ISSN: 0975-8585

Research Journal of Pharmaceutical, Biological and Chemical Sciences

Comparison of The Use of Mccoy Laryngoscope and Intubating Laryngeal Mask Airway in Patients with Simulated Cervical Spine Immobilization

Aishwarya S* Ajaykumar Anandan, and Purushotham R.

[1]Assistant professor, Dept of Anesthesiology,sree Balaji Medical College & Hospital,Chennai, India.
[2]Professor, sree Balaji Medical College & Hospital,Chennai, India.
[3]Postgraduate,Dept of Anesthesiology,Sree Balaji Medical College & Hospital,Chennai, India.

ABSTRACT

The incidence of cervical spine injury is reported to be 1–4% in all major trauma victims, and may be as high as 34% in patients with severe injuries [1]. Orotracheal intubation is the preferred technique for airway management in trauma victims. Failure to adequately immobilize the neck during tracheal intubation in patients with cervical spine injuries can result in devastating neurological outcomes [2].Anatomic studies that mimic complete C4-5 ligamentous injury demonstrate that manual in-line axial stabilization (MIAS) reduces segmental angular rotation and distraction [3]. It also results in less subluxation into the spinal canal during Orotracheal intubation than cervical collar immobilization in a cadaver model of cervical spine injury [4]. However, it can be a double-edged sword, in that it has been shown to increase the difficulty level in visualizing the larynx using conventional laryngoscopy [5]. This is because MIAS prevents head extension and neck flexion, which are necessary for optimal alignment of the three airway axes and exposure of the vocal cords using direct laryngoscopic techniques.

Keyword: Mccoy Laryngoscope, Cervical Spine , intubating laryngeal mask airway.

**Corresponding author*

INTRODUCTION

Laryngoscopy and endotracheal intubation are known to cause an increase in arterial blood pressure, heart rate and intracranial tension, which can be deleterious in trauma cases with associated head injury [6]. Obtunding this reflex response during laryngoscopy and intubation remains a major concern of the anaesthesiologists. Exposure of the glottis during laryngoscopy requires the elevation of the epiglottis by a forward and upward lifting of the laryngoscope blade [7].

It has been observed that the amount of forces exerted during laryngoscopy and intubation is the key determinant for mechanical stimulation of stretch receptors present in the respiratory tract [8]. Any laryngoscopy technique requiring lesser lifting force would proportionally reduce the sympathetic discharge, and hence changes in heart rate and blood pressure.

MANUAL IN-LINE AXIAL STABILIZATION[MIAS]

Manual in line axial stabilization is best accomplished by having two operators in addition to the physician who is actually managing the airway. The first operator stabilizes and aligns the head in neutral position without applying cephalad traction. The second operator stabilizes both shoulders by holding them against the table or stretcher. The anterior portion of the hard collar, which limits mouth opening, may be removed after immobilization. In presence of MIAS, the glottis view maybe suboptimal in 10% to 15% of patients during direct laryngoscopy because of limitation of neck extension [9]. It prevents head extension and neck flexion, which are necessary for optimal alignment of the three airway axes and exposure of the vocal cords using direct laryngoscopic techniques[10].

McCOY LARYNGOSCOPE

The McCoy laryngoscope (Penlon) was introduced in 1993 [11]. It is based on the standard Macintosh blade with a hinged tip that is operated by a lever mechanism on the back of the handle, which allows for elevation of the epiglottis while reducing the amount of force required. It has been designed to facilitate tracheal intubation when the patient's head is in a neutral position. It has also been shown to reduce the stress response to laryngoscopy, probably as a result of the reduction in the required force. The effect of laryngeal view is variable depending on whether the base of tongue and valleculais already optimally elevated. In difficult direct laryngoscopy, activation of the tip may improve the laryngeal view where there is a grade 3 Cormack and Lehane view but is unlikely to do so where the epiglottis cannot be seen, in addition, the incidence of grade 2 or worse views maybe increased compared with a standard Macintosh blade even without activation of the tip [12].

The available blade sizes are 3 & 4.

