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# A COMPARATIVE STUDY OF PRESSOR RESPONSE FOLLOWING LARYNGOSCOPY AND TRACHEAL INTUBATION VERSUS INTRODUCTION OF INTUBATING LARYNGEAL MASK AIRWAY AND INTUBATION THROUGH IT


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## ABSTRACT

**Background:** Though laryngoscopy and tracheal intubation is the commonest technique of securing airway, laryngoscopy exceeding 15 seconds is associated with exaggerated pressor response. It can lead to a cardiovascular catastrophe especially in elderly patients

**Methods:** A prospective randomised study was conducted in patients belonging to American Society of Anaesthesiologist (ASA) physical status I and II scheduled for elective surgery under general anaesthesia. Sixty patients were randomly divided into two groups of 30 each. In group I laryngoscopy and intubation was performed and in group II intubation was performed through intubating laryngeal mask airway (ILMA), fastrach

**Results:** Haemodynamic parameters were compared between the two groups using two tailed independent t test. Surge in heart rate (HR) and mean arterial pressure (MAP) was statistically significant in group I ($p > 0.001$)

**Conclusion:** The technique of ILMA insertion and intubation can be recommended for patients vulnerable to cardiovascular event.


**KEYWORDS :** ILMA, fastrach, laryngoscopy, pressor response

## INTRODUCTION

Endotracheal Intubation following direct laryngoscopy is the commonest method of securing airway for administration of general anaesthesia. Laryngoscopy exceeding 15 seconds is associated with tachycardia and hypertension as result of rise in plasma noradrenaline level due to sympathetic response.[1] Laryngoscopy inevitably involves distortion of airway anatomy in order to bring larynx into view.[2]

Difficulty in airway management is an important cause of morbidity and mortality in anaesthesia practice.[3] Various pharmacological and non-pharmacological methods are tried to limit pressor response of endotracheal intubation. One such attempt is the use of intubating laryngeal mask airway (ILMA) and introduction of tracheal tube through it. It provokes less sympathetic response as this does not require distortion of pharyngeal structures in order to bring larynx into view.

Over the years many alternative airway management devices have come into practice including McCoy laryngoscope, rigid bronchoscope, flexible endoscope and light wand. All of these have been used with variable success.[4, 5, 6] ILMA is a modification of LMA classic designed in such a way that endotracheal tube can be passed through it.[7]

## MATERIALS AND METHODS

This prospective randomized controlled study was carried out in a tertiary care teaching hospital spanning over 12 months after obtaining approval of the hospital ethics committee. Sixty patients were divided into two groups i.e. group I and group II with 30 patients in each group.

### Inclusion criteria

- American Society of Anaesthesiologists (ASA) I and II physical status patients
- Age between 20 to 50 years
- Adults weighing 35 to 70 Kg
- Patients with normal airway anatomy were included in the study. Airway of each patient was assessed preoperatively by using five bedside tests viz. Modified Mallampatti Test, thyromental distance, atlanto-occipital joint extension, inter incisor gap and sternomental distance.

### Exclusion criteria

- BMI > $35 Kg/m^2$
- Cervical spine diseases
- Hiatus hernia
- Gastro-esophageal reflux diseases
- Known pharyngo- oesophageal pathology
- Hypertension and ischaemic heart diseases

Complete history was taken and thorough physical examination was conducted. Routine laboratory investigations were carried out. Written informed consent was sought following preanaesthesia check up. The patients were kept fasting overnight after 2200 hours prior to surgery. Tablet diazepam 5 mg was given for anxiolysis at bedtime. Vascular access was secured via a peripheral vein. General anaesthesia was induced in both the groups.

### Anaesthetic Technique

Patients were premedicated with injection midazolam 0.03mg/kg and fentanyl 1mcg/Kg intravenously. Induction was carried out with injection propofol 1.5 - 2 mg /kg intravenously. Injection vecuronium 0.1mg/kg was used intravenously to facilitate intubation.

**Group I:** Patients were intubated using Mcintosh laryngoscope with appropriate sized cuffed endotracheal tube.

**Group II:** Appropriate sized ILMA as per body weight of the patient was introduced and intubation attempted through it. Readjustment of endotracheal tube was done at the level of incisors for maintaining bilaterally equal air entry after removal of ILMA.

