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Original Research Article

Comparison of Clinical Performance of Endotracheal Intubation Between LMA Blockbuster™ (Blind Method) and Direct Laryngoscopy (Under Vision) in Adult Patients Undergoing General Anesthesia

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Abstract

Background: Endotracheal intubation is essential for airway management during general anesthesia. While direct laryngoscopy (DL) is the standard technique, the LMA Blockbuster™ (blind technique) offers an alternative for patients with difficult airways. This study aims to compare the effectiveness, safety, and complications of these two intubation techniques in adults undergoing elective surgeries.

Aim: To evaluate and compare the performance of LMA Blockbuster™ (blind technique) and direct laryngoscopy (under vision) in terms of ease of intubation, time to successful intubation, and postoperative complications in adults undergoing general anesthesia.

Methods: A randomized controlled trial was conducted at Darbhanga Medical College from July 2022 to June 2024. Sixty adult patients were randomly assigned to either Group L (LMA Blockbuster™) or Group D (Direct Laryngoscopy). Parameters such as time to intubation, number of attempts, and complications (pain, hoarseness, bleeding, coughing) were recorded. Data were analyzed using Chi-square, Student's t-test, and Mann-Whitney test.

Results: The LMA Blockbuster™ group showed significantly fewer post-operative complications (pain, hoarseness, bleeding, and coughing) compared to the direct laryngoscopy group ($P < 0.05$). Both groups had comparable intubation times and success rates.

Conclusion: The LMA Blockbuster™ technique is a viable alternative to direct laryngoscopy, offering reduced immediate postoperative complications, making it a safer and more comfortable option for airway management in elective surgeries under general anesthesia.

Introduction

Safe airway management is the fundamental aspect of anesthesia practice and the primary responsibility of anaesthesiologists. Ensuring an appropriate airway is crucial for procedures conducted under general anesthesia [1]. "Tracheal intubation is regarded as the gold standard for airway management; however, its success rate may fluctuate based on factors including the patient's airway anatomy, overall health, and the practitioner's skill and experience." [2,3].

Endotracheal intubation is an essential component of general anesthesia treatment since it ensures airway security and facilitates controlled ventilation of the patient. Although direct laryngoscopy is the conventional technique, the LMA Blockbuster blind method has surfaced as an alternative that may have certain benefits. The current study seeks to assess the efficacy and risk profiles of these two intubation procedures in individuals having general anesthesia [4].

The laryngeal mask airway serves as a conduit for LMA-guided intubation, facilitating both blind and glottic visualization using fibreoptic-guided intubation. Supraglottic airway devices function as a

contingency for challenging intubations, integrating ventilation and intubation into a single apparatus, hence providing a practical and efficient alternative for airway management [5].

The utilization of LMA is becoming increasingly prevalent in anesthetic practice, offering a dependable alternative to endotracheal intubation. The LMA has been extensively utilized for many surgical operations, yet the discussion persists over its appropriateness in comparison to conventional direct laryngoscopy for endotracheal intubation [6].

Effective airway care is essential in pediatric anesthesia, as prevalent airway-related accidents provide considerable hazards. Supraglottic airway devices (SADs) provide benefits compared to endotracheal intubation, such as simpler insertion, less trauma, and fewer hemodynamic abnormalities. The LMA Blockbuster®, a second-generation supraglottic airway device composed of silicone, has shown beneficial in enhancing ventilation and assisting intubation in both adult and pediatric patients [7-10].

Nevertheless, there is scant literature regarding the under-vision insertion of the LMA Blockbuster®, especially in pediatric patients. This research paper seeks to assess and contrast the clinical efficacy, efficiency, and safety of endotracheal intubation via the LMA Blockbuster™ (blind technique) vs direct laryngoscopy (visual approach) in adult patients under general anesthesia.

Materials and Methods

Study Design and Setting

This study was a "single-blind, randomized controlled trial" conducted over two years, from July 2022 to June 2024, at the "Department of Anaesthesiology" and Critical Care, Darbhanga Medical College, Laheriasarai, Darbhanga. The research aimed to compare the effectiveness and ease of intubation using the LMA Blockbuster method versus the Conventional Direct Laryngoscopy. Participants were randomized into two groups: Group L (LMA Blockbuster) and Group D (Direct Laryngoscopy), with equal distribution.

