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Original Research Article

A study of BlockBuster laryngeal mask airway versus Fastrach/Intubating laryngeal mask airway as a conduit for blind oro-tracheal intubation: A prospective randomized controlled study

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ABSTRACT

Background: A Laryngeal Mask Airway (LMA) has two parts, a simple breathing tube and a mask. The mask at the laryngeal end of the tube aligns against the glottis and provides better channel of ventilation than the face mask. There have been modifications in the basic design of the LMA to incorporate gastric drainage channel and some devices are also equipped with a channel for intubation to secure airway by guiding endotracheal tube (ETT) through it. In this study we evaluated the performance of two LMA devices that can aid in rescue ventilation and are also equipped with a channel for intubation namely the BlockBuster LMA(2012) and the Fastrach/ Intubating LMA(1997) for blind oro-tracheal intubation in terms of First attempt success rate and Over-all success rate of intubation.

Material and Methods: A hundred consenting patients of age group 18-60 years and ASA status I or II, were randomly allocated into two groups Group BB (BlockBuster LMA) and Group FT (Fastrach LMA) with 50 patients each. Standard anesthesia technique was used for both groups. After insertion of airway device, cuff was inflated and ventilation was attempted (maximum 2 attempts). Once ventilation was achieved, ETT of appropriate size was inserted through LMA (maximum 2 attempts). The correct placement of ETT was confirmed by capnography. Data was collected for number of attempts of tracheal intubation, time taken for intubation and complications.

Result: First attempt success rate of intubation was more in Blockbuster LMA than Fastrach LMA. Over-all success rate of Intubation was 100% for both devices. Time taken for intubation and incidence of post-operative sore throat was less in BlockBuster LMA than Fastrach LMA(p-value<0.05).

Conclusion: Blockbuster LMA is better conduit for oro-tracheal intubation than Fastrach LMA in terms of higher first attempt success rate, lesser time taken for intubation and lesser post-operative complications.

1. Introduction

Airway management is of prime importance in anaesthesia and resuscitation. Conventional airway management involves the use of a rigid direct laryngoscope to guide an endotracheal tube whereas, the fibreoptic bronchoscope has been the gold standard for access and intubation in difficult airway but, the limited availability, high cost and steeper learning curve hinders the use of fibreoptic guided intubation across many institutes. Therefore, to aid difficult intubation innovations have been done in the form of supraglottic airway devices (SAD) and video laryngoscopes.

The first major innovation was the introduction of laryngeal mask airway (LMA) in 1988 by Dr. Archie Brain. Over the years, there have been modifications in the basic design of the LMA to incorporate gastric drainage

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channel in order to decrease the chances of aspiration. Some devices also have an added channel for intubation making it possible to secure airway by guiding endotracheal tube (ETT) through it.[1]

The Intubating LMA (ILMA, popularly known as the LMA Fastrach) first described by Brain and coworkers in 1997,[2] is currently the gold standard for intubation through SAD or by fiberscope guidance. ILMA has been assessed for effectiveness with favourable results in the past for patients with Mallampati grade 3 or 4 views, with immobilized cervical spines, patient wearing stereotactic frames, and airways distorted by tumors, surgery or radiation therapy.[3,4]

In our study we have assessed the performance of the BlockBuster LMA, a new second generation SAD introduced in 2012 by Professor Ming Tian to the time tested Fastrach LMA in terms of first attempt success rate of intubation after insertion of the device. Also, observations were made on the second attempt success rate of intubation, the success rate of LMA insertion, the time taken for insertion of LMA and ETT and also the intra-operative and post-operative complications observed.

2. Materials and Methods

This prospective randomized single blinded controlled trial of 100 consenting ASA I and II patients of 18-60 years age group, belonging to either gender, undergoing elective surgeries under general anaesthesia requiring oral endotracheal intubation. Exclusion criteria included patients refusal, patient with predicted difficult airway (mouth opening of < 2.5cm, Mallampati class III and IV, cervical spine deformities, neck and jaw deformities), patients with BMI > 25kg/m^2, recent upper respiratory tract infection, patients with any oro-pharyngeal pathology, patients with history of gastro-oesophageal reflux disease, pregnant females and history of allergy to any drugs.

A sample size of 100 patients (50 patients in each group) was obtained after conducting a pilot study prior to the actual study. Patients were randomly divided into two groups by sealed envelope method.