Baseline pulse rate, blood pressure and $Spo_2$ were recorded after confirmation of effect of the muscle relaxant. Following stages for haemodynamic response were considered in group I: stage 1 involving laryngoscopy, stage 2 following intubation and stage 3 once pressor response decreases. Whereas in Group II: stage 1 involved insertion of ILMA, stage 2 following intubation and stage 3 once pressor response decreases. Successful tracheal intubation was judged by adequate chest rise and capnography.

## Observations and Results

All the patients were in the age group of 22 to 50 years. Mean age of the patients in group I was 32.03±6.47 years and 31.56±7.31 years in group II. The age distribution in both the groups was as shown in table 1 and figure 1. The two groups were statistically comparable with respect to age using two tailed independent t test ($p > 0.05$).

**Table 1: Mean age in the two groups in years**

| Group | Mean | Standard deviation |
|---|---|---|
| I ( n=30) | 32.03 | 6.47 |
| II (n=30) | 31.56 | 7.31 |

**Age range**

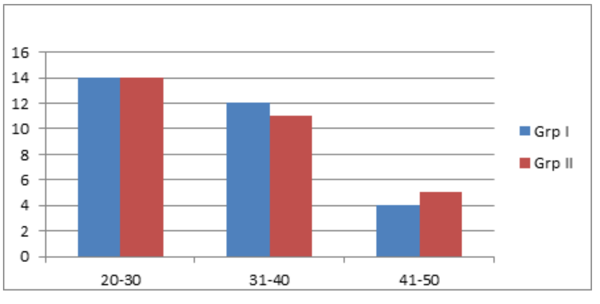


**Fig 1**

Sex ratio of the patients in both the groups was comparable as shown in table 2.

**Table 2: Sex distribution in two groups**

| Group | Male | Female |
|---|---|---|
| I ( n=30) | 9 | 21 |
| II (n=30) | 6 | 24 |

Weight of the patients ranged from 42 to 68 kg. The average weight of the patients in group I was 57±9.93 kg and 54.4±14.21 kg in group II as shown in table 3. The two groups were compared with regard to weight using two tailed independent t test and no statistically significance difference was observed.

**Table 3: Weight of patients in both the groups in kg**

| Group | Mean | Standard Deviation |
|---|---|---|
| I ( n=30) | 57.9 | 9.93 |
| II (n=30) | 56.85 | 14.21 |

The success rate of intubation in group I was 100% at first attempt as shown in table 4 and figure 2. In group II, ILMA insertion was successful at first attempt in all the cases but intubation was achieved in 80.6% (26) cases in first attempt, in 10% (3) cases in second attempt and in 3.3 % (1) cases in third attempt as shown in table 4 and figure 3.

**Table 4: Successful ventilation & intubation in both the groups**

| Group | No of attempts | Successful ventilation | Successful intubation |
|---|---|---|---|
| I | First attempt | 30 | 30 |
| N= 30 | Second attempt | 0 | 0 |
| | Third attempt | 0 | 0 |
| II | First attempt | 30 | 26 |
| N= 30 | Second attempt | 0 | 3 |
| | Third attempt | 0 | 1 |

Number of attempts in group I

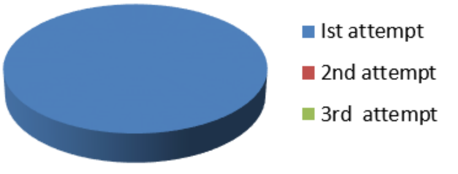


**Fig 2**

Number of attempts in group II

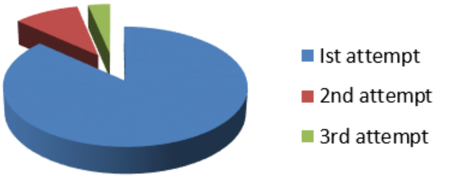


**Fig 3**

In group I time taken for intubation was noted. In group II time taken for insertion of ILMA to successful tracheal intubation through it was recorded. Total time taken was in the range of 9 to 25 seconds in group I and 17 to 45 seconds in group II. The mean time taken for successful intubation was longer in ILMA group compared to the laryngoscopy group. The difference in mean time was found to be statistically significant using two tailed independent t test ($p < 0.001$) as depicted in table 5.

