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COMPARATIVE EVALUATION OF EASE OF INTUBATION WITH INTUBATING LARYNGEAL MASK AIRWAY AND VIDEO LARYNGOSCOPE IN PATIENTS WITH ANTICIPATED DIFFICULT AIRWAY.

Anaesthesiology

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ABSTRACT

Background: Difficult airway management remains a cornerstone for anesthesiologists. Many difficult intubations are not recognized until after the induction of anesthesia. Such difficulties may result in multiple laryngoscopic attempts causing airway damage and airway edema. Supraglottic airway devices fill a niche between the facemask and tracheal tube in terms of both anatomical position and degree of invasiveness. The aim of this study is to compare and evaluate the efficacy of Intubating Laryngeal Mask Airway(ILMA) and i-scope Video Laryngoscope(VL) in anticipated difficult airway patients. **Methods:** 60 ASA I & II patients of either sex with MP grade-3 planned for elective surgery under general anesthesia requiring endotracheal intubation were randomly allocated into two groups namely: GROUP I - Intubating laryngeal mask airway and GROUP V- i-Scope VL. Standard anesthesia protocol was followed and patients intubated using group specific airway devices with maximum of 3 attempts. In case of failure, patient managed with standard protocol and excluded from further statistical analysis. The following parameters were measured, 1) time to intubate. 2) hemodynamic changes(HR, BP,MAP). 3) overall success rate. 4) complications. **Results:** The baseline characteristics were comparable between two groups. Time to intubation was significantly shorter in group V (38.97±19.62, P= 0.022) in the first attempt with comparable overall rate of successful intubation. Hemodynamic stability was comparable in both the groups. **Conclusion:** ILMA guided tracheal intubation is an effective alternative to VL guided intubation in patients with anticipated difficult airway.

KEYWORDS

Intubating LMA, Video Laryngoscope, Difficult airway.

Airway management is one of the main concerns of anesthesiologists. Maintaining a patent airway is of foremost importance to provide adequate ventilation. Many difficult intubations are not recognized until after the induction of anesthesia and may result in multiple laryngoscopic attempts causing airway damage and airway edema, and hence making ventilation difficult.

Supraglottic airway devices have become a standard fixture in airway management. They fill a niche between facemask and endotracheal tube (ETT) in terms of both anatomical position and degree of invasiveness although the cuffed ETT is considered as the gold standard for providing a safe glottic seal. The first successful supraglottic airway device, the LMA Classic became available in 1989, described by Archie Brain.[4] Apart from anesthesia, variants of LMA can be used in other clinical situations such as cardiopulmonary resuscitation (CPR),[5,6,7,8] pre-hospital emergency use, and management of a difficult airway.[9,10] These devices overcome many disadvantages of endotracheal intubation such as esophageal intubation, endobronchial intubation, failed intubation, and the pressor response to laryngoscopy.

The ILMA is a modification of the LMA. It is a device specifically designed as an effective ventilatory device and a blind intubation guide in patients with normal as well as an abnormal airway. It is designed to facilitate tracheal intubation with better insertion and intubating characteristics as compared to the standard LMA. ILMA consists of an anatomically curved, rigid airway tube with an integral guiding handle, an epiglottic elevating bar(EEB) replacing the LMA bars, and a guiding ramp to direct the tracheal tube anteriorly as it emerges from the mask aperture.[12]

Recently, the combination of fibreoptic bronchoscope(FOB) and laryngoscope led to the development of VL. They provide a video-based view of the glottic opening with or without additional guidance. VL consists of a blade, a handle, and a camera at the end of the blade by which glottis can be visualized directly on a screen. Due to the various above mentioned advantages of both devices, we conducted a study to evaluate and compare the ease of endotracheal intubation with ILMA and VL in anticipated difficult airway scenarios.

MATERIALS AND METHODS

This comparative, randomized study was conducted in the Department of Anesthesiology, in a Tertiary care hospital over a span of 1.5 year. 60 ASA I and II patients of either sex and 18-60 years of age, planned for elective surgery under general anesthesia with anticipated difficult airway requiring endotracheal intubation, were enrolled in the study after taking written informed consent. Preoperative evaluation was done, and patients were randomly divided into two groups of 30 patients each _Group I in which ILMA was used for intubation and Group V in which VL was used for intubation with allocation sequence generated by computerized random number table. Patients with cervical spine fixed in flexion, incresaed risk of gastric aspiration (Morbid obesity BMI>35, Gastroesophageal reflux disease, Diabetes mellitus), history of allergy to drugs used in the study and reactive airway disease,were excluded from the study.

