Original Research Article

Comparison between McCOY laryngoscope and iLMA for airway management in cervical spine injury

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Abstract

Background: In the modern age road traffic accidents are becoming the leading cause of death and head and neck injuries make a major part of it. In any case of trauma having a high degree of suspicion on cervical spine injury and taking the necessary precautions during treatment and surgery plays a major role in averting mortality and morbidity. During anaesthesia in cases of both confirmed and suspected cervical spine injury manual inline axial stabilization of the cervical spine is done which poses a major airway management challenge to the anaesthesiologist. In this study we compare two methods which are used in this scenario – Mc Coy laryngoscope and iLMA. 40 patients undergoing elective surgeries under general anaesthesia were included in the study and divided into 2 groups randomly using computer generated numbers and were connected to standard monitors and iv fluids and premedicated with inj. Fentanyl 2mcg/kg. they were induced with inj.propofol2.5mg/kg after preoxygenation and intubated under atracurium 0.5mg/kg using Mc Coy or iLMA depending on the group by an experienced anaesthesiologist. The hemodynamic changes, number of attempts and time taken were noted and statistically analysed. The two groups were coparable demographically. There was a significant difference in the time taken for intubation, and in heart rate and mean arterial pressure(MAP) during and 3 and 6 minutes after intubation between the two groups with the Mc Coy group proving to be better than the iLMA group.
Keywords: Mc Coy laryngoscope, iLMA, cervical spine injury.

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INTRODUCTION

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 manualin-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. 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 anesthesiologists. 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. The purpose of this study was to compare the effectiveness of iLMA and McCoy laryngoscope when performing tracheal intubation in patients with neck immobilization using manual in-line axial cervical spine stabilization in elective surgeries in terms of hemodynamic response to intubation, number of intubation attempts and time take for insertion

MATERIALS AND METHODS

The study was conducted on 40 adult patients who were scheduled for elective surgery under general anesthesia, requiring endotracheal intubation. The approval for the study was obtained from the Institutional Ethics Committee and informed consent was obtained from all patients. Patients of ASA physical status 1 and 2, mallampatti classification 1 and 2, interincisor distance >3.5cms and thyromental distance>6.5cms were included in the study. Patients with raised intracranial tension, patients requiring rapid sequence induction and hypertensive patients and patients on beta blockers were excluded from the study. Forty patients were selected and randomly allocated into two groups, the iLMA (I) group and the McCoy (M) group, each with 20 patients by computer generated random numbers. Use of the airway device and endotracheal intubation was performed by an anesthesiologist who has at least 3 years of experience in anesthesia and has performed at least 20 intubations in the clinical settings with both devices. All patients were kept nil per oral for 6 hours prior to the surgery. They were premedicated with lorazepam 0.04 mg/kg orally the night before and 2 hours prior to the surgery. In the operating room, the patient was connected to 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 preoxygenated with 6 L of oxygen for 5 min and general anesthesia was induced with propofol at a dose of 2.5mg/kg. Muscle relaxant Atracurium 0.5mg/kg was administered after checking adequacy of the mask ventilation. Mask ventilation with oxygen and sevoflurane 2% was done for 3 min. At the end of the 3 min, the pillow was removed and the neck was immobilized using MIAS(manual in line axial stabilization of cervical spine) 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. Laryngoscopy was done with either iLMA or McCoy laryngoscopes 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 ausculatation technique, the lungs were mechanically ventilated for the duration of the procedure and anesthesia was maintained with sevoflurane 1MAC in a mixture of 2:1of N_2O and O_2. No other medications were administered or procedures performed during the 6minutes of data collection period after tracheal intubation. Subsequent management had been left to the discretion of the anesthesiologist 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, as evidenced by five point auscultation technique by the anesthesiologist. A failed 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 and hemodynamic 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 with Statistical Package for the Social Sciences (SPSS) version 10. The statistical tests applied to the data obtained from the study were Chi-square test. $P<0.05$ was considered statistically significant.

RESULTS

Both the groups were comparable in terms of age and weight and sex distribution(mean age in McCOY group is 38.60 years and in ILMA group is 33.50 years, mean weight in McCOY group is 55.45 kgs and in ILMA group is 58.50kgs, male: female in McCOY group was 12:8 and 10:10 in ilma group) with p values >0.05.

