airways**

Video laryngoscopy has become abruptly a first-line management for potential and occasionally encountered difficult intubation. Many current algorithms for difficult airway management recommends video laryngoscopy as a rescue plan for failed or difficult intubation with direct laryngoscopy.[50 - 52]

2 randomized control study compared V-MAC and C-MAC video laryngoscopes and its effectiveness versus direct laryngoscope for endotracheal intubation in patients, who had predicted difficult airways. They showedthat video laryngoscopy provide improved laryngeal views,had more successful intubations in first attempt, shorter laryngoscopy and time of intubation and decreased help of adjuncts.[53-54]

The patients with c- spine injury required semi-rigid cervical collar or MILS to prevent neck movements and it leads to poor view of larynx on direct laryngoscope and difficulty in intubation.[55]

**Byhahn C et al.,**[56]compared oro-tracheal intubation using videolaryngoscope and direct laryngoscope in patients ,who had simulated difficult airway and showed that video laryngoscope offer an improved laryngeal visualisation, but had non-conclusive benefits with regard to intubation time, number of attempts, intubation success rate and incidence of complications.

**Piepho T et al.,**[57]studied the performance of the video laryngoscopein 51 patients who had limited glottic view after use of Macintosh laryngoscope. In patients with unexpected CL grade 3 or 4 view with Macintosh laryngoscope, the laryngeal views improved significantly and successful intubation was performed with video laryngoscope in 49 patients (94%).

**Performance of video laryngoscope versus other devices**

**Lee AH et al**.,[58] a randomised single blinded study and comparesthe Bonfils intubation fiberscope and video laryngoscope in normal airways patient ,who neededorotracheal intubation . 44 patients with ASA I who were aged between 18 and 60 years and scheduled for elective surgery and who required endotracheal intubation were included in the study. Recordingof hemodynamic changes, laryngeal view, time taken for intubation andcomplicationd post intubation were done. They studied that the success rate of intubation at the first attempt showed no difference between the 2 devices, while intubation with video laryngoscope required a lesser time, and showed a significant attenuated hemodynamic responses.

**Ng I et al**.,[59]compared the McGrath video laryngoscope with the C-MACvideo laryngoscope for intubating adult patients who had potential difficult airways.130 patients withMallampati grade ≥3 requiring oro-tracheal intubation, were randomly diveded into two groups. Time taken for intubation, the laryngoscopic view obtained, the number of attempts, the intubation success rate, ease of intubation, haemodynamic responses and occurance of any complications was recorded. They implied that the C-MAC device allows quicker intubation , reduced number of intubation attempts and a had ease of intubation compared with the McGrath device.

**Brück S et al.,**[60] compared C-MAC withGlideScope video laryngoscopes inpatients with immobilized cervical spine disorders . 56 patients whom withASA 1- 3 posted for elective cervical spine surgery were taken up for study. Laryngelvisualisation, time for successful intubation, no of intubation attempts were noted. They said that Glidescope and C-MAC video laryngoscopes both provide comparable laryngeal views, while the C-MAC device had a higher first-attempt failure rate and required more intubation attempts and optimizing maneuvers.

**Yumul R et al**.,[61] conducted a randomised single blinded study and compared the video laryngoscope with a flexible fibreoptic device for intubation in immobilized cervical spine . 140 patients with ASA 1- 3 undergoing elective spinal surgery were selected for the study. Cormack-Lehane grade, POGO score, the time needed for successful intubation, intubation attempts, the need for other airway devices, hemodynamic changes, adverse effects, and any traumato airway are recorded. They suggested that the video laryngoscope has significantly reduced the times needeed to obtain laryngeal view and for successful intubation.

**Material and Methods:**

The study was done at Stanley medical college ,department of anaesthesiology from August 2019 to January 2020. Sixty patient of who have been assessed under American Society of Anesthesiologists (ASA) classification l and ll and who are between 18 to 60 years of age and who are scheduled for various elective neuro surgeries under general anaesthesia requiring endotracheal intubation are included in this study. Informed and written consent was taken from all the patients.

EXCLUSION criteria:

Patients who had Modified mallampatti class 3 and 4 score, thyromental distance 6, interincisor distance 3,body mass index 30, with risk of gastric aspiration(emergency surgeries),with relevant drug allergyand who have anticipated difficult airway were excluded from the study.

Preoperative assessment was done and airway assessment done. All patients were kept nil per oral (npo) for 8hrs previous to surgery. patients general conditions like ECG , pulse oximetry, non invasive blood pressure and end tidal carbon dioxide monitors were attached and values recorded.

60 patient was randomly selected and divided into group A and group B for tracheal intubation with McCoy laryngoscope or Huge med videolaryngoscope respectively.

After patients are preoxygenated with 100% oxygen for 3 minutes then Premedicated with intravenous glycopyrolate 5 mcg/kg,Midazolam 0.05mg/kg and Induction of anesthesia was done with fentanyl 2mcg/kg intravenously and thiopentone 3-4 mg/kg intravenously.After induction manual inline stabilisation(MILS) of cervical spine done. After assessing ability to intubate, atracurium 0.2mg/kg was infused intravenously and intubation was done. After manual ventilation with $0_2$ for 3 minutes .Intubation was done with McCoy for Group A and Huge Med laryngeoscope for group B by the same anaesthesiologist who is experienced in using both the laryengoscope. The POGO(Percentage Of Glocttic Opening)score(0 to 100%,100= full visualisation of glottis from anterior commisure to inter arytenoids notch,0= no visualisation even inter arytenoids notch is not seen).Cuffed endotracheal tube of size 7 to 8.5 mm is used according to appropriate size under direct vision is introduced into trachea and respiratory circuit was connected. Air entry was confirmed by capnography and chest auscultation. If attempt of first intubation failed, next intubation was made only after 1 minute of mask ventilation. Failure of intubation was considered if it could not be done in 3 attempts .Intubation was performed by experienced anaesthesiologist who had experience of more than 20 intubation in each device.

The number of optimization maneuvers required like (laryengeal manipulations, use of stylate) to facilitate intubation, number of attempts of intubation, the duration of successful intubation and its success rates were recorded. IDS(intubation difficulty score) IDS 0=easy intubation, score 1-5= slightly difficult, score 5= difficult, was calculated for outcome. Following intubation, Patients was mechanically ventilated till the end of surgical procedure and anaesthesia was maintained with desflurane or Sevoflurane in a mixture of oxygen and nitrous oxide. Immediately following tracheal intubation for 5 min, no other interventions was done and no other drug was administered.

## RESULTS:

A total of 60 patients for tracheal intubation randomized into group A with McCoy laryngoscope and group B with HugeMed video laryngoscope each 30 patients. Demographic profile and airway parameters(table) were comparable between the groups. All patients were intubated successfully.

1. **Comparison of age distribution among the study groups (N=60).**

| Age | Group A | Group B | Chi square | P value |
|---|---|---|---|---|
| **<20** | 1 (3.33%) | 1 (3.33%) | 0.522 | 0.971 |
| **21-30** | 10 (33.33%) | 11 (36.67%) | | |
| **31-40** | 7 (23.33%) | 5 (16.67%) | | |
| **41-50** | 5 (16.67%) | 6 (20%) | | |
| **51-65** | 8 (26.67%) | 7 (23.33%) | | |
| **Total** | 30 (100%) | 30 (100%) | | |

Among the study population, 3.33% belong to the age group <20 years in both groups, 33.33% of group A and 36.67% of group B belong to age group 21 – 30 years, 23.33% of group A and 16.67% of group B belong to age group 31 -40 years, 16.67% of group A and 20% of group B belong to age group 41 – 50 years, 26.67% of group A and 23.33% of group B belong to age group of 51 – 65 years. There was no statistical significance between the age groups among the study groups (P value= 0.971).

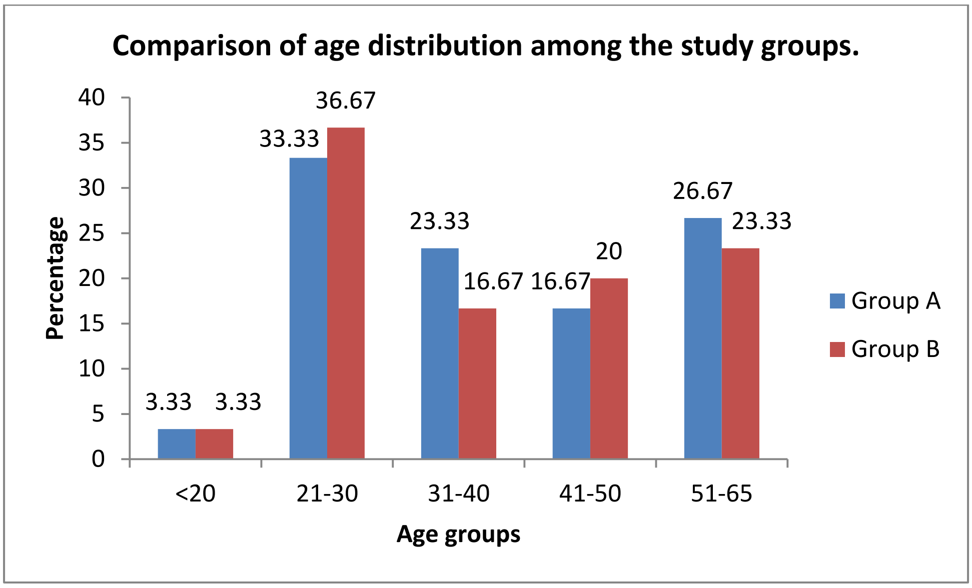



**Figure 10: Cluster bar graph showing comparison of age distribution among the study groups.**

## 2. Comparison of gender distribution among the study groups (N=60).

| Gender | Group A | Group B | Chi square | P value |
|---|---|---|---|---|
| **Male** | 21 (70%) | 18 (60%) | 0.659 | 0.416 |
| **Female** | 9 (30%) | 12 (40%) | | |
| **Total** | 30 (100%) | 30 (100%) | | |

Among the participants of group A, 21 (70%) were male and 9 (30%) were females. Among the people of group B, 18 (60%) were males and 12 (40%) were females. The difference between the gender distribution among the study groups was statistically not significant (P value 0.416).