Deepak G Mathew, et al[1] observed that success rates of intubation in ILMA, C-Trach, and CPLA groups were 100, 100, and 98% respectively. The first-attempt success rate was significantly better with C-Trach compared to Cobra PLA (100 vs. 85%, $p < 0.05$). Time taken for device insertion was significantly more with Cobra PLA as compared to that taken with ILMA or a C-Trach (35.7 vs. 30.3 and 27.5 s, respectively). Intubation through C-Trach took least amount of time (84.4 s) as compared to ILMA (117.9 s) or Cobra PLA (139.2 s). The incidence of hypoxia and airway morbidity was similar between the groups. Taking this as reference, sample size was calculated to be 60 patients with 30 in each group. Standard institutional anesthesia protocol was followed. Standard ASA monitors were attached to the patients (ECG, Pulse oximetry & Non-Invasive Blood Pressure). Baseline vital parameters like heart rate(HR), systolic BP(SBP), diastolic BP(DBP) and mean arterial pressure(MAP), O_2 saturation were recorded. Patients received Inj.Glycopyrrolate 0.2 mg, Inj.Midazolam 0.03 mg/kg and Inj.Fentanyl 2µg/kg intravenously followed by pre-oxygenation with 100% oxygen for 3 minutes. Anesthesia was induced with titrated doses of Inj.Propofol intravenously. After check ventilation, Inj.Vecuronium Bromide 0.1 mg/kg was given intravenously. Intubation was carried out after three minutes, with an appropriate sized cuffed ETT using the group specific device. In cases were airway could not be secured using ILMA or VL after three attempts, failure of insertion was declared. Each attempt was terminated after 180s or if the oxygen saturation on pulse oximeter fell below 90% whichever was earlier. If three attempts were unsuccessful either an alternative device was inserted or the procedure was discontinued and the patient awakened. The primary outcomes measured were (1) Ease of insertion including number of attempts and duration of each attempt which was measured from the time when the

device is introduced in the mouth until the square shaped capnograph curve reappears on the monitor and (2) Success rate of intubation and heamodynamic perturbations like hypertension, tachycardia, bradycardia, were tachycardia and hypertension was defined as HR > 20% of baseline value and SBP > 20% of baseline value, respectively and bradycardia and hypotension was defined as HR < 20% of baseline value and SBP < 20% of baseline value, respectively. Adverse events occurring during intubation like laryngospasm, bronchospasm, trauma, dental loss and bleeding were also noted. The secondary outcomes measured were hemodynamic changes including HR, SBP, DBP and MAP. All these parameters were measured at the baseline, prior to induction (before premedication), prior to intubation and at 1, 3, 5, 7 minutes after intubation.

Statistical Analysis:
Quantitative variables were compared using Unpaired t-test / Mann-Whitney Test (when the data sets were not normally distributed) between the two groups and paired T test / Wilcoxon rank sum test for comparison within group across follow up. Qualitative variables were correlated using Chi-Square test / Fisher's exact test. A p value of <0.05 was considered statistically significant. The data was entered in MS EXCEL spreadsheet and analysis was done using Statistical Package for Social Sciences (SPSS) version 21.0.

Consort Flowchart

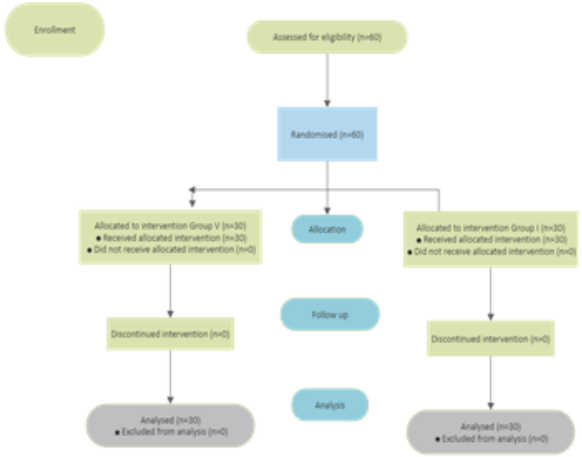

Figure 1.

RESULTS

Demographic characteristics (age, gender, body weight) were similar between the two groups with p>0.05

Table 1: Comparison of duration of attempt (in seconds) between group I and V.

Duration of attempts (in seconds)	Group I	Group V	Total	P value	Test performed
Duration of 1st attempt (in seconds)					
Mean ± SD	49.83 ± 15.99	38.97 ± 19.62	44.4 ± 18.57	0.022	t test; 2.351
Median(IQR)	56(40-60)	33.5(22.25-57)	54(28-59.25)		
Range	6-68	6-68	6-68		
Duration of 2nd attempt (in seconds)					
Mean ± SD	53.4 ± 22.2	47.25 ± 26.73	50.67 ± 22.91	0.716	t test; 0.378
Median(IQR)	61(30-68)	44.5(26.5-65.25)	61(30-68)		
Range	30-78	22-78	22-78		
Duration of 3rd attempt (in seconds)					
Mean ± SD	60 ± 19.08	47 ± 35.36	54.8 ± 23.35	0.617	t test; 0.555
Median(IQR)	70(54-71)	47(34.5-59.5)	70(38-72)		
Range	38-72	22-72	22-72		

Interpretation: The above table shows the time required for intubation and a statistically significant difference was found on comparison (p value <0.022) on 1st attempt. It was observed that intubation with Intubating LMA required more time i.e. 49.83 seconds as compared to Video Laryngoscope i.e. 38.97 seconds in the first attempt (DA1- duration of 1st attempt). Duration of intubation in 2nd attempt (DA2) was not statistically significant (p value <0.716) being 53.4 seconds for group I vs 47.25 seconds for Group V. The duration of intubation in the 3rd attempt was 60 seconds in Group I and 47 seconds in Group V but it was not statistically significant.