Ethical Clearance and Consent

The study adhered to ethical principles outlined by the "International Conference on Harmonization" (ICH) "Good Clinical Practice guidelines and the Declaration of Helsinki. Approval was obtained from the institutional" ethics committee of Darbhanga Medical College. Informed consent was sought from each participant after providing them with a Participant Information Sheet (PIS) in their local language. Consents were documented through signed or thumb-imprinted forms. Data was collected from hospital records after authorization. The trial was registered with the Clinical Trials Registry – India (CTRI) before commencement.

Inclusion and Exclusion Criteria

Inclusion criteria involved patients with ASA Physical Status Grade I and II, Mallampati Classification scores I and II, and body weight ranging from 30 kg to 70 kg. Patients of either sex undergoing elective surgeries under general anesthesia were eligible.

Exclusion criteria included patient refusal, ASA Grades III and IV, mouth opening less than 2 cm (Mallampati scores III and IV), presence of loose dentures, and oropharyngeal pathologies such as abscess, hematoma, or tissue disruption.

Sample Size Calculation

The sample size was determined using Stata/BE 17 (StataCorp) for a superior randomized controlled trial. Assuming a 90% success rate for the LMA Blockbuster group in terms of ease of intubation (primary outcome), with a two-sided α of 0.05 and β of 0.2, the estimated number of subjects per group was 26. To account for potential dropouts, this number was increased by 15%, resulting in a final sample size of 30 subjects per group, or 60 patients in total.

Randomization and Allocation

Participants were randomly assigned to either Group L (LMA Blockbuster) or Group D (Direct Laryngoscopy) using computer-generated random numbers with block randomization to ensure a balanced distribution by age and sex. Allocation concealment was achieved through sealed opaque envelopes, which were opened sequentially for eligible participants. To minimize bias, only the participants were blinded to the intubation method used.

Study Methodology

Comprehensive preparation was carried out before intubation. This included taking a complete medical history, conducting general and systemic examinations, and performing necessary laboratory investigations. Patients were weighed, and the size of the LMA Blockbuster and endotracheal tube (ETT) was determined.

The workflow for all patients involved:

- Premedication and preoxygenation.
- Administration of opioid and induction agents.
- Endotracheal intubation, either using the LMA Blockbuster method (Group L) or Direct Laryngoscopy (Group D).

The LMA Blockbuster group underwent precise adjustment of the device if any ventilation or placement issues arose. After successful placement,

anesthesia was maintained using 1–2% isoflurane, 66% nitrous oxide, 33% oxygen, and cisatracurium besylate. A lubricated endotracheal tube was then inserted through the LMA for intubation, with correct placement confirmed by bilateral equal air entry and capnography. For patients in the Direct Laryngoscopy group, conventional techniques were employed.

Assessment and Documentation

Key parameters for the study included the ease of intubation, the time required for successful intubation, and the number of attempts. An attempt was considered successful when the ETT was passed without resistance. If three attempts failed, the procedure was abandoned, and intubation was performed using Direct Laryngoscopy. Post-intubation, complications such as changes in intraoperative hemodynamics, hoarseness of voice, oropharyngeal pain, and mucosal bleeding were recorded at intervals of immediate, 15 minutes, 30 minutes, and one-hour post-extubation.

Statistical Analysis

Data were documented using a structured proforma and entered into an EPIDATA database for analysis. Continuous variables were summarized as means, medians, and standard deviations, while categorical variables were expressed as numbers and percentages.

Statistical comparisons were conducted using the following tests:

- Chi-square test for categorical variables.
- Student's t-test for parametric continuous variables.
- Mann-Whitney test for non-parametric data.
- Fisher's exact test for small sample sizes.

A p-value of less than 0.05 was deemed statistically significant. Stepwise logistic regression was utilized for multivariate analysis to determine determinants of successful intubation, with outcomes reported as adjusted odds ratios and 95% confidence intervals (CI). Statistical analysis was conducted utilizing SPSS software, version 16.0 (SPSS Inc., Chicago, IL, USA).