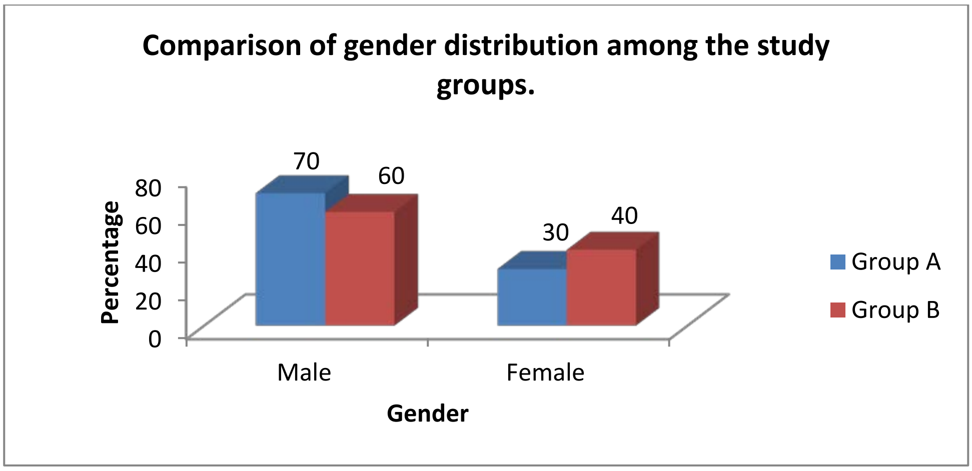



**Figure 11: Cluster bar graph showing gender distribution among the study groups.**

**3. Comparison of mean weight among the study groups (N=60).**

| Parameter | Group A | | Group B | | P value |
|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | |
| **Weight (kgs)** | 60.7 | 7.2 | 61.3 | 7.7 | 0.756 |

Among the study participants, mean weight of cases in group A was 60.7±7.2 kgsand in group B was 61.3±7.7kgs. There was no statistical significance in mean weight among the study groups (P value 0.756).

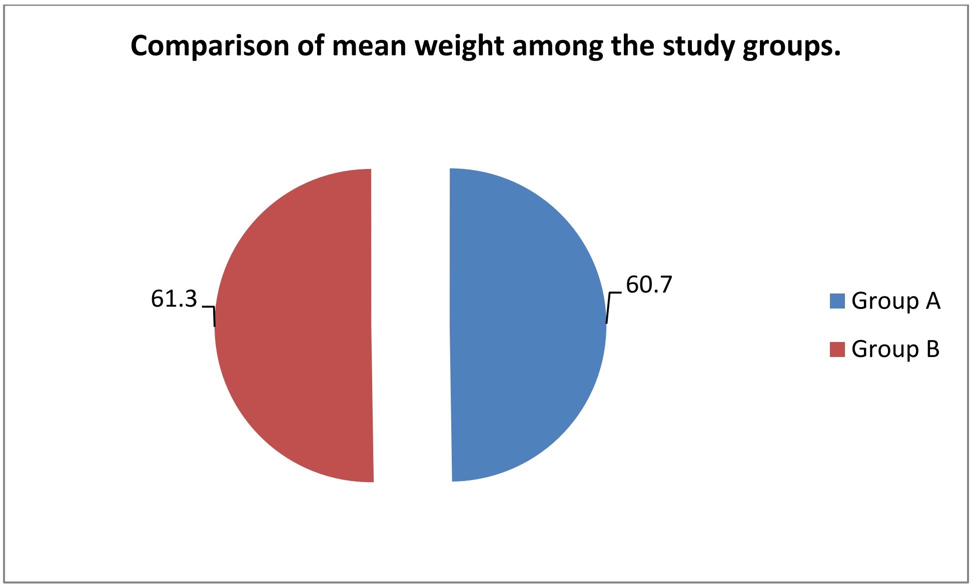



**Figure 12: Pie graph showing comparison of mean weight among the study groups.**

**4. Comparison of BMI distribution among the study groups (N=60).**

| BMI | Group A | Group B | Chi square | P value |
|---|---|---|---|---|
| **<18.5** | 2 (6.67%) | 3 (10%) | 9.59 | 0.022 |
| **18.5-24.9** | 12 (40%) | 22 (73.33%) | | |
| **25-29.9** | 13 (43.33%) | 3 (10%) | | |
| **>30** | 3 (10%) | 2 (6.67%) | | |
| **Total** | 30 (100%) | 30 (100%) | | |

Among the participants in group A, 2 (6.67%) had BMI <18.5, 12 (40%) had BMI 18.5-24.9, 13 (43.33%) had BMI 25-29.9% and 3 (10%) had BMI >30. Among the people of group B, 3 (10%) had BMI <18.5, 22 (73.33%) had BMI 18.5-24.9, 3 (10%) had BMI 25-29.9 and 2 (6.67%) had BMI >30. The difference between BMI distribution among the study groups was statistically significant (P value 0.022).

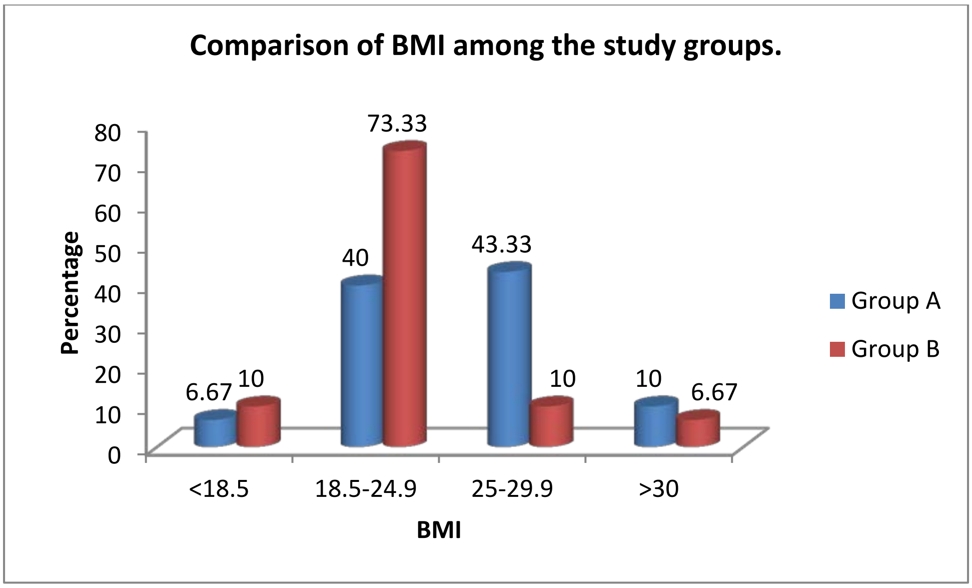



**Figure 13: Cluster bar graph showing comparison of BMI among the study groups.**

**5. Comparison of ASA among the study groups (N=60).**

| ASA | Group A | Group B | Chi square | P value |
|---|---|---|---|---|
| **1** | 18 (60%) | 26 (86.67%) | 5.45 | 0.019 |
| **2** | 12 (40%) | 4 (13.33%) | | |
| **3** | 0 (00%) | 0 (00%) | | |
| **4** | 0 (00%) | 0 (00%) | | |
| **Total** | 30 (100%) | 30 (100%) | | |

In current study, 60% of participants belong to ASA grade 1 in group A and 86.67% in group B. 40% of participants belong to grade 2 in group A and 13.33% in group B. In both the study groups there were no cases of ASA grade 3 & 4. The difference between ASA grading among the study groups was statistically significant (P value 0.019).

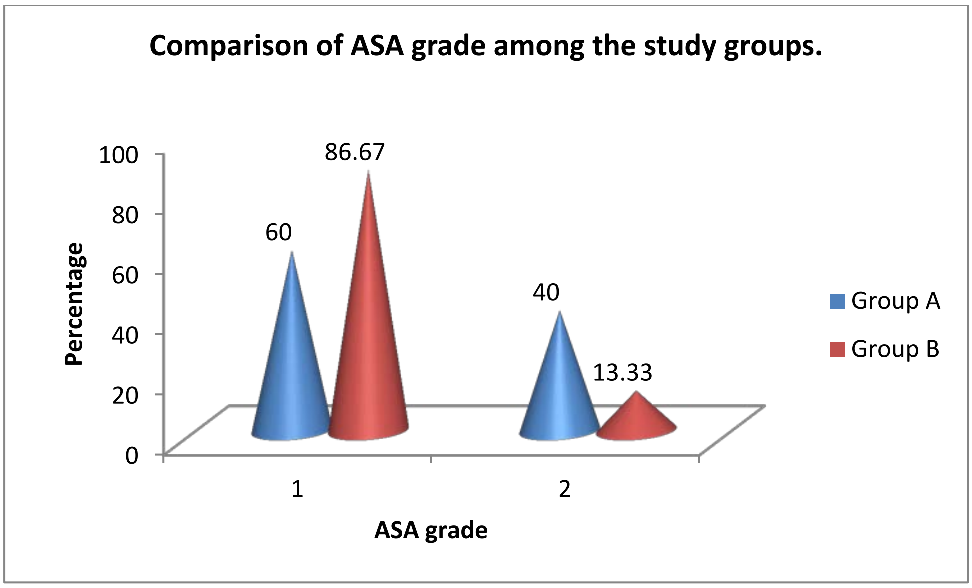



**Figure 14: Cluster bar graph showing comparison of ASA grading among the study groups.**

**6. Comparison of thyromental distance among the study groups (N=60).**

| TMD | Group A | Group B | Chi square | P value |
|---|---|---|---|---|
| **>6.5cm** | 25 (83.33%) | 21 (70%) | 1.49 | 0.222 |
| **<6.5cm** | 5 (16.67%) | 9 (30%) | | |
| **Total** | 30 (100%) | 30 (100%) | | |

Among the participants in group A, 83.33% belong to the parameter >6.5 cm and 16.67% cases belong to <6.5 cm. Among the people of group B, 70% cases belong to >6.5 cm and 30% of cases belong to <6.5 cm. The difference between thyromentaldistances among the study groups was statistically not significant (P value 0.222).

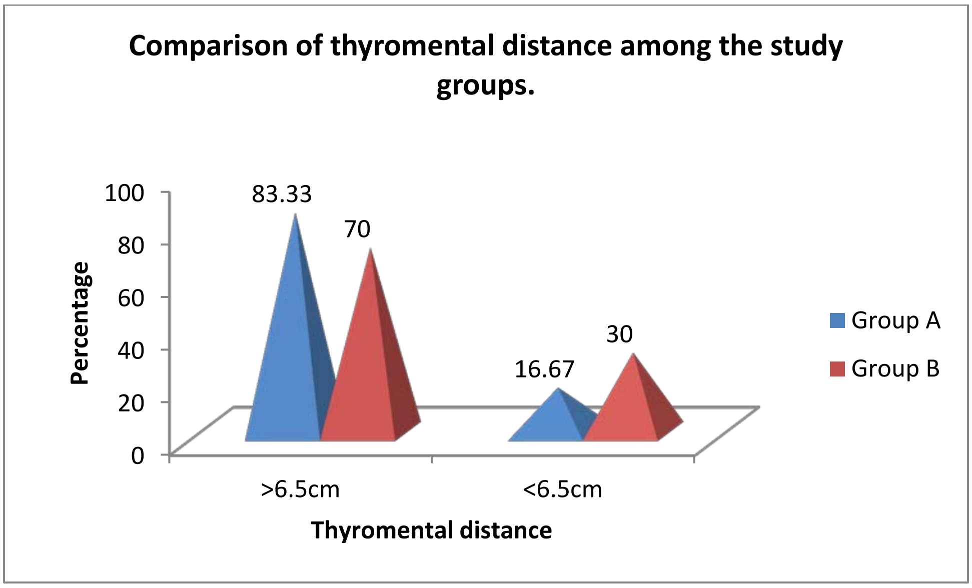



**Figure 15: Cluster bar graph showing comparison of thyromental distance among the study groups.**

**7. Comparison of inter-incisor distance among the study groups (N=60).**

| IID | Group A | Group B | Chi square | P value |
|---|---|---|---|---|
| **<4.5** | 18 (60%) | 26 (86.67%) | 5.45 | 0.019 |
| **>4.5** | 12 (40%) | 4 (13.33%) | | |
| **Total** | 30 (100%) | 30 (100%) | | |

Among the partcipants of group A, 60% belong to IID less than 4.5cm and 40% greater than 4.5cm. Among the people of group B, 86.67% cases belong to IID less than 4.5cm and 13.33% greater than 4.5cm. The difference between inter-incisor distance among the study groups was statistically significant (p value 0.019).