**Table 5: Time taken to successful intubation**

| Group | N | Minimum (seconds) | Maximum (seconds) | Mean (seconds) | Standard deviation |
|---|---|---|---|---|---|
| I | 30 | 9 | 25 | 13.65 | 4.48 |
| II | 30 | 17 | 45 | 27.45 | 7.56 |

Haemodynamic parameters were compared between the two groups using two tailed independent t test. The heart rate (HR) rose from 75±18 beats per minutes (bpm) at stage 1 to 83±12 bpm at stage 2 in group I. This increase in HR was statistically significant $p < 0.001$.This increase in HR was not maintained throughout and it was 74±11 bpm at stage 3. However, in group II HR rose from 71±16 bpm following insertion of ILMA at stage 1 to 74±13 bpm after intubation through it at stage 2 and decreased to 68±14 bpm at stage 3. The changes were not statistically significant. The Mean arterial pressure (MAP) in group I increased from 75.13±8.41 mmHg at stage I to 83.5±13.42 mmHg at stage 2 and decreased to 80.44±9.42 mmHg at stage 3. These changes in MAP were statistically significant ($p < 0.001$). In group II, the MAP increased from 76.71±10.4 mmHg to 77.69±15.02 mmHg at stage 2 ($p > 0.05$) which was not statistically significant. At stage 3, the MAP slightly increased to 80.34±10.28 mmHg in group II ($p < 0.001$). Figures 4 and 5 and table 6 showed the comparison of mean changes in HR and MAP observed respectively. The mean change in HR and MAP was more in group I at stage 2.

**Table 6: Mean of haemodynamic parameters observed at various stages in the two groups**

| Group | Variable | Stage 1 | Stage 2 | Stage 3 |
|---|---|---|---|---|
| I(n=30) | HR(bpm) | 75±18 | 83±12 | 74±11 |
| | MAP(mmHg) | 75±8 | 83±13 | 80±9 |

| | | | | |
|---|---|---|---|---|
| II(n=30) | HR(bpm) | 71±16 | 74±13 | 68±14 |
| | MAP(mmHg) | 76± | 77±15 | 80±10 |

HR: heart rate, bpm: beats per minute, MAP: mean arterial pressure

**Mean change in heart rate**

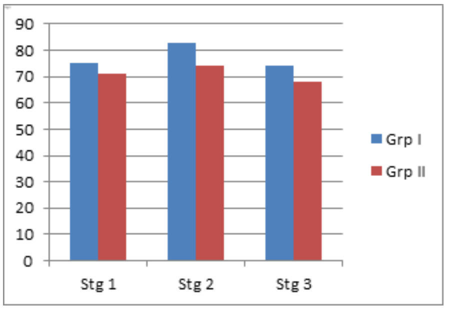


**Fig 4**

**Mean change in Mean arterial pressure**

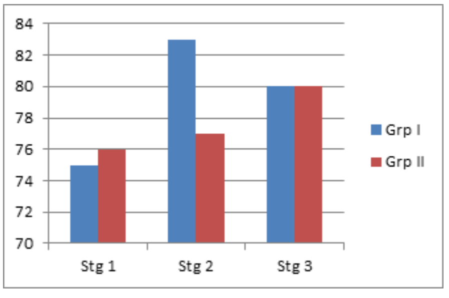


**Fig 5**

Complications encountered during intubation in both the groups were as depicted in table 7. Tip of ILMA was examined for traces of blood for mucosal injury. Lips were examined for any lip trauma and incidence of sore throat was recorded by asking the patients immediately in preoperative period as well as post operatively after 24 hours. The patients were enquired regarding any other complications as well.

**Table 7: Complications**

| Complications | Group I (n= 2/30) | Group II (n=4/30) |
|---|---|---|
| Mucosal trauma | 0 | 3 |
| Lip injury | 1 | 2 |
| Sore throat | 2 | 2 |
| Oesophageal intubation | 0 | 3 |

## DISCUSSION

Airway management is the prime responsibility of an anaesthesiologist. Various gadgets have been developed for the same over a period of time. Conventional laryngoscopy followed by tracheal intubation is the most commonly practiced method of securing airway.

ILMA is an advanced LMA designed to facilitate tracheal intubation. It permits single handed insertion in any position with minimal manipulation of head and neck. It can be used as an airway management device in its own right. Ventilation and oxygenation can be continuous during intubation attempts to prevent desaturation. In this study, we compared these two techniques of airway management with regards to efficacy, intubating conditions and haemodynamic response.

In our study, tracheal intubation using conventional laryngoscopy was successful in first attempt in all the patients while ILMA intubation was possible in first attempt in 80% of the patients, in second attempt in 10% of the patients and in third attempt in 3.3% of the patients. In group II oesophageal intubation was seen in 10% of the patients.