Figure 1: McCOY LARYNGOSCOPE

INTUBATING LARYNGEAL MASK AIRWAY [ILMA]

The ILMA was designed to overcome some limitations of LMA – classic [13]. It has a short, curved stainless shaft with a standard 15mm connector. The tube is of sufficient diameter that a cuffed 9mm tracheal tube can be inserted and short enough to allow a standard tracheal tube cuff to pass beyond the vocal cords [14]. The metal handle is securely bonded to the shaft near the connector end to facilitate one – handed insertion, position adjustment, and maintain the device in a steady position during tracheal tube insertion and removal. There is a single, movable epiglottic elevator bar in place of the vertical bars. A V- shaped guiding ramp is built into the floor of the mask aperture to direct the tracheal tube toward the glottis. The tip is slightly curved to permit atraumatic insertion [15, 16].

METHODS OF INSERTION

The ILMA was designed for its use in neutral position [17]. This includes using a head support, such as a pillow, but no head extension. The insertion technique consists of one hand movements in sagittal plane. It doesn't require placing fingers in patient's mouth, thus minimizing the risk of injury or infection transmission as well as allowing insertion from almost any position. The ILMA should be deflated and lubricated in a manner similar to LMA – Classic. It is held by the handle, which should be approximately parallel to patient's chest. The mask tip is positioned flat against the hard palate immediately posterior to the upper incisors, then slid back and forth over the palate to distribute the lubricant. After the mask is flattened against the hard palate, it is inserted with a rotational movement along the hard palate and the posterior pharyngeal wall. The mouth opening may need to be increased momentarily to permit the widest part of the mask to enter the oral cavity [18]. The handle should not be used as a lever to force the mouth open. As the mask moves toward the pharynx, it should be firmly pressed to the soft palate and posterior pharyngeal wall to keep the tip from folding. The curved part of the metal tube should be advanced without rotation until it contacts the patient's chin, then kept in contact with the chin as a device is rotated inward. The handle should not be used to lever upward during insertion, because this will cause the mask to press into the tongue [19]. When properly inserted, the tube should emerge from the mouth directed somewhat caudally. Aligning the internal ILMA aperture and the glottic opening by finding the position that produces optimal ventilation and then applying a slight anterior lift with the ILMA facilitates correct positioning and blind intubation. The ILMA can be inserted with a 180° rotation technique [20].

The tracheal tube recommended by the manufacturer for use in ILMA is a silicone,wirereinforced,cuffed tube with a tapered patient end and a blunt tip. This tube is flexible, which allows negotiation around the anatomical curves of the airway. It has a high pressure, low volume cuff that reduces resistance during tracheal intubation and makes cuff perforation as the tube passes through the LMA unlikely. There is a stabilizer that allows the LMA to be removed without extubating the patient [21].

The sizes available in ILMA are 3 & 4.

USES

ILMA was designed to facilitate tracheal intubation,it can also be used as a primary airway device. It is especially useful for the anticipated or unexpected difficult airway [22].

DISADVANTAGES

1. ILMA cannot easily adapt to a change in the position of patient's neck[23].
2. Unsuitable for use in the MRI unit.
3. Increased incidence of sore throat, sore mouth, difficulty swallowing.

ISSN: 0975-8585

Figure 2: ILMA

MATERIALS AND METHODS

The study was conducted on 40 adult patients who were scheduled for elective surgery under general anaesthesia , requiring endotracheal intubation. The approval for the study was obtained from the Institutional Ethics Committee and informed consent was obtained from all patients.

INCLUSION CRITERIA

i. ASA PHYSICAL STATUS 1 AND 2.
ii. MALLAMPATTI CLASSIFICATION: 3 &LESS THAN 3.
iii. INTER INCISOR DISTANCE > 3.5cm.
iv. THYROMENTAL DISTANCE > 6.5 cm.

EXCLUSION CRITERIA

i. ASA PHYSICAL STATUS > 3
ii. MALLAMPATTI CLASSIFICATION: 4
iii. PATIENTS WITH RAISED INTRACRANIAL PRESSURE
iv. RAPID SEQUENCE INTUBATION.
v. INTER INCISOR DISTANCE < 3.5 cm.
vi. THYROMENTAL DISTANCE < 6.5cm.