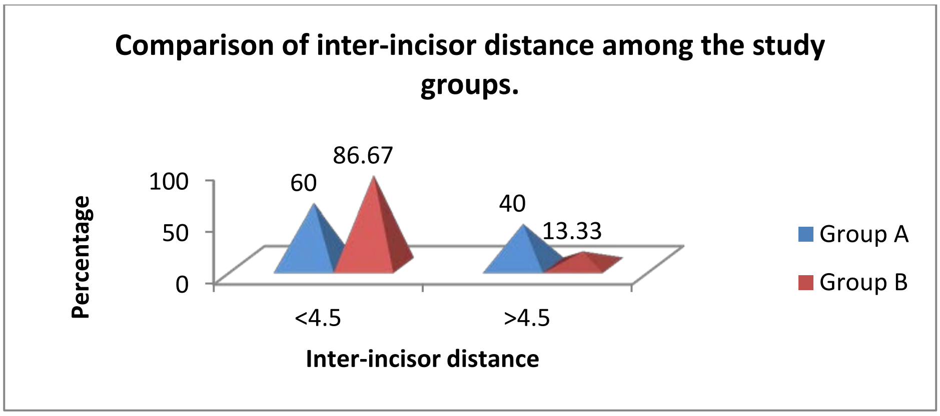



**Figure 16: Cluster bar graph showing comparison of inter-incisor distance among the study groups.**

**8. Comparison of MPC among the study groups (N=60).**

| MPC grade | Group A | Group B | Chi square | P value |
|---|---|---|---|---|
| **1** | 16 (53.33%) | 13 (43.33%) | 0.609 | 0.737 |
| **2** | 8 (26.67%) | 10 (33.33%) | | |
| **3** | 6 (20%) | 7 (23.34%) | | |
| **4** | 0 (00%) | 0 (00%) | | |
| **Total** | 30 (100%) | 30 (100%) | | |

Among the participants of group A, 53.33% cases belong to MPC grade 1, 26.67% cases belong to MPC grade 2 and 20% cases belong to MPC grade 3. Among the people of group B, 43.33% cases belong to MPC grade 1, 33.33% cases belong to MPC grade 2 and 23.34% cases belong to MPC grade 3. Among both the groups no cases recorded MPC grade 4. The difference between MPC grading among the study groups was statistically not significant (P value 0.737).

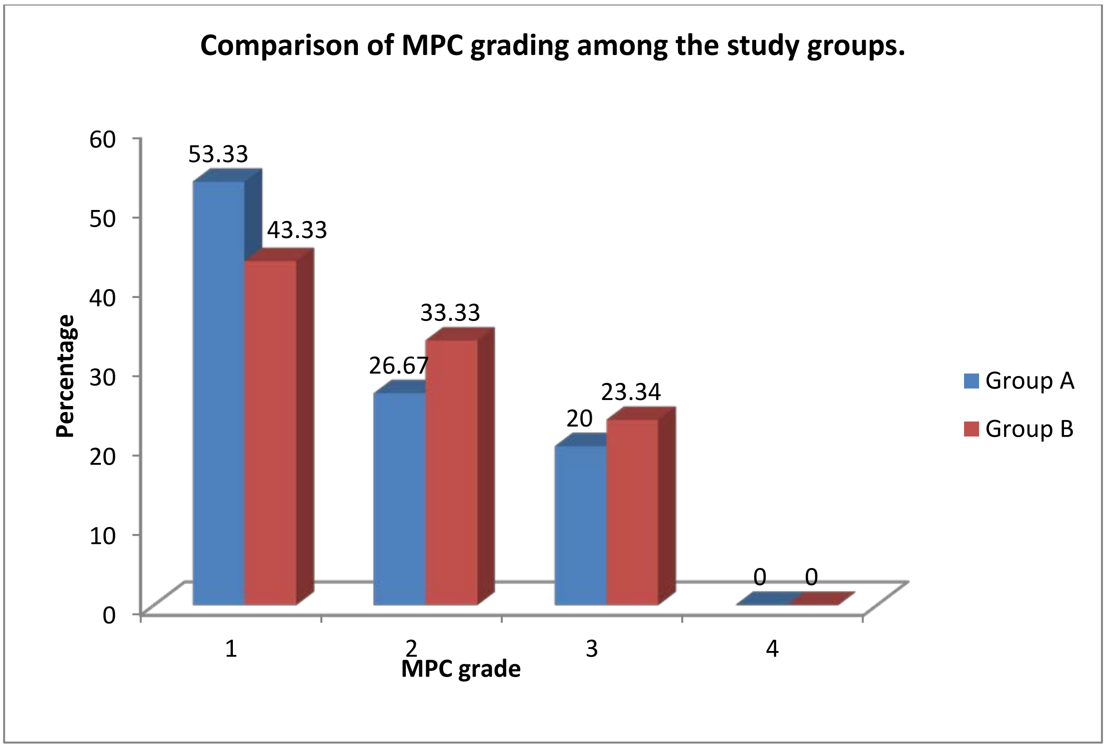



**Figure 17: Cluster bar graph showing comparison of MPC grades among the study groups.**

**9. Comparison of Intubation difficulty scale score among the study groups (N=60).**

| IDS score | Group A | Group B | Chi square | P value |
|---|---|---|---|---|
| **N1 (attempts)** | | | 4.32 | 0.037 |
| **1st – Score 0** | 22 (73.33%) | 28 (93.33%) | | |
| **2nd – Score 1** | 8 (26.67%) | 2 (6.67%) | | |
| **N2 (operators)** | | | 2.96 | 0.085 |
| **1 – Score 0** | 25 (83.33%) | 29 (96.67%) | | |
| **2 – Score 1** | 5 (16.67%) | 1 (3.33%) | | |
| **N3 (alternative techniques)** | | | | |
| **Not used – Score 0** | 30 (100%) | 30 (100%) | | |
| **N4 (CL grade)** | | | 8.02 | 0.018 |
| **1 – Score 0** | 19 (63.33%) | 28 (93.34%) | | |
| **2a –** | 7 | 1 (3.33%) | | |

| | | | | |
|---|---|---|---|---|
| **Score 1** | (23.34%) | | | |
| **2b – Score 2** | 4 (13.33%) | 1 (3.33%) | | |
| **N5 (lifting force)** | | | 5.45 | 0.019 |
| **Normal – Score 0** | 18 (60%) | 26 (86.67%) | | |
| **Increased – Score 1** | 12 (40%) | 4 (13.33%) | | |
| **N6 (laryngeal pressure)** | | | 4.35 | 0.036 |
| **Not applied – Score 0** | 19 (63.33%) | 26 (86.67%) | | |
| **Applied – Score 1** | 11 (36.67%) | 4 (13.33%) | | |
| **N7 (vocal cord position)** | | | | |
| **Abducted – Score 0** | 30 (100%) | 30 (100%) | | |

Among the study groups, the individual parameters in the intubation difficulty scale score, number of operators (N2) among the study groups was comparable and not statistically significant (P value 0.08). Number of attempts (N1), in group A, 73.33% participants were intubated in 1$^{st}$ attempt and in group B, 93.33% participants were intubated in 1st attempt and was statistically significant among the study groups (P value 0.03). There was no alternative techniques (N3) used in both the groups.

Among the participants of group A, 63.33% had CL grade of 1, 23.34% had 2a and 13.33% had 2b CL grading. Among the people of group B, 93.34% had grade 1, 3.33% had 2a and 3.33% had 2b CL grading. The difference between CL grading (N4) among the study groups was statistically significant (P value 0.018).40% of participants in group A required extra lifting force (N5) than 13.33% in group B which was statistically significant (P value 0.019). 36.67% of participants required laryngeal pressure (N6) in group A than 13.33% in group B which was statistically significant among the study groups (0.03). There was abduction of vocal cords (N7) among both the groups.

**10. Comparison of mean POGO score among the study groups (N=60).**

| Parameter | Group A | | Group B | | P value |
|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | |
| **Mean POGO score** | 71.53 | 26.97 | 87.13 | 15.71 | 0.0082 |

Among group A, the mean POGO score was 71.53±26.97 and among group B, the mean POGO score was 87.13±15.71. The difference between the mean POGO scores among the study groups was statistically significant (P value 0.0082).

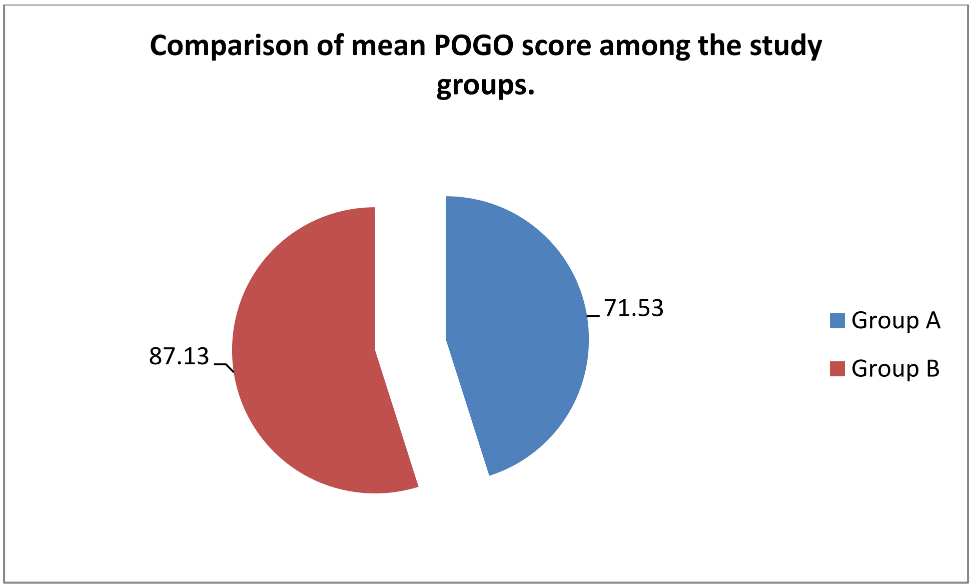



**Figure 18: Pie graph showing comparison of mean POGO score among the study groups.**

**11. Comparison of mean duration of intubation among the study groups (N=60).**

| Parameter | Group A | | Group B | | P value |
|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | |
| **Mean Duration of intubation (sec)** | 27.33 | 7.21 | 21.5 | 5.21 | 0.0007 |

Among the study groups, the mean duration of intubation in group A was 27.33secs and in group B was 21.5secs. The difference between mean duration of intubation among the study groups was statistically significant (0.0007).