1. **Group BB**: Patients in whom intubation was performed via Blockbuster LMA.
2. **Group FT**: Patients in whom intubation was performed via Fastrach Intubating LMA.

The study was carried out in the department of Anaesthesiology, SSG hospital and medical college, Baroda. The study protocols were approved by Institutional Ethics Committee for Human Research (IECHR-PGR 125/19). This study was also registered with Clinical Trials Registry-India (CTRI/2020/12/029655)

Statistical analysis of the data for the various parameters was done using the MedCalc software. Student t test was used for intra-group comparison, unpaired student t test was used for inter-group comparison and chi- square test was used for qualitative data.

After thorough pre-anaesthetic check-up, patients were kept nil by mouth for 10 hours before surgery. Tablet Ranitidine (150mg) and Diazepam (10mg) were given to all the patients on the night before the procedure. On the day of surgery, IV line was secured and IV fluids were started. After taking patient inside the operation theatre, standard multipara monitor with heart rate, electrocardiogram, blood pressure (NIBP), oxygen saturation and end tidal CO2 monitoring was attached. Patients were premedicated with IV Glycopyrrolate 0.2mg, Ondansetron 4 mg and Tramadol 1mg/kg followed by pre-oxygenation with 100% O_2 for 3min and induction of anesthesia with intravenous Propofol 2.5mg/kg IV till loss of eye lash reflex and muscle relaxation by intravenous Succinylcholine 2mg/kg was achieved following confirmation of adequate mask ventilation. After assessing jaw relaxation, under all aseptic precautions study device of appropriate size (according to the weight of the patient) was inserted in neutral position. The device was then inflated with appropriate amount of air with a 20ml syringe and was attached to the closed-circuit. Confirmation of correct placement of device was done by capnography. After the confirmation of placement against the glottis with bilaterally equal chest rise, an appropriate sized tube was lubricated with 2% lignocaine jelly and gently passed via the intubating channel in the LMA followed by inflating the cuff of the tube with appropriate amount of air with a 10ml syringe and the position of the tube was confirmed by capnography. The LMA was removed after confirmation of intubation, while stabilising the tube with a stabilising rod. Following the removal of the LMA, closed circuit was re-attached and ventilatory parameters were adjusted according to the patient.

Maximum 2attempts were allowed for LMA insertion and a maximum of 2 attempts were allowed for intubation after which the procedure was abandoned and patient was intubated with conventional direct laryngoscopy.

1. If adequate ventilation is not possible by the Fastrach LMA, it was manipulated by Chandy's maneuver.[4]
2. If adequate ventilation is not possible by the Blockbuster LMA, it was manipulated by the up and down maneuver in which the device is held along the integral bite block and gently moved up and down until the least resistance to ventilation is achieved.

Table 1:

Score	Ease of insertion of LMA
0	No manoeuvre used
1	One manoeuvre used

If there is resistance encountered while introducing the ET tube, the ET tube was gently pushed and rotated to

Table 2:

Score	Ease of insertion of ET Tube
0	No Rotation required
1	Rotation required

advance it further.

Anesthesia was maintained with oxygen and nitrous oxide in 50: 50 ratio, variable concentration of inhalational volatile anaesthetic agent sevoflurane and intravenous Vecuronium bromide 0.1mg/kg for muscle relaxation. Volume controlled mechanical ventilation was maintained through tidal volume of 6-8 ml/kg, respiratory rate of 12 breaths/min and fresh gas flow at the rate of 3L/min

At the end of surgery, all anesthetic gases were discontinued before 10 mins and patient was ventilated with 100% oxygen and reversal of residual neuromuscular blockade was done after return of spontaneous respiration using Neostigmine 50 mcg/kg and Glycopyrrolate 10 mcg/kg IV.

Patient was extubated when regular spontaneous breathing pattern was established with ablility to open eyes on command. Patient was shifted to post anesthesia care unit.

All the observations were entered in a master chart and these were then subjected to statistical analysis using MedCalC software. The results were expressed as Mean±SD. T-test and Chi square test were used for parametric and non-parametric variables respectively. P-value<0.05 was considered as significant and P-value < 0.001 was considered highly significant.

3. Result

The two groups were comparable to each other with respect to age, gender, weight, height, BMI, thyromental distance (TMD), sternomental distance (SMD), Mallampatti grading (MPG), duration of surgery and ASA physical status.

In group BB, the ET tube was inserted via the device in first attempt in 96% patients whereas in group FT the insertion of ET via the device in first attempt was possible in 86% patients. The second attempt intubation rate was comparable in group BB (4%) and for group FT (14%).