Results

Two arms were recruited as follows (30 in each group)

1. Group L: LMA BLOCKBUSTER™
2. Group D: DIRECT LARYNGOSCOPY

The demographic characteristics of Group L (BlockBuster LMA) and Group D (conventional direct laryngoscopes) were well-matched, ensuring comparability for outcome analysis. The mean age for Group L was 43 years, while Group D had a mean age of 46 years (P = 0.19, not significant). The mean weight for Group L was 52 kg, compared to 55 kg for Group D (P = 0.97, not significant). In terms of sex distribution, Group L consisted of 5 males and 25 females, while Group D had 7 males and 23 females. These findings confirm that both groups were adequately matched for age, weight, and sex, allowing for a valid comparison of the outcomes.

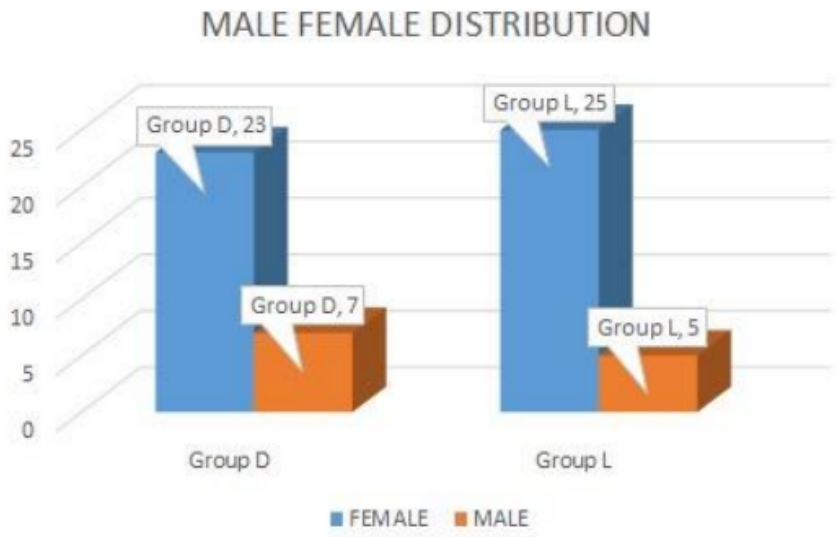

Fig 1: Graph showing our recruited as per sex in Group L and Group D

The Laryngeal Mask Airway (LMA) size and laryngoscope blade used for both groups were matched to ensure consistency in the study. In Group L (BlockBuster LMA), 19 patients were assigned Size 3, and 11 patients were assigned Size 4. In Group D (conventional direct laryngoscopes), 15 patients received Size 3, and 15 received Size 4.

Statistical analysis showed no significant difference in LMA size and laryngoscope blade size distribution between the groups (P = 0.78, not significant). This confirms that any observed differences in outcomes cannot be attributed to variations in LMA size.