Forty patients were selected and randomly allocated into two groups, the McCoy (M) group and the ILMA (I) group, each with 20 patients by “chit-in-box” method. Forty chits, 20 labeled M and 20 labeled I, were put into a box and after mixing, and were picked by the subjects and not replaced in the box. This simple method of randomization ensured equal allocation of cases to both the McCoy and the ILMA groups. All patients were kept nil per oral for 8 h prior to the surgery. In the operating room, pre-induction monitoring was performed with a five-lead electrocardiogram, noninvasive blood pressure and a pulse oximeter. Appropriate intravenous access was secured. Premedication with Fentanyl 2 mcg/kg was given. The patients were pre-oxygenated with 6 L of oxygen for 5 minutes and general anaesthesia was induced with Propofol titrated to induce anaesthesia in a dose of 2mg/kg sufficient to produce loss of response to verbal commands. Muscle relaxant Atracurium 0.5mg/kg was administered after checking adequacy of the mask ventilation. Mask ventilation with oxygen and isoflurane was done for 3 min. At the end of the 3 minutes, the pillow was removed and the neck was immobilized using MIAS applied by an experienced assistant holding the sides of the neck and the mastoid processes thus preventing flexion/extension or rotational movement of the head and neck.

Intubation was done with either McCoy laryngoscopes [Figure 1] or ILMA [Figure 2, 3] in their respective groups. The trachea was intubated with an appropriate size cuffed ETT (7.0 in females and 8.0 in males). After successful tracheal intubation,which was confirmed by five point auscultation technique, the lungs were mechanically ventilated for the duration of the procedure and anaesthesia was maintained with isoflurane in a mixture of N_2O and O_2.

No other medications were administered or procedures performed during the 6minutes data collection period after tracheal intubation. Subsequent management had been left to the discretion of the anaesthesiologist providing care for the patient.

The duration of the tracheal intubation procedure was noted. The duration of the intubation procedure is defined as the time taken from insertion of the blade between the teeth until the ETT is placed through the vocal cords in case of McCOY laryngoscope and in case of ILMA after the insertion of ILMA to successful placement of ETT,evidenced by five point auscultation technique by the anaesthesiologists.

However, in patients in whom the ETT was not directly visualized as passing through the vocal cords, the intubation attempt was not considered complete until the ETT was connected to the anaesthetic circuit and evidence obtained of the presence of CO_2 in the exhaled breath. Afailed intubation attempt is defined as an attempt in which the trachea is not intubated or which required more than 100 s to perform. A maximum of three intubation attempts was permitted with the device tested. If the tracheal intubation is unsuccessful with the device tested, MIAS will be discontinued and tracheal intubation performed with the Macintosh laryngoscope.

The number of intubation attempts, the rate of successful placement of the ETT in the trachea, the number of optimization maneuvers required (use of a bougie, cricoid pressure, second assistant) to aid tracheal intubation and haemodynamic response to laryngoscopy were noted.

A pilot study on 8 patients, four in each group, was conducted. The results were analyzed with the aid of a statistician and a sample size of 40 was decided to ensure a level of significance of 5% and a suitable power. Analysis of the statistical data obtained from the study was carried out by a statistical programming software Statistical Package for the Social Sciences (SPSS) version 10. SPSS is a statistical tool used to analyze and correlate social data. The statistical tests applied to the data obtained from the study were Chi- square test. $P<0.05$ was considered statistically significant.

