Original Article

Comparison of the LMA BlockBuster and intubating LMA as a conduit to blind tracheal intubation

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Abstract

Background and Aims: Primary aim of the study was to evaluate the performance of Intubating LMA (ILMA) and blockbuster LMA in terms of first pass success rate, ease and duration taken for blind tracheal intubation.
Material and Methods: The present prospective randomised study was conducted on 70 patients of either sex aged 18-60 years belonging to ASA physical status I or II. Patients were randomly allocated to either, group I and group B of n = 35 each. In group I and B patients were intubated using ILMA and LMA BlockBuster respectively. Insertion time and ease of placement of supraglottic device, total time taken for successful intubation, number of attempts for endotracheal tube (ETT) placement, and ease of placement of ETT, were recorded.
Results: In both groups, the supraglottic device was placed on the first attempt in 88.6% patients. The first-attempt success rate for ETT placement was 71.4% in group I versus 94.3% in group B, ($P = 0.01$) with an overall success rate of 88.5% in group I and 100% in group. More failure rate was observed in group I (11.4%) compared to group B (0%). The total time taken for successful intubation in group I was 11.53 ± 6.410 sec and 9.17 ± 2.749 sec in group B ($P = 0.04$).
Conclusion: We conclude that the modifications in the design of LMA Blockbuster (>95° angle, availability of the parker flex tube 27–30°angle of the emergence of airway tube) make it a more convenient, effective, simpler, and faster intubating device than ILMA.

Keywords: Blockbuster LMA, Intubating LMA, Supraglottic devices

Introduction

The laryngeal mask airway (LMA) may also be used as a conduit for LMA-guided intubation for both blind and fiberoptic-guided intubation. It can be utilized as a rescue device for unexpectedly difficult intubations. Over time, different supraglottic airway devices that incorporate the ability to ventilate and intubate into a single piece of equipment have been produced.[1–3]

Dr. Archie Brain invented the intubating laryngeal mask airway (ILMA) in 1997 in response to difficulties encountered when inserting an endotracheal tube (ETT) blindly into the trachea via the classic LMA. The Touren BlockBuster LMA, which was more recently designed in 2012, has proven to be a popular and effective tool for intubation through the supraglottic airway.[4–6]

BlockBuster LMA is a new multi-functional ILMA invented by Professor Ming Tian. This laryngeal mask is also referred to as a member of the fourth generation. There are three sizes available: 3, 4, and 5. Size 3 should be used for patients weighing 30–50 kg, size 4 for patients weighing 50–70 kg,

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and size 5 for patients weighing 70–100 kg. It is an effective supraglottic tool to establish an artificial airway with the soft wall, convenient placement, esophageal drainage, and good sealing characteristics. This device has an anatomically shaped airway tube. To prevent gastric aspiration, it features a separate route to insert a stomach tube and is designed to generate strong airway seal pressures around the laryngeal opening.[7–12]

Although both ILMA and BlockBuster LMA are effective for blind tracheal intubation in challenging airway situations, few studies have shown that BlockBuster LMA has a higher success rate than ILMA. Additionally, numerous studies have revealed that failure rates with the use of ILMA are high despite the implementation of a variety of various corrective maneuvers. Hence, the present study was planned to compare ILMA and BlockBuster LMA. The primary aim of the study was to evaluate the performance of both the devices in terms of first pass success rate and ease and time required for blind tracheal intubation.

Material and Methods

This prospective, randomized, double-blind study was conducted in 70 patients of either sex, aged 18 and 60 years, belonging to the American Society of Anesthesiologists (ASA) physical status I–II, and scheduled for surgery under general anesthesia (GA) requiring endotracheal intubation. The study was approved by the institutional ethics committee (BREC/Th/20/Anesth 03) and registered with the clinical trial registry [CTRI/2021/12/038727]. Informed consent was obtained from all the participants. Patients having respiratory or pharyngeal pathology, mouth opening <2.5 cm, body mass index (BMI) >30 kgm^{-2}, who were pregnancy, had full stomach, and anticipated difficult airway were excluded from the study. The patients were examined preoperatively, and all required investigations were performed. Patients were randomly allocated to either of the two groups: group I and group B of $n = 35$ each. Patients were randomly allocated into group I and group B using a sealed envelope that contained code numbers to either of the two groups. Patients were intubated using ILMA in group I and BlockBuster LMA in group B.