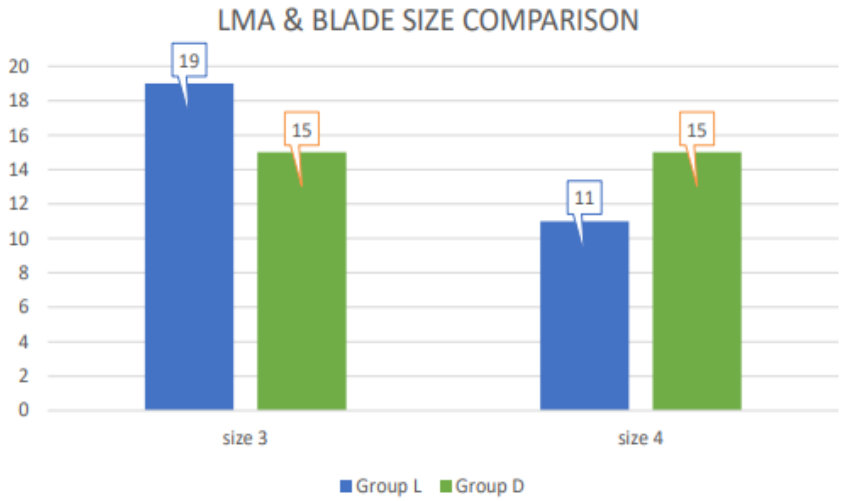

Fig 2: Graph showing various Blade sizes and LMA sizes used in our study cohort

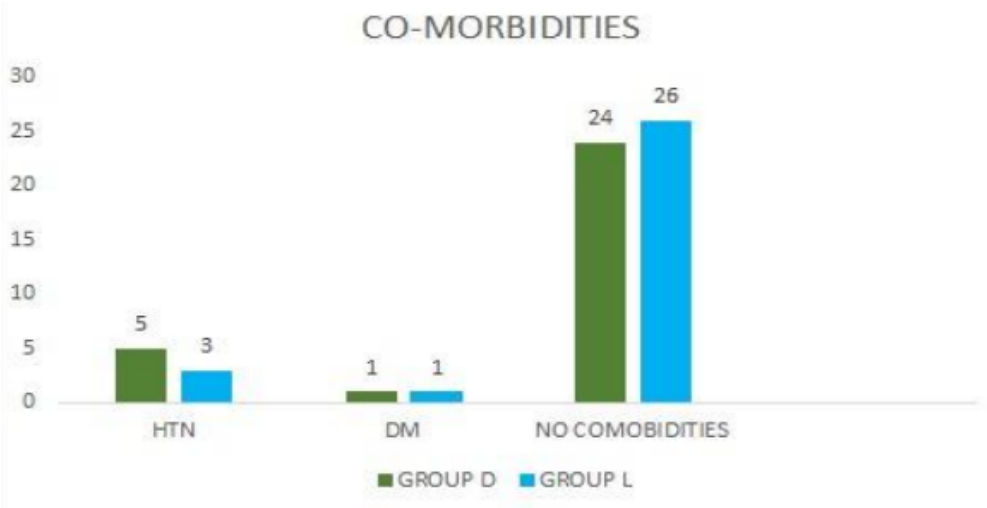

Fig 3: Graph depicting co-morbid factors in our cohort

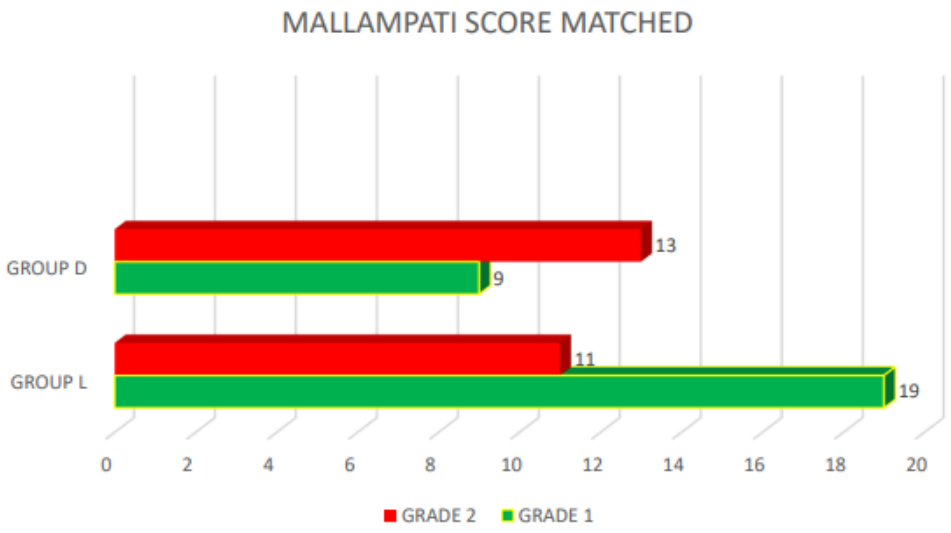

Fig 4: Graph depicting mallampati grading in our cohort

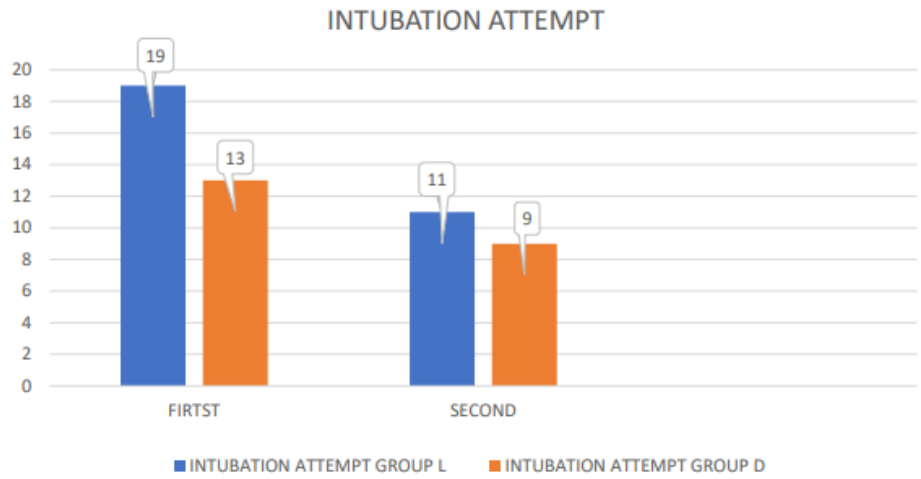