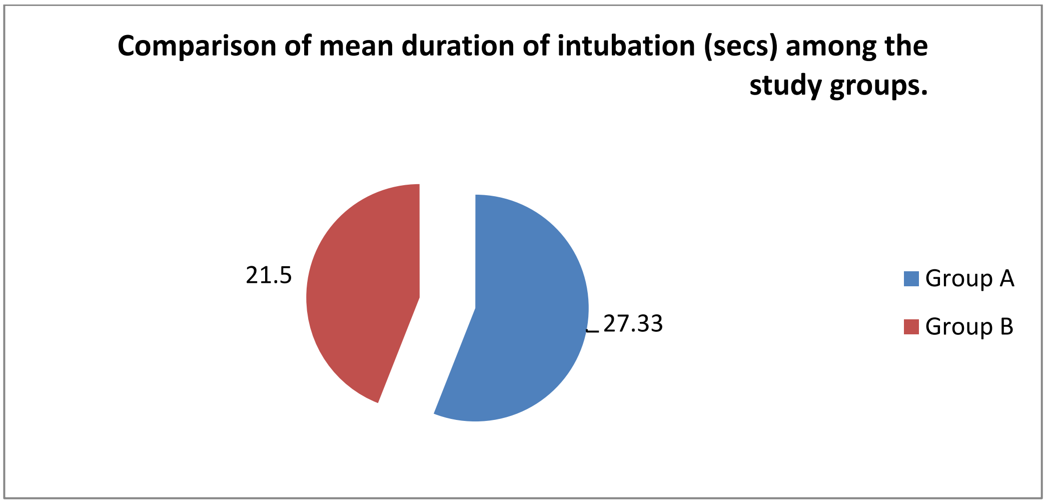



**Figure 19: Pie graph showing comparison of mean duration of intubation among the study groups.**

**12. Comparison of mean heart rate among the study groups (N=60)**

| .Heart rate | Group A | | Group B | | P value |
|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | |
| **Baseline** | 86.7 | 1.84 | 81.53 | 1.17 | <0.0001 |
| **During intubation** | 83.77 | 1.57 | 75.6 | 4.37 | <0.0001 |
| **After 1 min** | 84.8 | 2.83 | 76.27 | 3.25 | <0.0001 |
| **After 3 min** | 83.53 | 1.5 | 77.07 | 1.96 | <0.0001 |
| **After 5 min** | 83.07 | 3.05 | 77.37 | 2.74 | <0.0001 |
| **Grand mean** | 84.37 | | 77.57 | | |
| **P value** | <0.0001 | | | | |

Among the participants of group A, mean baseline heart rate was 86.7, after intubation was 83.77, after 3min was 84.8, after 5mins was 83.53 and after 10 minutes was 83.07. Among the people of group B, mean baseline heart rate was 81.53, after intubation it was 75.6, after 3 minutes 76.27, after 5 minutes 77.07

and after 10 minutes was 77.37. The difference between mean heart rate among the study groups was statistically significant (p<0.0001).

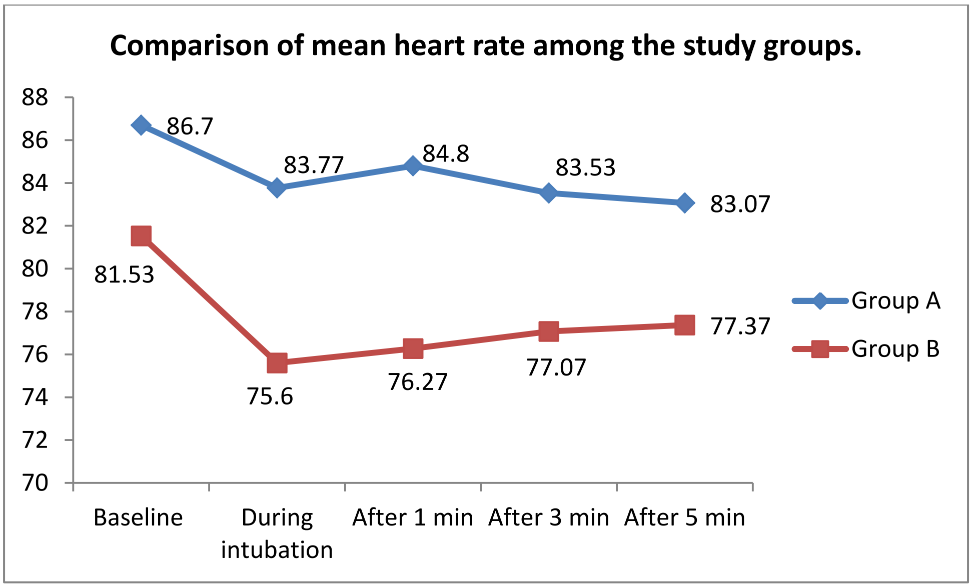



**Figure 20: Line graph showing comparison of mean heart rate among the study groups.**

**13. Comparison of mean systolic blood pressure among the study group =60).**

| Systolic blood pressure | Group A | | Group B | | P value |
|---|---|---|---|---|---|
| | **Mean** | **SD** | **Mean** | **SD** | |
| **Baseline** | 122.27 | 5.75 | 126.03 | 5.71 | 0.013 |
| **During intubation** | 136.93 | 2.03 | 124.17 | 5.37 | <0.0001 |
| **After 1 min** | 125.87 | 5.82 | 112.63 | 6.46 | <0.0001 |
| **After 3 min** | 126.6 | 5.26 | 114.4 | 5.99 | <0.0001 |
| **After 5 min** | 126.73 | 5.64 | 123.87 | 4.29 | 0.031 |
| **Grand mean** | 127.68 | | 120.22 | | |
| **P value** | <0.0001 | | | | |

Among the participants of group A, mean baseline systolic blood pressure was 122.27, after intubation was 136.93, after 3min was 125.87, after 5mins was 126.6 and after 10 minutes was 126.73. Among the people of group B, mean baseline systolic blood pressure was 126.03, after intubation it was 124.17, after 3 minutes 112.63, after 5 minutes 114.4 and after 10 minutes was 123.87. The difference between mean systolic blood pressure among the study groups was statistically significant (p<0.0001).

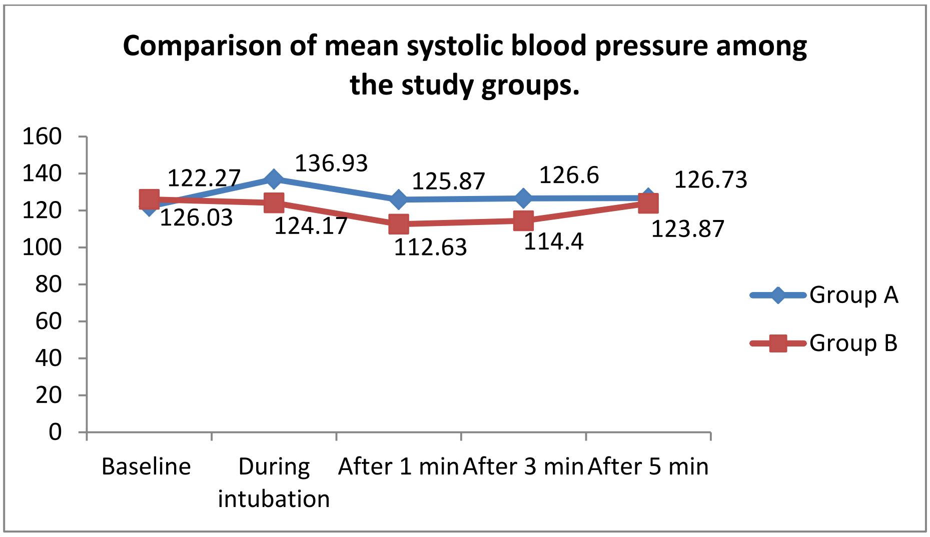



**Figure 21: Line graph showing comparison of mean systolic blood pressure among the study groups.**

**14. Comparison of mean diastolic blood pressure among the study groups (N=60).**

| Diastolic blood pressure | Group A | | Group B | | P value |
|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | |
| **Baseline** | 84.93 | 3.89 | 78.6 | 1.19 | <0.0001 |
| **During intubation** | 80.8 | 5.08 | 76.53 | 5.28 | 0.002 |
| **After 1 min** | 78.47 | 3.43 | 74.83 | 2.55 | <0.0001 |
| **After 3 min** | 81.27 | 5.34 | 77.8 | 7.4 | 0.04 |
| **After 5 min** | 82.13 | 4.52 | 79.07 | 3.1 | 0.003 |
| **Grand mean** | 81.52 | | 77.37 | | |
| **P value** | <0.0001 | | | | |

Among the participants of group A, mean baseline diastolic blood pressure was 84.93, after intubation was 80.8, after 3min was 78.47, after 5mins was 81.27 and after 10 minutes was 82.13. Among the people of group B, mean baseline diastolic blood pressure was 78.6, after intubation it was 76.53, after 3 minutes 74.83, after 5 minutes 77.8 and after 10 minutes was 79.07. The difference between mean diastolic blood pressure among the study groups was statistically significant ($p<0.0001$).