RESULTS

The results of the 40 adult patients who were studied are as follows:

AGE DISTRIBUTION

Table 1: Age distribution

	GROUP MCCOY	%	GROUP I LMA	%
< 30	4	20	3	15
31-40	5	25	6	30
41-50	5	25	5	25
51-60	6	30	6	30
TOTAL	**20**	**100**	**20**	**100**

Chi – Square value is 17.15, P value = 0.571

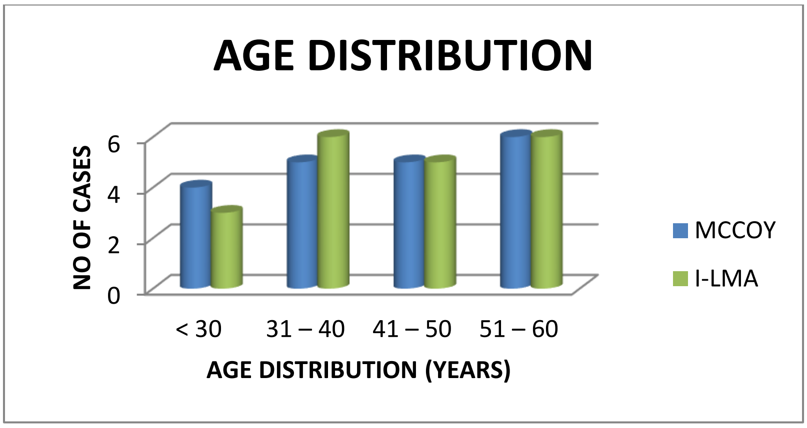

Figure 4: Comparison of the age distribution of MCCOY and ILMA group

The mean age in MCCOY group is 38.60 years and in ILMA group is 33.50 years.
The data is statistically insignificant (P>0.05) and thus both groups are comparable in terms of age.

WEIGHT

Table 2: Weight comparison

	GROUP MCCOY	%	GROUP I LMA	%
< 50	7	35	5	25
51 – 60	6	30	8	40
61 – 70	7	35	7	35
TOTAL	**20**	**100**	**20**	**100**

Chi – Square value is 21.41, P value = 0.0674

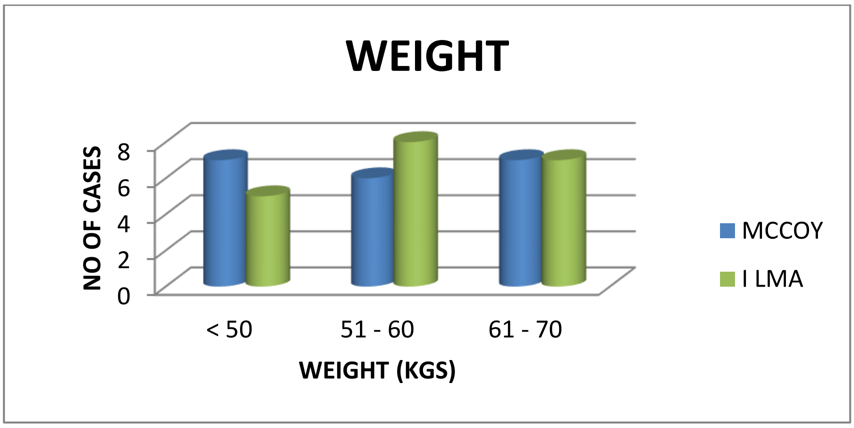

Figure 5: Comparison of the weight distribution of MCCOY and ILMA group

The mean weightin MCCOYgroup is 55.45 kgs and in ILMA group is 58.50kgs.
The data is statistically insignificant (P>0.05) and thus both groups are comparable in terms of weight.

GENDER DISTRIBUTION

Table 3: Sex distribution in patients

	GROUP MCCOY	%	GROUP I LMA	%
Male	12	55	10	50
Female	08	45	10	50
TOTAL	**20**	**100**	**20**	**100**