TABLE 1: Pre induction heart rate

	MCCOY	%	I LMA	%
50 – 60	2	10	2	10
60 – 70	5	25	4	20
70 – 80	7	35	6	30
80 – 90	6	30	8	40
TOTAL	**20**	**100**	**20**	**100**

Chi – Square value is 21.25, p value = 0.104

TABLE 2: Pre induction MAP:

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

Chi – Square value is 14.25, p value = 0.427

TABLE 3: Induction Heart Rate:

	MCCOY	%	I LMA	%
60-70	3	15	4	20
70-80	4	20	4	20
80-90	7	35	5	30
90-100	6	30	7	35
TOTAL	**20**	**100**	**20**	**100**

Chi – Square value is 12.784, p value = 0.274

TABLE 4: Induction MAP

	MCCOY	%	I LMA	%
60-70	4	20	4	20
70-80	9	45	8	40
80-90	7	35	8	40
TOTAL	**20**	**100**	**20**	**100**

Chi – Square value is 1.687, p value = 0.067

TABLE 5: Intubation Heart Rate:

	MCCOY	%	I LMA	%
60-70	3	15	4	20
70-80	6	30	4	20
80-90	7	35	6	30
90-100	4	20	6	30
TOTAL	**20**	**100**	**20**	**100**

Chi – Square value is 22.478, p value = 0.0145

TABLE 6: Intubation MAP

	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

TABLE 7: Three 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

TABLE 8: Three Minutes After Intubation MAP

	MCCOY	%	I LMA	%
60-70	4	20	3	15
70-80	5	25	5	25
80-90	8	40	10	50
90-100	3	15	2	10
TOTAL	**20**	**100**	**20**	**100**

Chi – Square value is 9.568, p value = 0.000

TABLE 9: Six Minutes After 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

TABLE 10: Six Minutes After Intubation MAP

	MCCOY	%	I LMA	%
60-70	4	20	5	25
70-80	6	30	5	25
80-90	7	35	6	30
90-100	2	10	4	20
TOTAL	**20**	**100**	**20**	**100**

Chi – Square value is 5.879, p value = 0.000

TABLE 11: Number Of Attempts:

	MCCOY	%	I LMA	%
1	11	55	8	40
2	8	40	7	35
3	1	05	5	25
TOTAL	**20**	**100**	**20**	**100**

TABLE 12: Time Taken

SECONDS	MCCOY	%	I LMA	%
0-25	8	40	3	15
25-50	8	40	7	35
50-75	2	10	6	30
75-100	2	10	4	20
TOTAL	**20**	**100**	**20**	**100**

Mean Time for McCOY – 22.9s. Standard deviation- 8.5
Mean Time for i LMA - 33.2s. Standard deviation- 12.3
There was no statistically significant difference between the two groups with respect to demography, American society of anaesthesiologists classification, Mallampatti

class, pre induction and induction heart rate and MAP (p values>0.05. There was satistically significant difference in heart rate and MAP in the two groups during intubation and 3 and 6 minutes after intubation (p value<0.05) The number of third attempt intubation was more in the lma group. The time taken for laryngoscopy and intubation with McCoy was 22.9 s and with iLMA was 33.2 s, with a $P<0.001$, which proved to be statistically significant. There was no intubation failure in any group. There was no incidence of dental or more severe airway laceration withany group.

DISCUSSION

In this study, we aimed to evaluate the relative efficacy of iLMA and McCoy when used by an experienced anesthetist in the clinical setting of cervical spine immobilization using MIAS. Both iLMA and McCoy offer better intubation success and lesser force is exerted during intubation when compared with the standard Macintosh laryngoscope[6]. The cardiovascular response to laryngoscopy and intubation is significantly higher with the iLMA group than with the McCOY group[7]. There was a significant increase in heart rate in both groups up to 3 minutes after intubation, but it did not persist till 6 minutes. The increase in heart rate is significantly higher in the iLMA group than in the McCOY group for 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 for 6 minutes after intubation. In the 6th minute, there is no significant difference between the two groups. In the study, the hemodynamic response to laryngoscopy and intubation was significantly less with the McCOY laryngoscope when compared with the Macintosh laryngoscope[8]. 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. The main reason for increased duration of tracheal intubation with iLMA is the difficulty experienced in advancing the tube[9]. There was no intubation failure in any group. There was no incidence of dental or more severe airway laceration with any group.

CONCLUSION

Comparing the effectiveness of the iLMA and McCOY laryngoscope when performing tracheal intubation in patients with simulated cervical spine, we found that McCOY laryngoscope appears to be better than iLMA in terms of ease of laryngoscopy and intubation, lesser hemodynamic response.

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