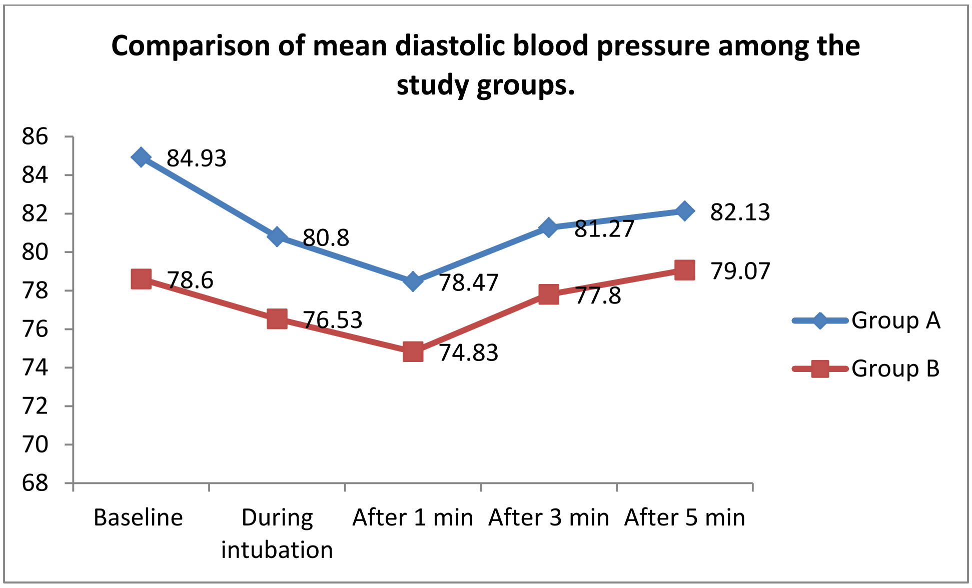



**Figure 22: Line graph showing comparison of mean diastolic blood pressure among the study groups.**

15. **Comparison of mean arterial pressure among the study groups (N=60).**

| Mean arterial pressure | Group A | | Group B | | P value |
|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | |
| **Baseline** | 82.9 | 3.58 | 80.73 | 1.23 | 0.002 |
| **During intubation** | 84.33 | 2.88 | 82.7 | 1.78 | 0.010 |
| **After 1 min** | 79.9 | 4.66 | 75.4 | 2.5 | <0.0001 |
| **After 3 min** | 81.73 | 4.86 | 76.4 | 3.08 | <0.0001 |
| **After 5 min** | 79.73 | 3.7 | 77.6 | 3.38 | 0.023 |
| **Grand mean** | 81.72 | | 78.57 | | |
| **P value** | < 0.0001 | | | | |

Among the participants of group A, mean baseline arterial pressure was 82.9, after intubation was 84.33, after 3min was 79.9, after 5mins was 81.73 and after 10 minutes was 79.73. Among the people of group B, mean baseline arterial pressure was 80.73, after intubation it was 82.7, after 3 minutes 75.4, after 5 minutes 76.4 and after 10 minutes was 77.6. The difference between mean arterial pressure among the study groups was statistically significant (p <0.0001).

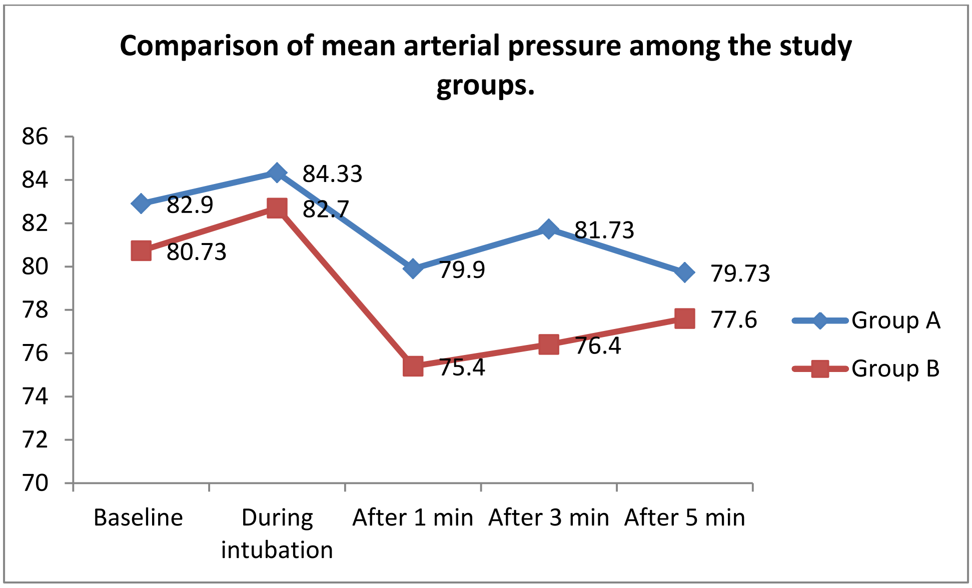



**Figure 23: Line graph showing comparison of mean arterial pressure among the study groups.**

16. **Comparison of mean SPO2 among the study groups (N=60).**

| Mean SPO2 | Group A | | Group B | | P value |
|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | |
| **Baseline** | 98.73 | 0.78 | 98.13 | 0.86 | 0.006 |
| **During intubation** | 98.9 | 0.84 | 99.17 | 0.87 | 0.001 |
| **After 1 min** | 98.73 | 0.91 | 98.73 | 0.91 | 1.000 |
| **After 3 min** | 98.7 | 0.84 | 98.83 | 0.75 | 0.529 |
| **After 5 min** | 98.67 | 1.06 | 98.57 | 1.1 | 0.721 |
| **Grand mean** | 98.75 | | 98.69 | | |
| **P value** | 0.4035 | | | | |

Among the participants of group A, mean baseline SPO2 was 98.73, after intubation was 98.9, after 3min was 98.73, after 5mins was 98.7 and after 10 minutes was 98.67. Among the people of group B, mean baseline SPO2was 98.13, after intubation it was 99.17, after 3 minutes 98.73, after 5 minutes 98.83 and after 10 minutes was 98.57. The difference between mean SPO2 among the study groups was not statistically significant (p=0.4035).

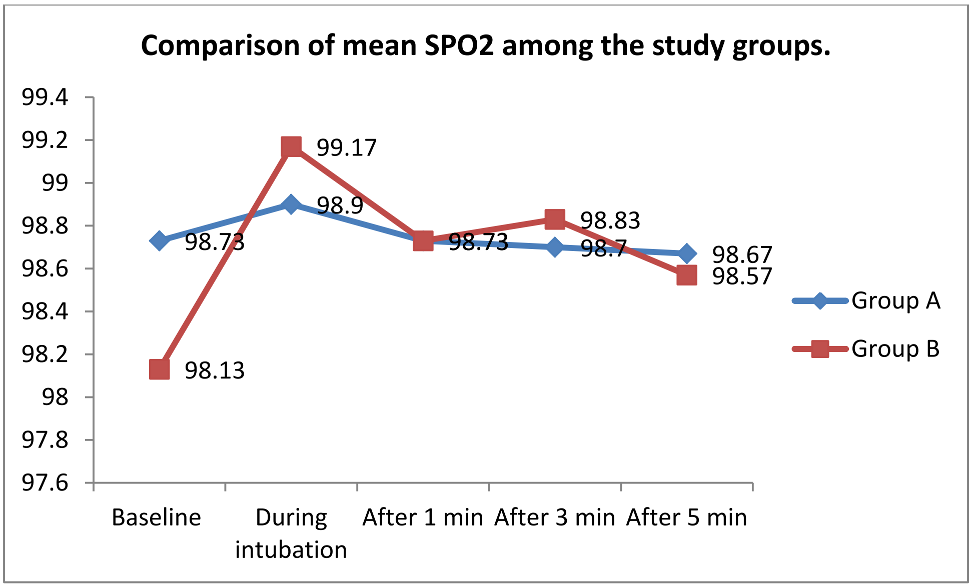



**Figure 24: Line graph showing mean SPO2 among the study groups.**

# DISCUSSION

About 2-5% of trauma patients would have cervical spine injury. Patient with c-spine injury may need airway management for protection of airway, to avoid hypoxia and hypoventilation.[1]

Manual in line stabilization (MILS) or a rigidcollars are recommended by Trauma life support guidelines to stabilize the spine in suspicious cervical spine injured patients. The collarsprescence has poor laryngoscopic view and causes difficultly in intubation with conventional laryngoscope.[4]To overcome this difficultly various devices are helpful, like direct laryngoscope with the help of gum elastic bougie, the fibre-optic bronchoscope, the airway scope, the McCoy laryngoscope, the Intubating laryngeal mask airway and Bullard laryngoscope are being recommended by many authors.[6]

The Mc-Coy levering laryngoscope is a modified standard Macintosh blade,[6]which has a hinged tip. The hinged tip improves the Cormac and Lehanelaryngoscopic view grade by 1 when compared with Macintosh blade in patient with cervical spine injury.[4]

The new generation video laryngoscopes has many distinct improvements.[8]It consists of a external light source and a tiny digital camera, attached to a display monitor.[9]It gives a optimum visualisation of the glottis by direct and indirect view.[9]

In this study we compared the efficacy of Hugemed laryngoscope and McCoy blade laryngoscope in simulated cervical spine injury and recorded the duration of laryngoscopy, time taken for intubation, difficulty in intubationintubation (IDS score) and haemodynamic response.

In our study the demographic variables compared are age, gender and BMI between both the groups.

The primary idea of our study is to compare and record the duration of laryngoscopy, intubation time, attempts of intubation, IDS scoring.

The mean duration of intubation was compared between two groupsand inferred that it was shorter in hugemed group (21.5seconds) than McCoy group (27.33 seconds) and is statistically significant.

The time taken for intubation was shorter in hugemed and the mean total duration of intubation was comparatively significant between the groups. Our results for duration of intubation differed with the study of **Jain et al**.,[4]comparing McCoy and video laryngoscope in simulatedcervical spine injury.

IDS score was observed in this study to evaluvate the difficulty in

intubation.

In our study 28patients in hugemed group B and 22 patients in McCoy group A was intubated in first attempt and were comparable. The results was same as the study by **Jain et al**.,[4] 25 patients in group A and 29 patients in group B needed single person for intubationand all the patients were intubated by same technique in our study.

In C-MAC group 28 patients had CL grade 1 and 2 patients each had CL grade 2a & 2b respectively . In McCoy group 19 patients had CL grade 1 and 7 patients had CL grade 2a & 4 had Cl grade 2b. So the glottis exposure was best in Hugemed group than McCoy group and it is statistically significant which was similar in studies by **Jain et al.,**[4] and **Sabry et al**.,[8]

**Jain et al.,**[4]compared McCoy laryngoscope and C-MAC video laryngoscopein simulated cervical spine injury and observed that out of 30 patients, 29 patients in C-MAC group and 16 patients in McCoy group had CL grade 1 and was statistically significant. **Sabry et al.,**[8] compared C-MAC D blade and McCoy laryngoscopes during cervical immobilization and observed that out of 30 patients, 16 patients in C-MAC group and 4 patients in McCoy group had CL grade 1 and was statistically significant.

The McCoy group (12 patients) required more lifting force for glottic view than Hugemed group (4 patients) and this was statistically significant. 4 patients in group B needed external laryngeal pressure at time of intubation compared to11 patients in group A, which was statistically significant.

The IDSscore was found to be significant statistically between the groups. Hugemed's use resulted in more ease of intubation when compared with McCoy. This resultis similar to the study by **Jain et al.**[4]

In our study the heart rate, mean systolic BP,mean diastolic BP , mean BP and MAP were recorded at all times was comparable between Hugemed and McCoy group and was statistically significant while spo2 was insignificant between the group. This result differed from the study by **Jain et al**.,[4]

# SUMMARY

Ourstudy was “Comparison of Hugemed and McCoy for laryngoscopy in adult patients, who were undergoing oro-tracheal intubation for elective surgery with simulated c-spine injury using Manual In Line Stabilization was studied in Stanley Medical College, Chennai.