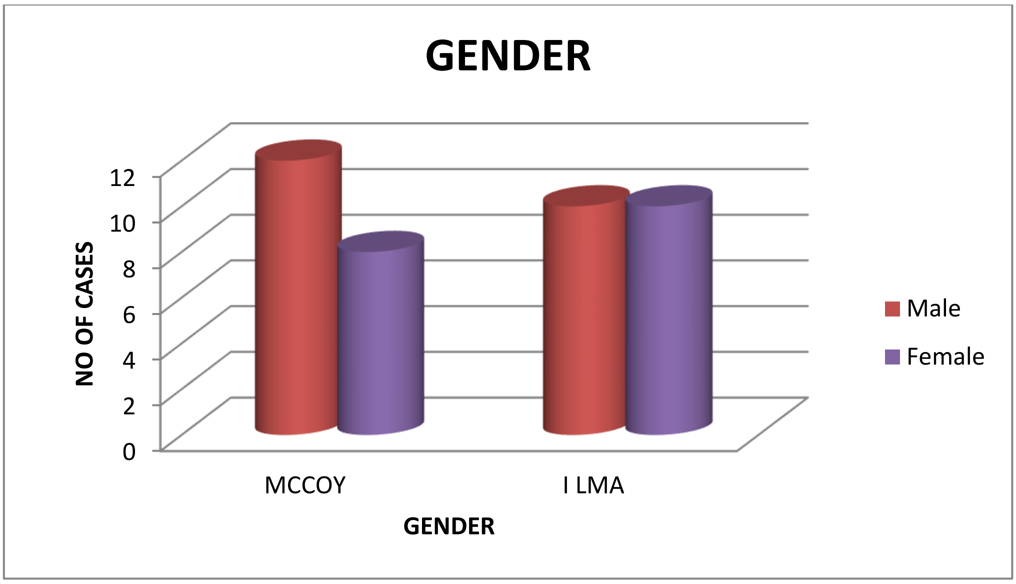

Figure 6: Gender distribution of MCCOY and ILMA group

INTUBATION MAP

Table 9: Intubation MAP of McCoy and ILMA group

	MCCOY	%	I LMA	%
60-70	3	15	2	10
70-80	5	25	5	25
80-90	7	35	6	30
90-100	3	15	7	35
TOTAL	**20**	**100**	**20**	**100**

Chi – Square value is 19.580, P value = 0.000

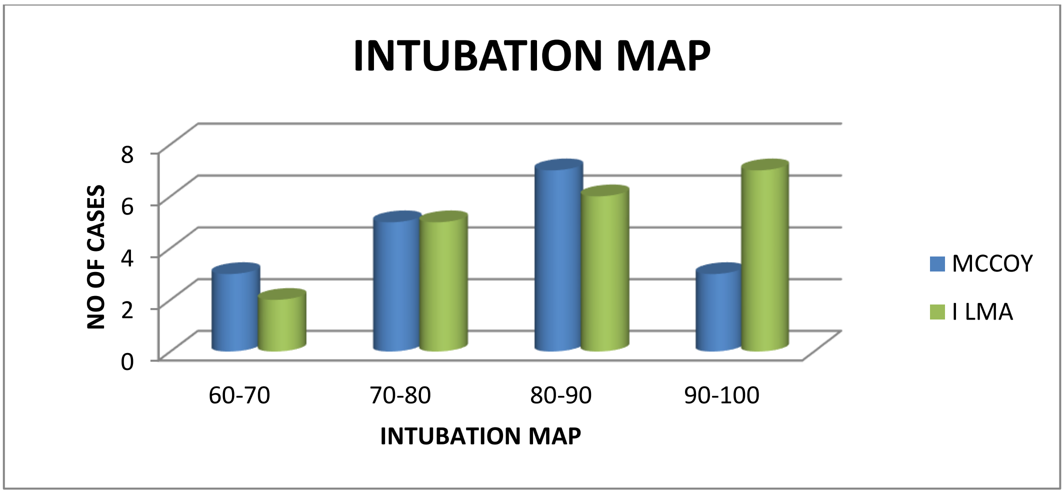

Figure 12: Bar Diagram Compares the INTUBATION MAP of MCCOY and ILMA group

The intubation MAP is statistically significant with a P value of 0.000 <0.05

THREE MINUTES AFTER INTUBATION HEART RATE

Table 10: 3 minutes after intubation heart rate

	MCCOY	%	I LMA	%
60-70	5	25	4	20
70-80	6	30	5	25
80-90	6	30	8	40
90-100	3	15	3	15
TOTAL	**20**	**100**	**20**	**100**

Chi – Square value is 7.458, P value = 0.013

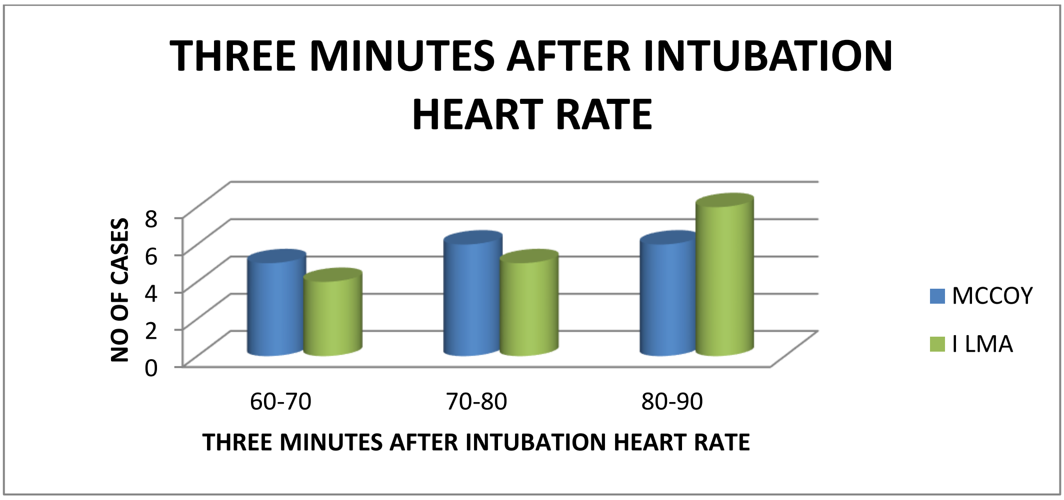

Figure 13: Bar Diagram Compares the THREE MINUTES AFTER INTUBATION HEART RATE of MCCOY and ILMA group