One of the initial works done by Brain to assess the performance of ILMA as a ventilatory device and blind intubation guide in 150 individuals showed 100% success rate for device insertion and ventilation in first attempt. Tracheal intubation was possible in 99.3% of the patients. Fifty percent of the patients were intubated in the first attempt, 19% of the patients required 2 attempts and 31% of the patients were intubated in 3 to 5 attempts.[7]

Chan et al. who studied the efficacy of ILMA in predominantly Chinese population reported an overall success rate of 97% for blind intubation through ILMA. Fifty percent of those were intubated in first attempt, 42% in second attempt and 5% in the third attempt.[8] Hundred percent success rate for intubation and ventilation using ILMA was reported by Agro et al. Forty percent of those were intubated in the first attempt and the rest in second attempt.[9]

Baskett et al. & Joo and Rose found overall higher success rates and were similar for both blind ILMA guided and direct laryngoscopy guided intubation.[6,10] Incidences of oesophageal intubation was not documented by them. Kihara et al. in their study reported intubation success rate of 100% with laryngoscopy and 94% using ILMA. Fifty six percent of those were achieved in first attempt in patients with normal airway.[11] The success rate of intubation using ILMA achieved in our study was comparable with that found by Baskett et al. who carried out a multicentric trial at 7 centres in UK on 500 ASA grade I and II patients.[6] Ventilation after ILMA insertion was satisfactory in 95% of the patients, difficult in 4% of the patients and unsatisfactory in 1% of the patients. Intubation was successful in 96.2% case (79.8% in first attempt, 12.4% in second attempt and 4% in third attempt).

Time taken for successful intubation in our study was 13.65±4.48 seconds in group I and 27.45±7.56 seconds in group II. This difference was statistically significant ($p < 0.001$). In a study conducted by Kihara et al. successful intubation was achieved in 33 seconds using laryngoscope while intubation through ILMA required 57 seconds.[11] In both the studies intubation through ILMA required more time as compared to intubation using laryngoscope because intubation through ILMA occurs through various stages which is time consuming. Avidian et al. found that mean time for insertion of ILMA by naive intubators was 19.98 seconds though he did not compare the results with use of laryngoscopy but on comparison with our study time taken was more than that for laryngoscopy group.[12]

As shown in the observation table 6, there was significant rise in HR and MAP at stage 2 after intubation as compared to stage 1 in group I. On the other hand, the change in HR and MAP was not significant at stage 2 in group II. Joo and Rose reported lesser rise of MAP during ILMA insertion and intubation than direct laryngoscopy & intubation. Baskett et al. reported rise in HR and MAP which was statistically significant but of little clinical significance during ILMA insertion and intubation.[1,6,10]

Kihara et al. also found similar haemodynamic changes when intubation was done via ILMA and under direct laryngoscopic vision.[11] Another study conducted by the same author observed haemodynamic response to ILMA insertion, intubation and also for ILMA removal in addition to it. A significant rise in HR and MAP on ILMA insertion and immediate intubation was noted when compared with preinsertion values whereas no change was observed when compared with pre induction values. Choyce et al. reported pressor response to intubation of similar magnitude both for laryngoscopy and ILMA insertion groups but they compared it with preinsertion values.[13] Shimoda O et al. found no appreciable haemodynamic changes on ILMA insertion and intubation when compared with pre insertion values.[14]

The incidence of mucosal trauma and lip injury was greater with ILMA as compared to laryngoscopy group. Similar findings were reported by Kihara et al.[11] Higher incidences of mucosal injury in the ILMA group was attributed to high pressure exerted by ILMA against pharyngeal mucosa. Shung et al. reported 67% incidences of sore throat as against 10% in our study. Higher incidences of sore throat in the above study may be correlated to awake intubation technique used by the authors.[15]

## CONCLUSION

Blind intubation through ILMA offers no special advantage over conventional laryngoscopy for patients with normal airway anatomy in terms speed of intubation and number of attempts. The haemodynamic pressor response to ILMA insertion and intubation is less as compared to the conventional laryngoscopy and intubation. Thus, it can be recommended for the patients in whom pressor response is undesirable. Since ventilation even without intubation is possible with ILMA, it offers a good alternative in 'cannot intubate' scenario while dealing with difficult airway for conduct of anaesthesia. However, it requires further evaluation.

### Conflict of Interest

Nil

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