Our study Hugemed group has a statistical significance of the total duration of intubation was lesser, number of attempts taken for intubation was lesser, ease of intubation and hemodynamic parameters except spo2 was significant when compared to group A

The Hugemed group had better visualisation of glottis, needed optimal lifting force and clinically significant external laryngeal pressure with lower IDS score when compared to McCoy group.

# CONCLUSION

Hugemed video laryngoscope requires less time for intubation, provided best visualisation of glottis, IDS score was lesser and less haemodynamic responses when compared to Group A patients in simulated cervical spine injury.

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# ANNEXURES

## INSTITUTIONAL ETHICAL COMMITTEE APPROVAL CERTIFICATE:

**GOVERNMENT STANLEY MEDICAL COLLEGE & HOSPITAL,CHENNAI -01**

**INSTITUTIONAL ETHICS COMMITTEE**

TITLE OF THE WORK : COMPARISON OF HUGEMED AND MCCOY LARYNGOSCOPES FOR ENDOTRACHEAL INTUBATION IN PATIENTS WITH CERVICAL SPINE IMMOBILIZATION

PRINCIPAL INVESTIGATOR : DR.INDRANI APPIKONDA,
DESIGNATION : PG IN ANAESTHESIOLOGY,
DEPARTMENT : DEPARTMENT ANAESTHESIOLOGY, GOVT. STANLEY MEDICAL COLLEGE.

The request for an approval from the Institutional Ethical Committee (IEC) was considered on the IEC meeting held on 19.07.2019 at the Council Hall, Stanley Medical College, Chennai-1 at 10am.

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

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

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

MEMBER SECRETARY,
IEC, SMC, CHENNAI

## PATIENT INFORMATION SHEET

TOPIC: ***COMPARISON OF HUGEMED AND MCCOY LARYNGOSCOPES FOR ENDOTRACHEAL INTUBATION IN PATIENTS WITH CERVICAL SPINE IMMOBILISATION***

I **Dr.INDRANI APPIKONDA** SECOND year M.D post graduate in Anaesthesiology, Government Stanley medical college is going to undertake the study on above mentioned topic.

I request your co-operation and help for the study.

I assure that all the information provided by you will be kept highly confidential and privacy is assured. Your identity won't be revealed to anyone. The study may be published in scientific Journal, but your identity will not be revealed.

Your participation in this study is voluntary and you can withdraw from this at any point of time.

Signature/left thumb impression of the participant

## INFORMATION SHEET

## தகவல்நகல்

இந்த ஆய்வில் உங்களிடம் கேட்கும் கேள்விகளுக்கு முழுமனதுடன் பதில் அளிக்கவேண்டும்.

இந்த ஆய்வில் உங்கள் நாள்பட்டநோய்கள், உடல்நலம்தேடும்நடத்தைதொடர்பாகவிவரங்கள் பற்றியவிவரங்கள பற்றிபற்றிகேட்கப்படும்

இந்த ஆய்வில் உங்களுக்கு நேரடிபயன் எதுவும் இல்லை என்றாலும் நீங்கள்அளிக்கும் தகவல் மூலம் புதுயுக்திகள் வகுக்கப்படலாம். அதன் மூலம் வருங்காலத்தில் உங்களுக்கோ அல்லது உங்களைபோன்ற மக்களுக்கோ பயன்படலாம்.

உங்களின் விபரங்கள்எதுவும் மற்றவர்களுக்கு தெறிவிக்கப்படாது என்பதை உறுதியளிக்கிறேன்.

இந்த ஆய்வின் முடிவுகள் பத்திரிக்கைளில் பிரசுரிக்கபடலாம் ஆனால் உங்களின் அடையாளம் எதுவும்காட்டப்படாது.

உங்களுக்கு விருப்பம்இல்லை என்றால் எப்போது வேண்டுமானாலும் இந்த ஆய்வில் இருந்துவிலகிக் கொள்ளலாம். அதனால் உங்களுக்கு எந்தபாதிப்பும் இல்லை.

கையொப்பம்/ இடதுபெருவிரல்ரேகை

இந்த ஆய்வில் உங்களுக்கு எந்தபின் விளைவும் ஏற்படாது என்பதைநான் உறுதியளிக்கிகேன்.

உங்களிடம் கேட்கும் கேள்விகளில் உங்களின் சுயவிபரம், குடும்பவிபரம், தொழில்விபரம், விபரங்கள் மற்றும் இதரவிபரம்அடங்கும்.

உங்களுக்கு பணம் எதுவும் அளிக்கபடாது என்பதை இதன்மூலம் தெறிவிக்கிறேன்

**INFORMED CONSENT**

Study number:

Participant identification number for this study

Topic:

***COMPARISON OF HUGEMED AND MCCOY LARYNGOSCOPES FOR ENDOTRACHEAL INTUBATION IN PATIENTS WITH CERVICAL SPINE IMMOBILISATION***

Name of the Principal investigator: Tel no:

The content of the information sheet dated ______________________ that was provided have been read carefully by me/explained in detail to me, in a language that I comprehend, and fully understood the contents. I confirm that I have had opportunity to ask questions.

The purpose of the study and its potential risks/benefit and expected duration of the study, and other relevant details of the study have been explained to me in detail. I understand that my participant is voluntary and that I am free to withdraw at any time, without giving any reason, without my medical care or legal right being affected.

I agree to take part in the above study

(Signature/left thumb impression)
Name of the participant:
Parent/spouse of participant:
Address:
This is to certify that the above consent has been obtained in my presence;

Signature of the principal investigator:
Date:
Place:

| | |
|---|---|
| Witness 1: | Witness 2: |
| Signature: | Signature: |
| Name: | Name: |
| Address: | Address: |

## INFORMED CONSENT

## தகவல்தொடர்புஒப்புதல்படிவம்

நான் தகவல் நகலில் கொடுக்கபட்டுள்ள முழுவிவரங்களையும் கவனமாகப் படித்தேன்/ ஆய்வின் முழுவிவரங்களையும் தமிழில் எனக்கு விளக்கமாக எடுத்துக்குறப்பட்டது.

நான் இந்த ஆய்வின் விவரங்களை முழுமையாக புரிந்துகொண்டேன்.

ஆய்வில்பங்கு எடுக்கும்போது எற்படும் சாத்தியமானஅபாயங்கள்மற்றும்பயன்களைநான்அரிந்துள்ளேன்.

மேலும், நான் எந்தஒருவேளையிலும்ஆய்வில்இருந்துதிரும்பமுடியும்என்றும், அதன்பின்னர்நான்வழக்கம்போல்மருத்துவச்சிகிச்சைப்பெறமுடியும்என்றும் புரிந்துக்கொள்கிறேன்.

நான்ஆய்வில்பங்குகொள்ளபணம்எதையும்பெறமுடியாதுஎன்றுஅரிந்துள்ளேன்.

நான்இந்தஆய்வில்பங்குஎடுப்பதன்மூலம்நான்என்னசெய்யபோகிறேன்என்று தெரியும்.

நான்இந்தஆய்வில்என்முழுஒத்துழைப்பையும்கொடுப்பேன்என்றுஉறுதியளிக்கின்றேன்.

ஆய்வில்பங்கேற்பவர்பெயர்: சாட்சி:

பெயர்மற்றும்முகவரி:
பெயர்மற்றும்முகவரி:

கையொப்பம்/விரல்ரேகைகையொப்பம்/விரல்ரேகை

ஆராய்ச்சியாளராக

கையொப்பம்மற்றும்தேதி

## PROFOMA

## COMPARISON OF HUGEMED AND MCCOY LARYNGOSCOPES FOR ENDOTRACHEAL INTUBATION IN PATIENTS WITH CERVICAL SPINE IMMOBILISATION

| | | |
|---|---|---|
| NAME: | WEIGHT: kg | DATE: |
| AGE: | IP NUMBER: | ANAES ASST: |
| SEX: | BMI: | NS ASST: |

**PATIENT CHARACTERISTICS**

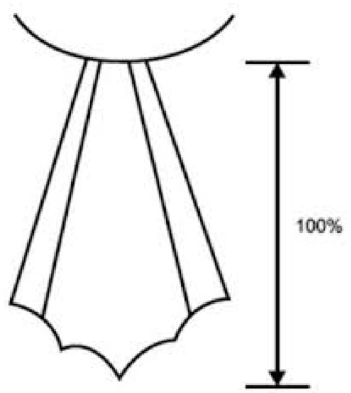
| Parameters | GROUP A | GROUP B |
|---|---|---|
| AGE | | |
| SEX | | |
| ASA | | |
| MPC | | |
| TMD(CM) | | |
| IID (CM) | | |
| BMI (KG/m2) | | |

**INTUBATION DIFFICULTY SCORE**

| VARIABLES | SCORE |
|---|---|
| Number (n) of intubation attempts >1 | |
| Number (n) of operators >1 | |
| Number of alternative intubation techniques used (like bougie, stylet, different size blade, endotracheal tube, etc.) | |
| Glottic exposure - Cormack and Lehane grade of laryngoscopy 1/2/3/4 | 0/1/2/3/4 |
| Lifting force required for laryngoscopy | 0-normal<br>1-increased |
| Necessity of external laryngeal pressure | 0 - not applied<br>1 - applied |
| Position of vocal cords at intubation | 0 - abduction/not visualised<br>1 - adduction |

| | PRE INTUBATION | 1 MIN | 3 MIN | 5 MIN |
|---|---|---|---|---|
| **HR** | | | | |
| **BP** | | | | |
| **MAP** | | | | |
| **SPO2** | | | | |