The three minutes after intubation heart rate is statistically significantwith a P value of 0.013 <0.05.

SIX MINUTES AFTER INTUBATION HEART RATE

Table 12: 6 minutesafter intubation heart rate

	MCCOY	%	I LMA	%
60-70	5	30	4	20
70-80	7	35	5	25
80-90	7	35	8	40
90-100	0	00	3	15
TOTAL	**20**	**100**	**15**	**100**

Chi – Square value is 4.587, P value = 0.000 .

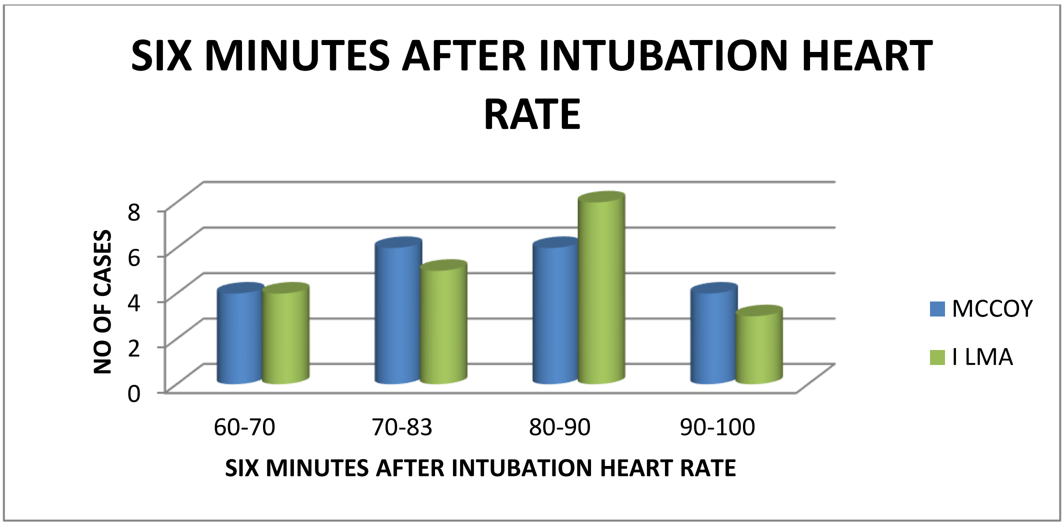

Figure 15: Bar Diagram Compares the SIX MINUTES AFTER INTUBATION HEART RATE of MCCOY and ILMA group

The six minutes after intubation heart rate is statistically significantwith a P value of 0.000 <0.05

The Chi- square test was applied to determine the statistical significance. There was no statistical significance demographically, American society of anaesthesiologists' classification and also Mallampatti classification.

