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Hemodynamic Response Following Endotracheal Intubation Using Intubating Laryngeal Mask Airway in Comparison with Conventional Macintosh Laryngoscope; A Prospective Randomised Controlled Trial

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Abstract
Background: *Aims to test the possible advantages offered by use of ILMA guided endotracheal intubation in patients with normal airways in association with direct laryngoscopy and compare the ILMA and DL taking into account the ease of intubation and to see if ILMA has any advantages over DL with regards to patient hemodynamic response to intubation*
Methods: *Prospective, randomised single blind study. Based on statistically derived formula, patients were randomly allotted to one of two groups. Group DL (patients with direct laryngoscopy), and Group ILMA (patients with ILMA). Randomisation was done via computer generated randomisation table and concealment of allotment was done using sealed envelope technique to be openedprior to induction.*
Results: *A significant rise of heart rate was noted in DL group as compared to ILMA in the 5 minute and 10 minute interval post intubation. Mean Arterial blood pressure was increased from baseline immediately post intubation in both groups. The rise was significantly higher in DL than ILMA group. The rise in MBP was persistently higher in DL group ascompared to ILMA group.*
Conclusion: *In this study it was found that the ILMA guided endotracheal intubation produces a less marked sympathetic response. This might not be of importance in the healthy normotensive patients, but it could be of importance in the patient with pre existing cardiac or cerebral pathology or hypertension. Therefore, where appropriate, the use of the ILMA would be recommended in such patient to avoid the marked response produced by the ETT.*
Keywords: *ILMA, ETT, ASA.*

Introduction

General anaesthesia is associated with various effects on the respiratory system, including the loss of airway patency, loss of protective reflexes, and hypoventilation or apnea. Therefore one of the fundamental responsibilities of the anaesthesiologist is airway management – the practice of establishing and securing a patent airway. Traditionally, ventilation via a mask and endotracheal intubation has been the foundation of airway management; in the past 25 years, however, the laryngeal mask airway has emerged as one of the most important developments in airway devices.[1]

Endotracheal intubation is the gold standard for airway management[1]. It establishes a definite airway and provides maximal protection against the aspiration of gastric contents. Endotracheal intubation is the preferred method of airway management in surgeries with patient positioning

that preclude rapid tracheal intubation (e.g. prone or turned away from the anaesthesia provider), prolonged procedures, critically ill patients or those requiring prolonged ventilatory support[3].

The lack of distension of extraglottic structures by ILMA may be responsible for less oro-pharyngeal stimulation. In recent years the Intubating laryngeal mask airway or LMA Fastrach© has emerged as a feasible alternative to laryngoscopy as it achieves the endpoint of endotracheal intubation without supraglottic structure stimulation. Despite having a steeper learning curve, the ILMA attenuates the deleterious effects of laryngoscopy on the cardiovascular and central nervous system.[3]

Investigators have reported lesser stress response with ILMA guidedendotracheal intubation. Bharti N and Naik AK reported that the ILMA is equally successful and offers better hemodynamic advantages over conventional laryngoscopyguided entotracheal intubation.

Hence this study aims to test the possible advantages offered by use of ILMA guided endotracheal intubation in patients with normal airways in association with direct laryngoscopy and compare the ILMA and DL taking into account the ease of intubation and to see if ILMA has any advantages over DL with regards to patient hemodynamic response to intubation

Material and methods

Study Design: Prospective, randomised single blind study. Based on statistically derived formula, patients were randomly allotted to one of two groups

Group DL (patients with direct laryngoscopy), and Group ILMA (patients with ILMA). Randomisation was done via computer generated randomisation table and concealment of allotment was done using sealed envelope technique to be openedprior to induction.

Study Area: Patients undergoing elective surgeries in Southern Railway HQ Hospital Perambur, Ayanavaram, Chennai, Tamil Nadu

Study Population: Patients aged 18-65 years of either gender belonging to ASA PS grade I or II with modified Mallampati classification I airway undergoing elective surgery under general anaesthesia in Railway Hospital Perambur from the period of June 2015 to January 2017

Patient Selection

Inclusion Criteria

- ASA physical status I and II
- Patients for elective surgery
- Between the ages of 18-65 years
- Modified Mallampati classification 1
- Willing to participate in study by giving written informed consent

Exclusion Criteria

- Patients with predetermined difficult airway
- Patients planned for nasotracheal intubation
- History of renal, hepatic problems
- History of CAD, Angina attacks,
- History of reflux gastritis
- Pregnancy
- Baseline heart rate < 60/min or >120/min
- Baseline systolic blood pressure <100mmHg.
- Body mass index > 30kg/m^2
- Newly diagnosed hypertension on β-blockers