The two groups were comparable in terms of number of attempts of LMA insertion, time taken for LMA insertion, ease of insertion of LMA and ease of intubation. However, the time taken for ETT insetion via the LMA was significantly lower in BlockBuster LMA than Fastrach LMA with p-value <0.05.

In terms of intraoperative complications, The incidence of trauma (blood on device) was seen in 3/50 cases (6%) in group BB and 5/50 cases (10%) in group FT. The results for intra-operative trauma was not significant (p value > 0.05%.)

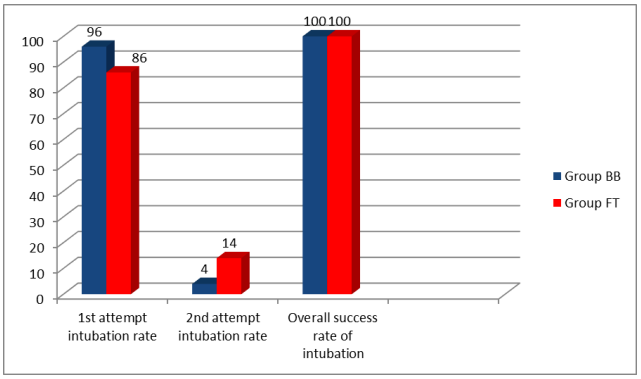


Fig. 1: Comparison of success rate of intubation in Group BB and Group FT

There was no incidence of intraoperative laryngospasm, bronchospasm or desaturation in both the groups.

In terms of post-operative sore throat, the incidence of post-operative sore throat was not significant immediately post-operatively but became significant at 2 hours and 4 hours post-operatively (p value <0.05). After 4 hours the incidence of sore throat in both these groups became comparable again (p value >0.05).

4. Discussion

Conventional supraglottic airway devices (SAD) have an established role in management of failed intubation and as rescue airway in cannot intubate and cannot ventilate scenario. In fact, SADs have been recommended at 5 places in the ASA task force algorithm on the management of the difficult airway either as a ventilatory device or as a conduit for endotracheal intubation. The efficacy of device to allow successful intubation varies greatly depending on the structure of the device.

In the present study, successful intubation was possible in all 100 cases with both the devices with a maximum of two attempts. However, the first attempt success rate of BlockBuster LMA was significantly higher (96%) than Fastrach LMA (86%). Results of intubation via BlockBuster LMA were in consonance with the study done by Archana Endigeri et al.[5] in which the first attempt success rate was 90% and overall success rate of intubation was 96.6%. The results of overall success rate of intubation via Fastrach LMA in our study was found to be higher when compared with the study done by Lakesh Anand et al.[6] with the overall success rate of intubation with Fastrach being 92% and the that done by Latha Naik et al.[7] with the overall success rate of intubation in their study with Fastrach being 90%

The difference in first attempt and second attempt success rate can be attributed to the structural differences in both the devices. The airway channel of BlockBuster LMA is angulated at more than 95° and it aids insertion of tube at an acute angle of 30 degree from bowl of LMA with the

Table 3: Demographic details of both groups

Parameter	Group BB Mean ± SD	Group FT Mean ± SD	P value
Age(years)	38.88 ± 13.62	38.38±12.36	>0.05
Gender(M:F)	23:27	22:28	>0.05
Weight(kg)	55.92 ± 5.93	56.36 ± 6.33	>0.05
Height(m)	1.57 ±0.042	1.57±0.03	>0.05
BMI(kg/m2)	22.56±1.63	22.70±2.06	>0.05
TMD (cm)	7.86±0.53	7.96±0.58	>0.05
SMD(cm)	14.12±2.14	13.82±0.55	>0.05
MPG	17:33	20:30	>0.05
ASA Grading ASA I:II	22:28	24:26	>0.05
Duration of Surgery	130.4±33.80	128.2±23.35	>0.05

Table 4: Results of comparison of parameters between Group BB and Group FT

S.No.	Variable	Group BB	Group FT	P value
1.	Intubation success rate			
	First attempt success rate	96%	86%	<0.05
	Second attempt success rate	4%	14%	>0.05
2.	Number of LMA insertion attempts			
	First attempt	92%	94%	>0.05
	Second attempt	8%	6%	>0.05
3.	Time to LMA placement (T1 seconds)	24.76 ± 12.14	24.78 ± 12.22	>0.05
4.	Ease of insertion of LMA (0:1)	46:4	40:10	>0.05
5.	Time to intubation(T2 seconds)	12.14 ± 2.010	13.22 ± 3.098	<0.05
6.	Ease of intubation (0:1)	47:3	42:8	>0.05
7.	Total Time taken for Intubation (seconds)	36.9 ±3.955	38 ± 4.120	>0.05