The time taken for laryngoscopy and intubation with McCoy was 22.9 s and with ILMA was 33.2 s, with aP<0.001, which proved to be statistically significant.

Figures [7, 9, 11, 13, and 15] shows the mean heart rate of the patients before induction, before intubation and after intubation at various time intervals (3 and 6minutes after intubation). To determine whether the variation in heart rate is statistically significant, Chi–square test was applied. The increase in heart rate is statistically significant in both groups up to 3 min after intubation. But, it does not persist till 6 minutes. To determine whether there is any statistically significant difference in the increase in heart rate between the two groups, the Chi-square test was applied. The increase in heart rate was significantly higher in the ILMA group than in the MCCOY group for at the time and 3 minutes after intubation.

Figures [8,10,12,14,16] shows the mean of the systolic, diastolic and mean arterial blood pressure of the patients before induction, before intubation, at time of intubation and after intubation at various time intervals (3 and 6 minutes after intubation). To determine whether the variation in blood pressure is statistically significant, the Chi-square test was applied. The increase is mean arterial blood pressure is statistically significant in both groups up to 6 minutes after intubation. To determine whether there is any statistically significant difference in the increase in mean arterial blood pressure between the two groups, Chi-square test was applied.

There was no intubation failure in any group. There was no incidence of any dental injury or airway laceration in both the groups.

DISCUSSION

In this study, we aimed to evaluate the relative efficacy of McCoy Laryngoscope and ILMA in the clinical setting of cervical spine immobilization using MIAS. Both McCoy Laryngoscope and ILMA offer better intubation success and lesser force is exerted during intubation when compared with the standard Macintosh laryngoscope.

In 2004,R.KOMASTU, O.NAGATA,K.KAMATAconcluded the ILMA allows tracheal intubation when the cervical spine is immobilized by a rigid collar from their study involving 120 patients. They found that ILMA insertion time was longer,more insertion attempts were required and that ventilation through the ILMA was worse in rigidly immobilized patients. In our study, the main reason for increased duration of tracheal intubation was the difficulty experienced in advancing the tube [36].

Later in 2014, MATHEW DG,RAMACHANDRAN,REVARI V, TRIKHA A,CHANDRALEKHA studied about endotracheal intubation with ILMA,C-TRACH &Cobra-PLA in simulated cervical spine injury patients in 180 patients. The success rates of intubation in the ILMA, C TRACH & Cobra - PLA groups were 100%, 100%, and 98% respectively. The time taken for device insertion was significantly more with Cobra- PLA as compared to that taken with an ILMA (or) C-TRACH (3.7s vs 30.3s and 27.5s respectively). The incidence of hypoxia and airway morbidity was similar between these groups. In our study,the duration of intubation was significantly less with the McCoy laryngoscope (mean of 22.9 s with standard deviation of 8.5) than with the ILMA (mean of 33.2 s with standard deviation of 12.3), with a P value of less than 0.001, which shows that it is very highly significant and the success rate of intubation was increased in the case of ILMA because the application of MIAS prevented head and neck extension that caused difficulty in insertion of ILMA [33].

Earlier in 1996, SC LAURENT studied the use of McCOY Laryngoscope in patients with simulated cervical spine injuries on 161 patients with application of MIAS. The results showed that McCOY was better than Macintosh. It was found that the difficulty to the hemodynamic response with Macintosh Laryngoscope was significantly higher when compared with the McCOY Laryngoscope.In our study, the haemodynamic response with ILMA was significantly higher when compared with the McCOY Laryngoscope [26].