Induction of anesthesia was done with glycopyrrolate (0.005 mg kg^{-1}), fentanyl (2 μkg^{-1}), propofol (2.5 mg kg^{-1}) and 2% sevoflurane. After achieving adequacy of ventilation, neuromuscular blockade was achieved with vecuronium (0.1 mg kg^{-1}). Following induction, a suitable ILMA or BlockBuster LMA (size 3 or 4) was chosen as per the manufacturer's instructions based on weight. The airway device was introduced using the standard technique for insertion. Chest auscultation and capnography confirmed the device's proper placement. In the event of difficult ventilation following insertion of device, the airway device was repositioned or reinserted. A maximum of three attempts were made. Insertion time and ease of placement of the supraglottic airway device (SAD) and fiberoptic grading (FOB) was noted.

A well-lubricated endotracheal tube (ETT) was placed via the LMA following successful LMA placement. Confirmation of orotracheal tube placement was done by auscultation and display of a square wave capnography trace. A number of attempts to place the tracheal tube, ease of endotracheal tube placement, and total time required for successful intubation were all noted. Total time was measured from the time the tracheal tube was picked up to the moment that the correct ETT placement was confirmed by the display of a square wave capnography. A maximum of three attempts were permitted. If difficulties with intubation were seen, the manufacturer-recommended maneuvers for the particular device were used. Three unsuccessful attempts at intubation were deemed a failure. Ease of ETT placement was graded on a three-point scale: "easy" for placement of ETT in a single attempt with no or mild resistance encountered; "difficult" if placing the tube needed multiple attempts and additional maneuvers; and "failure" for three failed attempts. Hemodynamic parameters (mean arterial pressure [MAP], heart rate [HR], and SpO_2) at baseline (T_0), after induction (T_1), after LMA insertion (T_2) and after intubation (T_3) were recorded and postoperative problems like sore throat, nausea, and hoarseness were noted after the device was removed.

Statistics

Our estimated sample size was based on comparing efficacy in terms of the success rate of intubation on the first attempt in two groups. With reference to the previous study,[7] we defined a relevant clinical difference of 20% in the success rate of intubation on the first attempt between two groups. We choose a 70% baseline ratio of the success rate of intubation in the first LMA group (group I). Thus, the sample size of 35 patients per group provided an 80% power for detecting a significant difference between any two groups at an alpha level of 0.05 one-sided.

Statistical testing was conducted using the Statistical Package for the Social Sciences (SPSS) version 17.0. Continuous variables were presented as mean ± SD or median (IQR) for non-normally distributed data. Categorical variables were expressed as frequencies and percentages. The comparison of normally distributed continuous variables between the groups was performed using Student's *t*-test. Nominal categorical data between the groups were compared using the Chi-squared test or Fisher's exact test, as appropriate. Non-normal distribution of continuous variables was compared using the Mann–Whitney U test. For all statistical tests, a P value less than 0.05 was taken to indicate a significant difference.

Results

The demographic data of the patients in both groups were comparable [Table 1]. Table 2 shows the insertion time of the SAD in both groups. In both groups, the SAD was placed on the first attempt in 31 patients (88.6%) [Table 3]. The majority of patients in both groups had Fibreoptic grade of 1. In groups I and B, respectively, 62.9% and 65.7% of patients showed fiberoptic grade 1. The first attempt's success rate for ETT placement was 71.4% in group I versus 94.3% in group B, and this was statistically significant ($P = 0.01$) [Table 3]. More failure rate was observed in group I (11.4%) compared to group B (0%). The total time taken for successful intubation in group I was 11.53 ± 6.410 s and 9.17 ± 2.749 s in group B ($P = 0.04$). The ETT was placed easily in 71.4% and 94.3% of patients in group I and group B, respectively, with an overall success rate of 88.5% in group I and 100% in group B [Table 4]. When the failure rate was compared, ETT placement failed in 11.4% of patients in group I compared to none in group B, which was statistically significant ($P = 0.010$), as shown in Table 4. Various maneuvers were applied for the unsuccessful placement of ETT. In group I, Chandy's maneuver was the commonest maneuver used in 25.7% of patients, followed by up-down movement. In a few cases, more than one maneuvers were used to ensure appropriate tube placement, whereas in group B only head extension was required in two patients. At all-time intervals, no statistically significant difference in mean HR, MAP, or SpO_2 was observed in either group ($P > 0.05$) [Figures 1 and 2]. Three patients in group I had sore throats but none in group B. Four patients in group I and two in group B experienced trauma.