Results

Table 1: Comparison of Heart rate in DL and ILMA groups

	DIRECT LARYNGOSCOPY		ILMA		p value
HEARTRATE (bpm)	Mean	Std. Deviation	Mean	Std. Deviation	
HR Baseline	82.77	12.6	83.09	11.0	.878
HR post induction	77.02	11.1	75.71	10.5	.489
HR T0	88.91	12.2	89.23	9.7	.869
HR T1	94.94	12.6	92.36	10.7	.208
HR T5	90.64	12.0	86.70	9.6	.039
HR T10	85.35	10.8	81.44	9.1	.026

Of the 132 patients divided into two equal and randomised groups of 66 each, the heart rate was documented on arrival to operation theatre (taken as Baseline Heart Rate), 3 minutes post induction of anaesthesia, immediately post endotracheal intubation, 1 minute post endotracheal intubation, 5 minutes post endotracheal intubation, and 10 minutes after endotracheal intubation. Only the increase or decrease of heart rate was analysed.

At Baseline, both groups had comparable heart rates (p=0.878). Post induction, heart rate was comparable in both groups (p=0.489). At 1 min post intubation heart rate was comparable in both groups (p=208). Mean heart rate 5 min post intubation in DL group was 90.64±12.0 bpm and in ILMA group was 86.70±9.6 bpm. On analysis with Student's t-test the difference was statistically significant (p<0.05). Mean heart rate 10 min post intubation in DL group was 85.35±10.8 bpm and in ILMA group was 81.44±9.1 bpm. On analysis with student's test the difference wasstatistically significant (p<0.05)

Table.2: Mean of Mean Arterial Blood Pressure (MBP) between DL and ILMA groups

	DIRECT LARYNGOSCOPY (n=66)		ILMA (n=66)		p value
	Mean	Std. Deviation	Mean	Std. Deviation	
MBP (mmHg)Baseline	97.00	11.1	96.36	8.6	.712
MBP (mmHg) Post Intubation	85.23	7.9	87.46	7.2	.090
MBP(mmHg) T0	105.26	8.9	95.97	6.5	.000
MBP(mmHg) T1	108.23	7.8	95.56	9.7	.000
MBP(mmHg) T5	101.65	7.7	93.08	5.9	.000
MBP(mmHg) T10	97.41	7.2	91.05	5.8	.000

Of the 132 patients divided into two equal and randomised groups of 66 each, the mean arterial blood pressure was documented on arrival to operation theatre (taken as Baseline diastolic blood pressure), 3 minutes post induction of anaesthesia, immediately post endotracheal intubation, 1 minute post endotracheal intubation, 5 minutes post endotracheal intubation, and 10 minutes after endotracheal intubation. Only the increase or decrease of mean arterial blood pressure was analysed.

The mean arterial blood pressure at baseline between DL (97.00±11.1 mmHg) and ILMA (96.36±8.6 mmHg) groups was comparable p=0.712. The mean arterial blood pressure post-induction was comparable between DL (85.23±7.9 mmHg) andILMA (87.46±7.2 mmHg) groups with p=0.09. The mean arterial blood pressure immediately post intubation was 105.26 ± mmHg in DL group and 95.97±6.5 mmHg in ILMA group. On analysis by student's t-test the p-value<0.05 was calculated, which was statistically significant. The mean arterial blood pressure at one minute post intubation was 108.23 ± 7.8 mmHg in DL group and 95.56±9.7 mmHg in ILMA group. On analysis by Student's t-test the calculated p-value<0.05 was statistically significant. The mean arterial blood pressure at 5 min post intubation was 101.65±7.7 mmHg in DL group and 93.08±5.9 mmHg in ILMA group. On analysis by student's t- test the calculated p-value<0.05 was statistically significant. The mean arterial blood pressure at 10 min post intubation was 97.41±7.2 mmHg in DL and 91.05±5.8 mmHg in ILMA group. On analysis by student's t-test the calculated p-value<0.05 was statistically significant.

Discussion

Our study reveals that mean and max SBP, DBP, MBP in group DL increased more than group ILMA. The reason could be attributed to less mechanical pressure of oro-pharyngeal supraglottic and sub-glottic structures due to soft fit of well lubricated silicone used during ILMA guided intubation.[4] So this would possibly lessen the sympathetic stimulation than Direct Laryngoscopy.

However some studies showed a similar or greater hemodynamic response with endotracheal intubation using ILMA. The reason for this could be that the insertion is a three step procedure, the longer apnea time associated with ILMA insertion and endotracheal intubation through it, the fact that the epiglottis elevating bar elevates the epiglottis to guide the endotracheal tube through, and the fact that it is a blind procedure that may require head and neck manipulation.[5,6]

Conclusion

In this study it was found that the ILMA guided endotracheal intubation produces a less marked sympathetic response. This might not be of importance in the healthy normotensive patients, but it could be of importance in the patient with pre existing cardiac or cerebral pathology or hypertension. Therefore, where appropriate, the use of the ILMA would be recommended in such patient to avoid the marked response produced by the ETT.

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