The cardiovascular response to laryngoscopy and intubation is significantly higher with the ILMA group [P=0.05] than with the McCOY group [P=0.0145]. There was a significant increase in heart rate in both groups up to 3 minutes after intubation, but it did not persist until 6 minutes. The increase in heart rate is significantly higher in the ILMA group than in the McCOY group up to 3 minutes after intubation. In the sixth minute, there was no significant difference between the two groups. There was significant increase in systolic and diastolic blood pressure in both the groups up to 6 minutes after intubation. In the 6th minute, there is no significant difference between the two groups. In the study, the haemodynamic response to laryngoscopy and intubation was significantly less with the McCOYlaryngoscope when compared with the Macintosh laryngoscope.

There was no intubation failure in both the groups. Similarly, there was no incidence of any dental injury or airway laceration in both the groups.

CONCLUSION

Comparing the effectiveness of the McCOY laryngoscope and the ILMAwhen performing tracheal intubation in patients with simulated cervical spine immobilization, we found that the McCOY laryngoscope appears to be better than the ILMA in terms of ease of laryngoscopy and intubation with alesser haemodynamic response.

REFERENCES

[1] Grossman MD, Reilly PM, Gillet T. National Survey of the incidence of Cervical Spine Injury and Approach to Cervical Spine Clearance in US trauma centre. J Trauma 1997;47:684-90.

[2] Hastings RH, Kelly SD. Neurologic deterioration associated with airway management in a cervical spine injured patient. Anaesthesiology 1993;78:580-3.

[3] Lennarson PJ, Smith DW, Sawin PD, Todd MM, Sato Y, Traynelis VC. Cervical spine motion during intubation. Efficacy of stabilization manoeuvres in the setting of complete segmental instability. J Neurosurg2001;94:265-70.

[4] Gerling MC, Davis DP, Hamilton RS, Morris GF, Vilke GM, Gartin, et al. Effects of cervical spine immobilization technique & laryngoscope blade selection on an unstable cervical spine in a cadaver model of intubation. Ann Emerg Med 2000; 36:293-300.

[5] Nolan JP, Wilson ME. Orotracheal intubation in patients with potential cervical spine injuries. An indication for the gum elastic bougie. Anaesthesia 1993;48:630-3.

[6] King BD, Harris LC, Greifenstein FE, Elder JD, Dripps RD. Reflex Circulatory Responses to Direct Laryngoscopy and Tracheal Intubation performed during General Anaesthesia. Anaesthesiology 1951;12:556-66.
[7] Crosby ET, Lui A. The adult cervical spine; Implications for airway management. Can J Anaesth 1990; 37: 77-93.
[8] Sahin A, Salman MA, Erden IA, Aypar U. Upper cervical vertebrae movement during intubating laryngeal mask, fibrescopic and direct laryngoscopy: a video-fluoroscopic study. Eur J Anaesthesiology 2004; 21: 819 – 23.
[9] Asai T, Murao K, Tsutsumi T, Shingu K. Ease of tracheal intubation through the intubating laryngeal mask during manual in-line head and neck stabilisation. Anaesthesia 2000; 55: 82-5.
[10] Asai T, Wagle AU, Stacey M. Placement of the intubating laryngeal mask is easier than the laryngeal mask during manual in-line stabilisation. British Journal of Anaesthesia 1999; 82: 712-4.
[11] Mc Coy EP, Mirakhur RK. The Levering Laryngoscope. Anaesthesia 1993;48:516-9
[12] Laurent SC, de Melo AE, Alexander-Williams JM. The use of the McCoy laryngoscope in patients with simulated cervical spine injuries. Anaesthesia 1996;51:74-5.
[13] Brain AIJ. LMA-Fastrach Instruction Manual. Henley-on- Thames: The Laryngeal Mask Company Ltd, 1997. 28
[14] Baskett PF, Parr MAJ, Nolan JP. The intubating laryngeal mask. Results of a multicentre trial with experience of 500 cases. Anaesthesia 1998; 53: 1174-9.
[15] Anonymous. ILMA ⁄ C-Trach Instruction Manual. Henley-on-Thames: The Laryngeal Mask Company Ltd, 2004.
[16] Caponas G. Intubating laryngeal mask airway (review). Anaesthesia and Intensive Care 2002; 30: 551-69.