**POGO SCORE**



# MASTER CHART

| | | | | | | | | | | | | | IDS | | | | | Duration | | Heart Rate | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sno | GROUP | Age | Sex | Weight | BMI | ASA | MPC | TMD | IID | N1 | N2 | N3 | N4 | N5 | N6 | N7 | POGO | for | Baseline | At intubati | 1min | 3min | 5min |
| 1 | A | 54 | 1 | 47 | 3 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 2 | 2 | 1 | 50 | 34 | 88 | 84 | 74 | 84 | 85 |
| 2 | A | 51 | 1 | 65 | 4 | 1 | 2 | 1 | 1 | 1 | 2 | 1 | 2 | 1 | 1 | 1 | 50 | 38 | 86 | 84 | 80 | 84 | 84 |
| 3 | A | 39 | 2 | 63 | 2 | 1 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 33 | 32 | 84 | 84 | 75 | 84 | 85 |
| 4 | A | 26 | 2 | 51 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 1 | 1 | 1 | 66 | 24 | 86 | 83 | 74 | 83 | 82 |
| 5 | A | 29 | 1 | 68 | 2 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 2 | 2 | 1 | 33 | 18 | 86 | 83 | 72 | 83 | 83 |
| 6 | A | 22 | 1 | 65 | 1 | 1 | 3 | 2 | 2 | 1 | 2 | 1 | 2 | 1 | 1 | 1 | 33 | 16 | 86 | 83 | 73 | 83 | 84 |
| 7 | A | 38 | 2 | 70 | 2 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 100 | 26 | 84 | 84 | 73 | 84 | 82 |
| 8 | A | 44 | 1 | 70 | 2 | 1 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 2 | 1 | 1 | 100 | 28 | 84 | 84 | 73 | 84 | 81 |
| 9 | A | 41 | 1 | 61 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 1 | 100 | 36 | 90 | 84 | 73 | 84 | 83 |
| 10 | A | 58 | 1 | 62 | 4 | 2 | 3 | 1 | 2 | 1 | 2 | 1 | 2 | 2 | 1 | 1 | 100 | 38 | 84 | 85 | 74 | 85 | 82 |
| 11 | A | 28 | 1 | 60 | 2 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 | 22 | 84 | 85 | 75 | 85 | 80 |
| 12 | A | 37 | 2 | 61 | 2 | 1 | 1 | 2 | 2 | 2 | 1 | 1 | 1 | 2 | 2 | 1 | 75 | 28 | 84 | 86 | 76 | 86 | 78 |
| 13 | A | 32 | 1 | 56 | 3 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 75 | 22 | 86 | 87 | 75 | 86 | 87 |
| 14 | A | 30 | 1 | 56 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 100 | 22 | 86 | 86 | 75 | 86 | 82 |
| 15 | A | 42 | 1 | 61 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 | 20 | 86 | 82 | 75 | 82 | 86 |
| 16 | A | 30 | 2 | 65 | 2 | 1 | 3 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 1 | 1 | 100 | 18 | 86 | 82 | 76 | 82 | 89 |
| 17 | A | 25 | 2 | 66 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 100 | 20 | 86 | 82 | 77 | 82 | 91 |
| 18 | A | 21 | 1 | 62 | 2 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 2 | 2 | 1 | 66 | 24 | 89 | 81 | 82 | 81 | 82 |
| 19 | A | 29 | 1 | 62 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 2 | 2 | 1 | 66 | 24 | 87 | 81 | 78 | 81 | 79 |
| 20 | A | 35 | 1 | 66 | 2 | 2 | 2 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 33 | 38 | 87 | 85 | 80 | 81 | 78 |
| 21 | A | 38 | 1 | 70 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 75 | 34 | 88 | 81 | 79 | 81 | 79 |
| 22 | A | 31 | 2 | 52 | 2 | 1 | 1 | 1 | 2 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 75 | 30 | 88 | 83 | 79 | 83 | 82 |
| 23 | A | 29 | 1 | 59 | 2 | 2 | 3 | 1 | 1 | 1 | 1 | 1 | 3 | 2 | 1 | 1 | 100 | 26 | 89 | 82 | 79 | 82 | 82 |
| 24 | A | 19 | 1 | 47 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 100 | 16 | 88 | 86 | 79 | 84 | 86 |
| 25 | A | 29 | 1 | 47 | 3 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 50 | 22 | 89 | 84 | 80 | 84 | 86 |
| 26 | A | 35 | 1 | 55 | 2 | 2 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 2 | 1 | 50 | 28 | 89 | 84 | 80 | 84 | 82 |
| 27 | A | 42 | 1 | 56 | 2 | 2 | 2 | 1 | 2 | 2 | 1 | 1 | 1 | 2 | 1 | 1 | 50 | 28 | 86 | 84 | 82 | 84 | 82 |
| 28 | A | 59 | 2 | 57 | 2 | 2 | 3 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 66 | 38 | 89 | 84 | 81 | 84 | 86 |
| 29 | A | 51 | 2 | 68 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 33 | 40 | 89 | 85 | 82 | 85 | 81 |
| 30 | A | 42 | 1 | 74 | 2 | 2 | 1 | 1 | 2 | 2 | 2 | 1 | 3 | 2 | 1 | 1 | 100 | 30 | 87 | 85 | 83 | 85 | 83 |
| 31 | B | 24 | 1 | 48 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 | 15 | 83 | 76 | 84 | 79 | 76 |
| 32 | B | 20 | 1 | 65 | 2 | 1 | 2 | 1 | 1 | 2 | 2 | 1 | 2 | 2 | 1 | 1 | 100 | 15 | 80 | 71 | 84 | 79 | 77 |
| 33 | B | 28 | 2 | 68 | 3 | 1 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 | 18 | 81 | 72 | 88 | 79 | 77 |
| 34 | B | 36 | 1 | 52 | 4 | 1 | 3 | 2 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 75 | 22 | 80 | 78 | 85 | 78 | 76 |
| 35 | B | 41 | 2 | 72 | 2 | 1 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 | 28 | 81 | 69 | 85 | 78 | 75 |
| 36 | B | 32 | 2 | 65 | 3 | 1 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 50 | 22 | 81 | 68 | 85 | 79 | 77 |
| 37 | B | 26 | 2 | 69 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 66 | 20 | 82 | 85 | 85 | 75 | 73 |
| 38 | B | 25 | 1 | 70 | 4 | 1 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 | 20 | 79 | 85 | 86 | 75 | 80 |
| 39 | B | 22 | 2 | 65 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 75 | 15 | 80 | 76 | 86 | 76 | 72 |
| 40 | B | 39 | 1 | 69 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 75 | 18 | 83 | 76 | 86 | 77 | 71 |
| 41 | B | 48 | 2 | 62 | 3 | 2 | 3 | 1 | 2 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 66 | 24 | 81 | 76 | 87 | 79 | 75 |
| 42 | B | 42 | 1 | 58 | 4 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 1 | 1 | 1 | 66 | 24 | 81 | 79 | 85 | 79 | 75 |
| 43 | B | 58 | 2 | 50 | 3 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 75 | 28 | 82 | 76 | 89 | 76 | 79 |
| 44 | B | 53 | 1 | 56 | 2 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 75 | 28 | 81 | 72 | 84 | 73 | 78 |
| 45 | B | 51 | 2 | 60 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 75 | 28 | 82 | 76 | 87 | 80 | 79 |
| 46 | B | 51 | 1 | 65 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 100 | 28 | 82 | 75 | 84 | 80 | 81 |
| 47 | B | 28 | 1 | 68 | 4 | 1 | 1 | 1 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 100 | 15 | 82 | 68 | 82 | 74 | 75 |
| 48 | B | 48 | 2 | 62 | 2 | 1 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 100 | 22 | 81 | 67 | 81 | 77 | 76 |
| 49 | B | 29 | 2 | 62 | 2 | 1 | 3 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 | 18 | 83 | 78 | 85 | 79 | 80 |
| 50 | B | 26 | 1 | 67 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 100 | 15 | 81 | 79 | 82 | 76 | 78 |
| 51 | B | 29 | 1 | 70 | 2 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 | 18 | 81 | 72 | 88 | 76 | 79 |
| 52 | B | 35 | 1 | 54 | 3 | 1 | 3 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 66 | 26 | 82 | 78 | 85 | 76 | 81 |
| 53 | B | 29 | 1 | 58 | 4 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 75 | 28 | 82 | 78 | 85 | 76 | 78 |
| 54 | B | 49 | 1 | 49 | 3 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 | 28 | 82 | 76 | 85 | 74 | 74 |
| 55 | B | 52 | 2 | 47 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 | 28 | 83 | 76 | 85 | 74 | 80 |
| 56 | B | 58 | 1 | 55 | 2 | 2 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 | 28 | 83 | 73 | 87 | 77 | 79 |
| 57 | B | 41 | 2 | 55 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 | 15 | 83 | 78 | 89 | 76 | 81 |
| 58 | B | 40 | 1 | 57 | 3 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 | 15 | 79 | 78 | 85 | 78 | 80 |
| 59 | B | 21 | 1 | 68 | 4 | 1 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 100 | 18 | 82 | 79 | 97 | 78 | 79 |
| 60 | B | 59 | 1 | 74 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 75 | 18 | 83 | 78 | 87 | 79 | 80 |