Table 5: Assessment of post-operative sore throat in Group BB and Group FT

Sore Throat	Group BB	Group FT	p Value
Immediately Postoperatively	20	26	>0.05
2 hours	17	29	<0.05
4 hours	11	22	<0.05
6 hours	8	15	>0.05
12 hours	8	11	>0.05
18 hours	3	5	>0.05
24 hours	1	3	>0.05

help of ETT guiding ramp in the mask of LMA whereas, in fastrach LMA the airway tube forms an arc of 128 degree that aids in introduction of the tube in the laryngeal inlet at an angle of 40 degree.

The time taken for ETT insertion via the LMA was also significantly lower in BlockBuster LMA (12.14 ± 2.01 seconds) as compared to Fastrach LMA (13.22 ± 3.098 seconds) results were similar to the study done by Archana Endigeri et al.[5]

In our study BlockBuster LMA was found comparable to Fastrach LMA in terms of first attempt success rate of LMA insertion, number of attempts of LMA insertion, ease of LMA insertion, time taken for LMA insertion and total time taken for intubation unlike Endigeri et al.[5]

It was possible to ventilate all the patients after insertion of either Blockbuster or Fastrach LMA and there was no incidence of intraoperative complications like desaturation in any case. The haemodynamic changes in response to the insertion of LMA and intubation were found to be similar for both the devices.

Postoperatively, there was a higher incidence of sore throat in group FT which can be attributed to the rigid metallic structure of the device that can cause more mucosal trauma as compared to the relatively flexible body of Blockbuster LMA.

Only patients with normal airway undergoing elective surgeries were included in this study and further studies in patients with difficult airway are needed to evaluate the performance of this device. Another limitation of this study is that fibreoptic visualization of the larynx through these supraglottic airway devices and evaluation of Cormack Lehane grading before intubation was not performed.

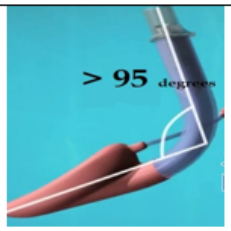
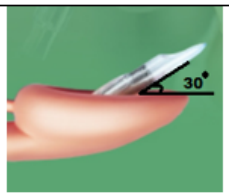
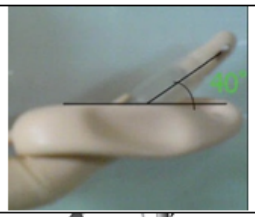
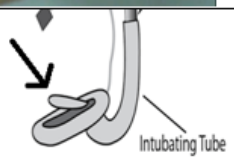
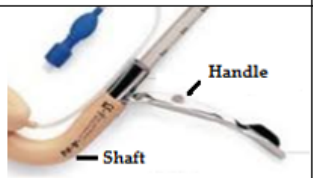
No.	Blockbuster LMA		Fastrach LMA	
1.		More than 95˚angulated short airway tube that matches oropharyngeal curve and provides easy insertion.		Airway tube curved around an arc of 128˚ corresponding to the alignment of glottis axis.
2.		Directs ETT towards laryngeal inlet at an angle of 30˚with the help of ETT guiding ramp in bowl of LMA.		Directs ETT towards laryngeal inlet at an angle of 40˚.
3.	X	No epiglottis elevating bar		Movable epiglottis elevating bar that pushes the epiglottis out of the way and provides unobstructed passage for insertion of ETT
4.		2nd generation device with Gastric access channel for gastric decompression	X	No gastric channel
5.		No guiding handle for LMA insertion, but presence of four way connector to stabilize the device after insertion		A metal guiding handle serves to insert and stabilize the device
6.		Only single use device available.		Both single use and reusable devices available but relatively costlier than Blockbuster LMA.

Fig. 2: Salient features of LMA

5. Conclusion

Blockbuster LMA is better conduit for oro-tracheal intubation than Fastrach LMA in terms of higher first attempt success rate, lesser time taken for intubation and lesser post-operative sore throat with additional features like channel for gastric drainage and lower cost.

6. Source of Funding

None.

7. Conflict of Interest

None.

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