The differences in HR, SBP, DBP and MAP were not significant statistically in both the groups

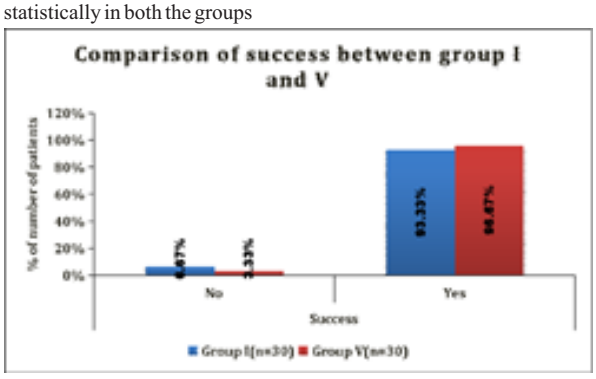

Figure 2: Comparison of success of intubation between group I and V.

There were 3 failed attempts of intubation with ILMA which required other techniques of intubation and all the attempts with VL were successful.

DISCUSSION

We conducted this prospective randomized comparative study, on 60 ASA Grade I and II patients with Modified Mallampati class III with adequate mouth opening posted for elective surgery under general anesthesia to compare i-scope VL and ILMA with respect to ease of insertion, success rate of insertion, hemodynamic responses to intubation and adverse events in patients. Patients were randomly divided into Group I (ILMA) and Group V(VL) with 30 patients in each group.

In our study the two groups were similar and comparable with respect to age, gender, BMI. Out of 30 patients in Group I, 24(80%) patients were intubated in 1st attempt whereas in Group V 25(83.3%) patients were intubated in 1st attempt. Though, VL required lesser number of attempts than ILMA, the difference was not statistically significant (p=0.896). The overall success rate for intubation is 100% with VL whereas it is 93.3% with ILMA as there were 3 cases of failure of intubation among 30 patients.

The results were contrary to study results by Chan et al[2] in 1998 on 100 patients concluded that 50% patients were successfully intubated in 1st attempt. In the study conducted by Langeron O et al[3]in 2001, 1st insertion success rate was found to be lower in ILMA group (34 patients) vs Fibreoptic group (31 patients), but were not significant statistically. These differences may be due to increased sample size, increased difficulty in intubating through ILMA compared to VL and also population differences between the two studies. In studies conducted by Massen[4], Xue[5] and Sun[6], the overall success rate of intubation with Glidoscope VL was found to be 100% compared to FOB. This is due to complexity in FOB procedure compared to VL and needs more practice.The time from which ETT is inserted in the mouth until the appearance of first square shaped end-tidal CO_2 curve was recorded as the time taken for insertion. In our study we found that the time required for endotracheal intubation was 33.5 seconds in 1st attempt, 44.5 seconds in 2nd attempt and 47 seconds in 3rd attempt for Group V, which was lesser compared to Group I in which it required 56 seconds in 1st attempt, 61 seconds in 2nd attempt and 70 seconds in 3rd attempt. But the results were statistically insignificant except for the 1st attempt with statistically significant difference (p=0.022). The increased time taken for intubation by ILMA may be due to various steps involved in the procedure.

According to a study by B. B. Abdelmalak[7], median time to intubate was 37 seconds with Glidescope VL and 43 seconds with FOB in obese patients under general anesthesia. But the results were not significant. Similar results were observed by F.S. Xue in his study in patients with normal airway.

In our study, the increase in HR was maximum at 1 minute after

intubation in both the groups, which was significant statistically. The time taken to reach the maximal stress response was similar in both groups. These results were consistent with those of Natalia Jakusenko[8] who found that hemodynamic changes were significantly higher after 1 minute of intubation. They also found that that the changes were more in FOB group compared to VL group. They attributed these differences to the fact that longer contact of the device with mucosal receptors in oral, pharyngeal and laryngeal zone produce greater stress response. But other parameters like SBP, DBP, MAP were comparable in both the groups.

We did not encounter any event of hypoxemia ($Spo_{2<}$ 90%). We also assessed other adverse events like dental, soft tissue trauma and bronchospasm. Soft tissue injury occurred in 6.67% in Group I versus 3.33% in Group V. Bronchospasm occurred in 3.33% patients in Group I. It was found that ILMA had more adverse events than VL but they were not statistically significant.

CONCLUSION

From our study we observed that i-scope VL guided intubations were equally easier to perform as compared to ILMA guided intubations. The time required for intubations was significantly lesser in VL group only in the 1st attempt. The hemodynamic stability was comparable between both groups. The rate of successful intubations was comparable in both groups. However, there were few cases of failed intubations with ILMA, but they were not statistically significant. Hence, ILMA is an effective and safe alternative to VL for intubation in patients with anticipated difficult airway.

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