| Systholic blood pressure | | | | | Diastolic blood pressure | | | | | MAP | | | | | SPO2 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Baseline | At intubati 1min | 3min | 5min | | Baseline | At intubati 1min | 3min | 5min | | Baseline | At intubati 1min | 3min | 5min | | Baseline | At intubati 1min | 3min | 5min | |
| 129 | 139 | 126 | 129 | 127 | 86 | 80 | 78 | 72 | 82 | 84 | 86 | 80 | 80 | 80 | 100 | 98 | 99 | 100 | 100 |
| 123 | 135 | 128 | 128 | 129 | 92 | 80 | 84 | 86 | 76 | 87 | 88 | 78 | 78 | 78 | 98 | 98 | 98 | 98 | 98 |
| 123 | 132 | 132 | 132 | 132 | 84 | 88 | 86 | 88 | 82 | 88 | 86 | 90 | 84 | 90 | 98 | 100 | 100 | 100 | 99 |
| 124 | 134 | 129 | 129 | 130 | 86 | 82 | 86 | 82 | 86 | 78 | 86 | 82 | 78 | 82 | 98 | 98 | 98 | 98 | 100 |
| 126 | 137 | 129 | 129 | 130 | 88 | 86 | 92 | 86 | 82 | 80 | 88 | 78 | 72 | 78 | 99 | 100 | 99 | 100 | 99 |
| 123 | 138 | 124 | 124 | 125 | 86 | 88 | 78 | 86 | 86 | 81 | 82 | 82 | 79 | 82 | 99 | 99 | 100 | 99 | 99 |
| 123 | 136 | 127 | 127 | 128 | 90 | 86 | 82 | 86 | 80 | 81 | 84 | 80 | 80 | 80 | 98 | 99 | 99 | 99 | 99 |
| 118 | 138 | 127 | 127 | 128 | 84 | 82 | 82 | 82 | 72 | 82 | 90 | 88 | 82 | 88 | 98 | 99 | 99 | 98 | 99 |
| 117 | 139 | 126 | 126 | 126 | 84 | 86 | 86 | 84 | 86 | 80 | 88 | 86 | 86 | 86 | 98 | 98 | 98 | 98 | 98 |
| 122 | 138 | 127 | 127 | 128 | 92 | 80 | 94 | 80 | 80 | 86 | 88 | 88 | 88 | 88 | 98 | 100 | 98 | 100 | 100 |
| 110 | 136 | 129 | 129 | 130 | 86 | 86 | 78 | 90 | 90 | 81 | 86 | 76 | 82 | 76 | 99 | 98 | 98 | 98 | 98 |
| 119 | 134 | 132 | 132 | 132 | 86 | 84 | 82 | 84 | 82 | 87 | 88 | 78 | 74 | 78 | 98 | 98 | 99 | 98 | 98 |
| 129 | 139 | 132 | 132 | 133 | 84 | 82 | 72 | 78 | 86 | 80 | 82 | 75 | 76 | 76 | 99 | 99 | 99 | 99 | 99 |
| 124 | 139 | 109 | 109 | 110 | 88 | 80 | 92 | 76 | 82 | 80 | 84 | 86 | 88 | 86 | 98 | 100 | 98 | 100 | 100 |
| 119 | 139 | 114 | 127 | 114 | 80 | 82 | 72 | 84 | 82 | 78 | 88 | 79 | 86 | 80 | 100 | 99 | 99 | 99 | 99 |
| 128 | 139 | 142 | 142 | 142 | 86 | 74 | 82 | 80 | 76 | 86 | 84 | 74 | 84 | 74 | 99 | 100 | 98 | 98 | 100 |
| 127 | 136 | 127 | 127 | 128 | 82 | 70 | 72 | 72 | 80 | 82 | 82 | 82 | 88 | 82 | 98 | 98 | 98 | 98 | 98 |
| 128 | 134 | 123 | 123 | 124 | 78 | 80 | 92 | 84 | 82 | 86 | 88 | 78 | 82 | 78 | 99 | 99 | 97 | 99 | 99 |
| 108 | 139 | 120 | 121 | 122 | 78 | 70 | 72 | 78 | 88 | 80 | 84 | 88 | 83 | 88 | 98 | 98 | 97 | 98 | 99 |
| 126 | 136 | 120 | 121 | 122 | 78 | 82 | 82 | 86 | 92 | 76 | 82 | 82 | 88 | 82 | 98 | 98 | 99 | 99 | 99 |
| 118 | 136 | 128 | 128 | 128 | 82 | 80 | 72 | 84 | 86 | 88 | 82 | 72 | 88 | 72 | 99 | 99 | 98 | 100 | 98 |
| 109 | 139 | 124 | 124 | 124 | 80 | 88 | 84 | 82 | 80 | 80 | 82 | 76 | 84 | 76 | 100 | 99 | 100 | 99 | 95 |
| 123 | 136 | 124 | 124 | 124 | 80 | 78 | 74 | 80 | 82 | 80 | 80 | 78 | 88 | 78 | 99 | 100 | 98 | 98 | 98 |
| 127 | 138 | 129 | 129 | 130 | 88 | 68 | 82 | 76 | 78 | 88 | 82 | 76 | 78 | 76 | 99 | 100 | 99 | 99 | 100 |
| 124 | 139 | 125 | 125 | 126 | 86 | 78 | 76 | 80 | 80 | 80 | 81 | 80 | 79 | 80 | 100 | 98 | 100 | 97 | 97 |
| 118 | 137 | 127 | 127 | 128 | 86 | 82 | 82 | 86 | 82 | 82 | 83 | 76 | 81 | 76 | 98 | 100 | 100 | 98 | 98 |
| 129 | 135 | 122 | 125 | 126 | 86 | 80 | 82 | 80 | 78 | 86 | 81 | 75 | 78 | 74 | 100 | 100 | 100 | 99 | 98 |
| 127 | 139 | 121 | 121 | 122 | 84 | 82 | 76 | 86 | 80 | 88 | 82 | 77 | 72 | 76 | 100 | 98 | 100 | 98 | 99 |
| 126 | 138 | 127 | 127 | 128 | 90 | 80 | 92 | 70 | 80 | 86 | 82 | 79 | 79 | 80 | 99 | 99 | 99 | 99 | 99 |
| 121 | 134 | 126 | 127 | 126 | 88 | 80 | 76 | 70 | 82 | 86 | 81 | 78 | 87 | 78 | 98 | 98 | 98 | 98 | 98 |
| 126 | 124 | 119 | 119 | 130 | 80 | 72 | 80 | 70 | 80 | 80 | 83 | 77 | 80 | 78 | 100 | 99 | 99 | 99 | 99 |
| 128 | 122 | 112 | 112 | 124 | 80 | 72 | 82 | 72 | 80 | 80 | 84 | 78 | 78 | 78 | 98 | 98 | 98 | 98 | 98 |
| 132 | 122 | 113 | 113 | 124 | 80 | 80 | 80 | 72 | 82 | 82 | 85 | 79 | 74 | 80 | 100 | 100 | 100 | 100 | 100 |
| 129 | 121 | 112 | 112 | 124 | 78 | 80 | 80 | 80 | 88 | 80 | 84 | 74 | 78 | 74 | 98 | 98 | 98 | 98 | 98 |
| 129 | 121 | 112 | 112 | 126 | 78 | 76 | 80 | 76 | 82 | 80 | 84 | 76 | 72 | 76 | 99 | 99 | 99 | 99 | 100 |
| 124 | 121 | 118 | 118 | 124 | 78 | 80 | 88 | 88 | 92 | 81 | 81 | 75 | 80 | 74 | 99 | 99 | 99 | 99 | 99 |
| 127 | 121 | 114 | 114 | 124 | 78 | 76 | 82 | 70 | 80 | 81 | 85 | 78 | 78 | 78 | 99 | 99 | 99 | 99 | 99 |
| 127 | 121 | 113 | 113 | 118 | 78 | 80 | 92 | 76 | 80 | 82 | 87 | 71 | 74 | 70 | 99 | 100 | 100 | 99 | 99 |
| 126 | 131 | 112 | 112 | 118 | 78 | 70 | 82 | 76 | 84 | 80 | 84 | 75 | 72 | 74 | 98 | 98 | 98 | 98 | 98 |
| 127 | 127 | 111 | 121 | 122 | 78 | 80 | 80 | 82 | 86 | 81 | 86 | 74 | 78 | 74 | 100 | 100 | 98 | 100 | 100 |
| 129 | 132 | 111 | 121 | 110 | 78 | 70 | 84 | 80 | 88 | 81 | 84 | 76 | 80 | 76 | 98 | 98 | 98 | 98 | 98 |
| 132 | 129 | 100 | 121 | 120 | 80 | 78 | 80 | 82 | 90 | 82 | 84 | 78 | 74 | 78 | 98 | 98 | 98 | 98 | 98 |
| 132 | 129 | 109 | 109 | 130 | 78 | 78 | 84 | 72 | 80 | 80 | 81 | 75 | 76 | 74 | 99 | 99 | 99 | 99 | 98 |
| 109 | 123 | 109 | 109 | 124 | 76 | 82 | 80 | 86 | 82 | 79 | 82 | 76 | 78 | 76 | 100 | 100 | 98 | 100 | 100 |
| 114 | 124 | 107 | 107 | 119 | 80 | 70 | 80 | 72 | 90 | 82 | 83 | 79 | 74 | 80 | 99 | 99 | 99 | 99 | 99 |
| 142 | 124 | 127 | 127 | 128 | 78 | 72 | 88 | 88 | 88 | 81 | 81 | 74 | 76 | 74 | 100 | 100 | 98 | 100 | 100 |
| 127 | 126 | 102 | 102 | 128 | 80 | 70 | 88 | 62 | 80 | 82 | 82 | 75 | 74 | 76 | 98 | 98 | 98 | 99 | 98 |
| 123 | 123 | 102 | 102 | 128 | 78 | 76 | 86 | 72 | 86 | 81 | 80 | 78 | 70 | 78 | 99 | 99 | 97 | 99 | 99 |
| 121 | 126 | 102 | 113 | 124 | 78 | 76 | 82 | 80 | 82 | 81 | 83 | 80 | 72 | 80 | 98 | 98 | 97 | 98 | 98 |
| 121 | 129 | 108 | 109 | 126 | 78 | 70 | 78 | 68 | 86 | 79 | 82 | 74 | 78 | 74 | 99 | 100 | 99 | 99 | 99 |
| 128 | 101 | 118 | 118 | 128 | 80 | 80 | 82 | 84 | 90 | 81 | 80 | 72 | 78 | 72 | 100 | 100 | 98 | 100 | 98 |
| 124 | 129 | 108 | 108 | 123 | 80 | 80 | 80 | 76 | 90 | 81 | 82 | 76 | 74 | 76 | 100 | 100 | 100 | 99 | 95 |
| 124 | 125 | 113 | 113 | 124 | 80 | 70 | 82 | 70 | 88 | 79 | 80 | 78 | 76 | 78 | 100 | 100 | 98 | 98 | 98 |
| 129 | 125 | 118 | 118 | 128 | 76 | 70 | 80 | 78 | 82 | 82 | 82 | 74 | 78 | 74 | 100 | 100 | 99 | 99 | 100 |
| 125 | 127 | 121 | 121 | 124 | 78 | 80 | 86 | 86 | 92 | 80 | 81 | 72 | 78 | 72 | 100 | 100 | 100 | 97 | 97 |
| 127 | 127 | 119 | 119 | 118 | 78 | 82 | 82 | 82 | 90 | 82 | 84 | 76 | 80 | 76 | 100 | 100 | 100 | 99 | 98 |
| 125 | 123 | 122 | 122 | 124 | 80 | 88 | 90 | 90 | 96 | 78 | 81 | 74 | 78 | 74 | 100 | 100 | 100 | 99 | 98 |
| 121 | 123 | 121 | 121 | 128 | 78 | 72 | 92 | 92 | 82 | 80 | 82 | 72 | 72 | 72 | 100 | 100 | 100 | 98 | 100 |
| 127 | 125 | 113 | 113 | 126 | 80 | 88 | 86 | 82 | 90 | 80 | 82 | 76 | 80 | 76 | 98 | 98 | 99 | 99 | 98 |
| 126 | 124 | 113 | 113 | 122 | 78 | 78 | 80 | 70 | 96 | 84 | 82 | 70 | 82 | 70 | 98 | 98 | 99 | 99 | 98 |

# PLAGIARISM CERTIFICATE

URKUND

## Urkund Analysis Result

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### Sources included in the report:

https://www.medpulse.in/Anesthsiology/Article/Volume11Issue2/Anes_11_2_8.pdf
https://www.researchgate.net/publication/336013326_Comparison_of_C-MAC_blade_and_McCoy_blade_for_laryngoscopy_in_adult_patients_undergoing_tracheal_intubation_for_elective_surgeries_with_simulated_cervical_spine_injury_using_manual_in_line_stabilizati

Introduction: Injuries to the

cervical spine may occur either because of trauma or diseases. There may be cervical spine damage in approximately 5 percent of trauma patients. Injury to the spinal cord is the result of c-spine

injury. The risk of spinal injury increases in the presence of head injury as the level of consciousness and focal neurological

deficiency are reduced. In order to prevent hypoxia and hypoventilation, patients

with c-spine damage can need rapid airway control for airway safety. The gold standard position for the initiation of laryngoscopy is the sniffing position.

# PLAGIARISM CERTIFICATE

This is to certify that this dissertation work titled **"COMPARISON OF HUGEMED VIDEO LARYNGOSCOPE AND MCCOY LARYNGOSCOPE FOR ENDOTRACHEAL INTUBATION IN PATIENTS WITH SIMULATED CERVICAL SPINE IMMOBILISATION"** of the candidate Dr. INDRANI APPIKONDA, with registration number 201820055 for the award of M.D in the branch of ANAESTHESIOLOGY. I personally verified urkund.com website for the purpose of plagiarism check. I found that the uploaded thesis file from introduction to conclusion and summary shows 6% percentage of plagiarism in the dissertation.

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