Table 1: Demographic profile of patients in both groups

Mean±SD	Group I	Group B	P
Age (years)	38.83±10.98	33.20±12.41	0.49
Weight (kg)	60.29±12.273	57.63±9.873	0.32
Male/Female (%)	17.1/82.9	28.6/71.4	0.25
ASA I/ASA II (%)	71.4/28.6	71.4/28.6	

Table 2: Insertion time of SAD and ETT

	Group I	Group B	P
Insertion time of supraglottic device (seconds)	12.64±4.434	11.08±3.798	0.11
Total time taken for successful intubation (seconds)	11.53±6.410	9.17±2.749	0.04*

Discussion

Intubating laryngeal mask airway (ILMA) is being widely used to provide a conduit for both blind and fiberoptic-guided intubation.[3] The more recent device, BlockBuster LMA, is a multi-functional intubation LMA that effectively creates an artificial airway with a soft wall, and is assumed to be placed conveniently over ILMA.[7–9] We compared the ILMA and BlockBuster LMA to evaluate the performance of devices in terms of simplicity, first pass success rate, ease and duration taken for blind tracheal intubation, and speed of placement. Insertion time and success rate for placement of SAD was nearly same for both the devices.

In our study, the SAD placement time required for groups I and B was 12.64 and 11.08 s, respectively, with placement success rate of 100% in both the groups. But ILMA had a higher second attempt success rate compared to BlockBuster LMA. In a related study, of Endigeri *et al.*,[7] similar results were observed while using BlockBuster LMA with overall 100% success rate for placement of both the devices.[13] In contrast, a few authors recorded a higher time for effective ILMA placement which is because of the reason that the rigid broad airway tube of ILMA is slightly difficult to insert and requires additional maneuver for appropriate placement.[14] Various maneuvers like neck extension, jaw thirst, and lifting maneuvers were employed on the patients who needed second and third attempts, for the device to be successfully placed. Additionally, when ILMA and BlockBuster LMA were compared, it was found that ILMA's airway tube had an angle of 80° to 85°, but BlockBuster LMA's airway tube had an angle of >95°. The acute angle of ILMA makes its insertion a little difficult [Figure 3].

Table 3: Showing number of attempts for SAD and ETT

	Attempts	Group I Frequency (%)	Group B Frequency (%)	P
Number of attempts for placing the supraglottic airway device	1st	31 (88.6)	31 (88.6)	
	2nd	3 (8.5)	4 (11.4)	
	3rd	1 (2.8)	0	
	Failure	0	0	
Number of attempts for endotracheal tube placement	1st	25 (71.4)	33 (94.3)	0.01*
	2nd	3 (8.5)	2 (5.7)	0.19
	3rd	3 (8.5)	0	0.01*
	Failure	4 (11.4)	0	0.01*

Table 4: Ease of placement of ETT

Ease of placement	Group I	Group B	P
Easy	25 (71.4%)	33 (94.3%)	0.76
Difficult	6 (17.14%)	2 (5.7%)	0.55
Failure	4 (11.4%)	0 (0%)	0.01*

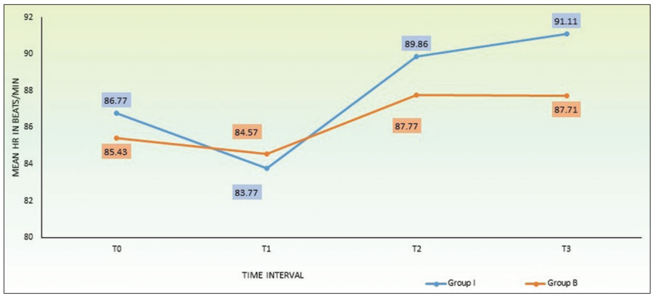

Figure 1: Comparison of heart rate among groups

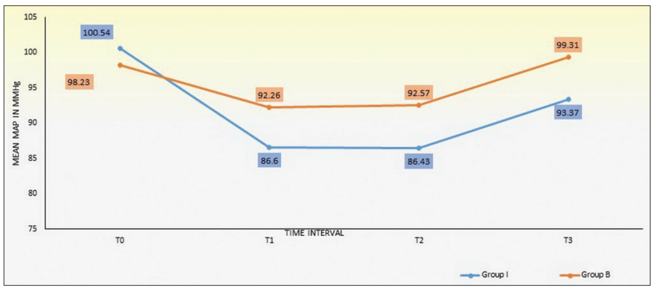

Figure 2: Comparison of mean arterial pressure among groups

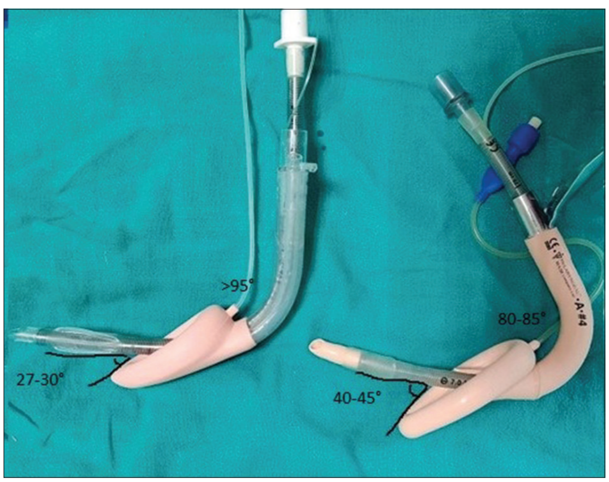

Figure 3: Displaying of angle of emergence of tube from supraglottic airway device

The first attempt success rate for intubation in the current study was higher with BlockBuster LMA (94.3%) compared to ILMA (71.4%) ($P = 0.01$) with an overall success rate of 100% with BlockBuster LMA and 88.6% with ILMA. We failed to intubate in 11.4% of patients with ILMA compared to none with BlockBuster LMA. Investigators who used BlockBuster LMA recorded first-pass success rates of >90%.[7–9] Success rate varied from 66% to 80% when ILMA was used as conduit for intubation which was in agreement with the current study.[6,12,13]

In the present study, the total time taken for successful intubation in group I and B was 11.53 ± 6.41 sec and 9.17 ± 2.74 s, respectively ($P = 0.04$). The results of Endigeri *et al*.[7] and Shuai *et al*.[9] were consistent with those of the current investigation; however, the time required for effective ETT placement was substantially longer in the study by Endigeri *et al*.[7] than in the present study. While using ILMA, more maneuvers were required. Chandy's maneuvers were the most common maneuvers used in group I, followed by Up and-down movement of the tracheal tube. In group B, head extension and twisting of the tracheal tube were the only attempted maneuvers for the successful placement of ETT.

ETT was placed easily in 71.4% and 94.3% of patients of group I and B, respectively, in our study. Significant failure rates were noted in group I (11.4%) compared to none in group B ($P = 0.010$). Findings of the present study was similar to that observed by Endigeri *et al*.[7] and Yunluo *et al*.[8] with regards to ease of intubation. All the studies, including the current study, had a common inference that using BlockBuster LMA increased placement simplicity and first-time success rates. This achievement is credited to the superior anatomical designs of BlockBuster LMA and Parker flex tube. This tube has an inverted tip that prevents anterior tracheal wall impingement while intubating, making it more suitable for blind tracheal intubation.[7–9] With ILMA, there were more failures, a lower success rate on the first attempt, and a need for additional maneuvers. Additionally, the angle produced by the BlockBuster tube as it emerges from the cuff is around 27°–30° as opposed to 40°–45° in ILMA [Figure 3], placing it closer to the glottic aperture.[7,9]

At all-time intervals, HR, MAP, and SpO_2 were comparable between the two groups. Since BlockBuster LMA and ILMA are both supraglottic devices, it has been demonstrated from time to time that these devices cause a reduced hemodynamic pressor response. Hence no variation in hemodynamic was observed. Incidence of trauma and sore throat was seen more with ILMA placement compared to BlockBuster LMA, but no statistically significant difference was observed at any time interval ($P > 0.05$). Blockbuster LMA may have fewer complications because it needs less force, less resistance, and less maneuvering to insert the device and negotiating the tube through it which further reduces the risk of mucosal injury. All of these elements contribute to a reduction in sore throat incidence.

There were several limitations to the study. The patient population included in the study were patients who had normal airway and might have experienced different outcomes in patients who had difficult airway. The scale employed for assessing the ease of intubation was subjective. This study was conducted by an experienced user, and results may vary when performed by less experienced users.

Conclusion

We come to the conclusion that the BlockBuster LMA outperforms ILMA in terms of effectiveness, safety, and ease of insertion. The modification in the anatomical design of Blockbuster LMA, that is, the distinctive characteristics of >95° angle of airway tube facilitates intubation and ventilation. The availability of the parker flex tube with BlockBuster LMA increases the suitability of a device for blind intubation. Additionally, 27°–30° angle of emergence of this ETT from the LMA cuff makes intubation easier with a high success rate in the first attempt and a lower incidence of device failure. The aforementioned modifications in the design of LMA Blockbuster make it a more convenient, effective, simpler, and faster intubating device.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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