Fig 5: Graph enumerating intubation attempts in our cohort

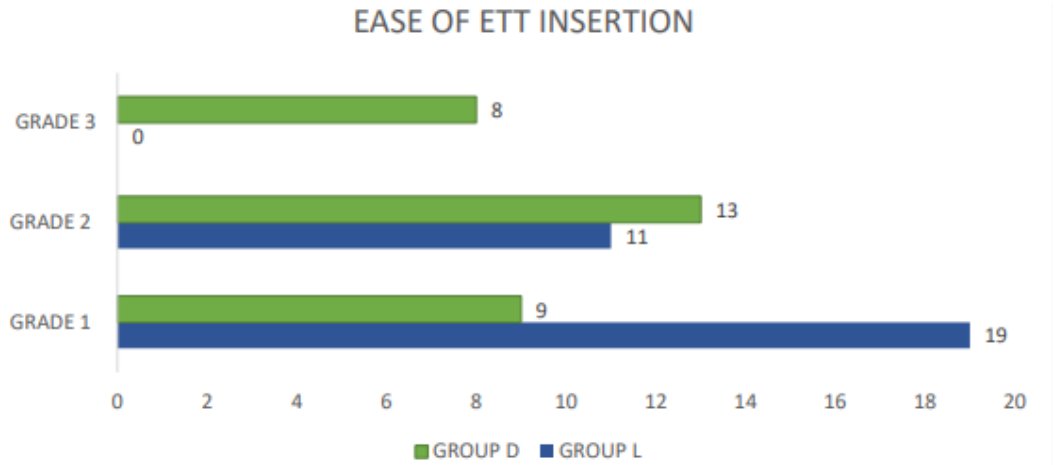

Fig 6: Graph depicting ease of ET insertion in our cohort

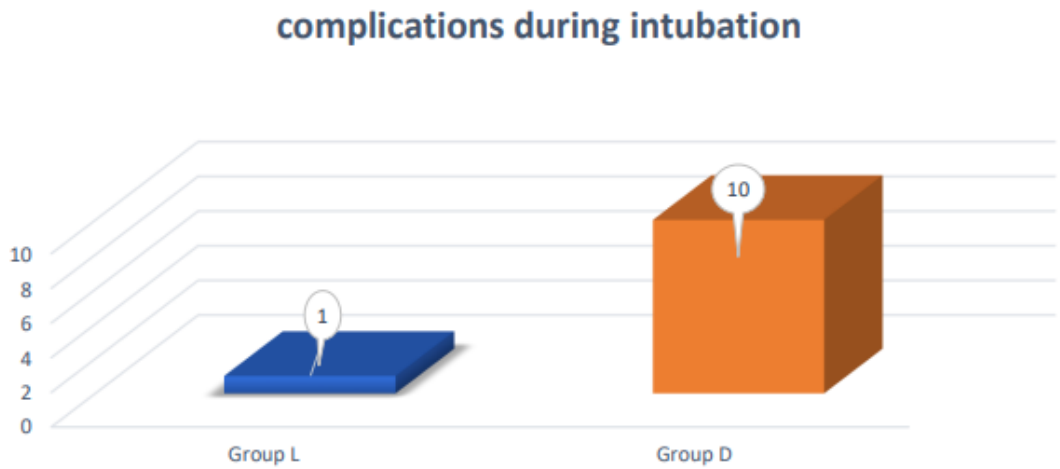

Fig 7: Graph depicting complications in our cohort

Table 1 highlights that postoperative complications were significantly more common in Group D (conventional direct laryngoscopy) compared to Group L (BlockBuster LMA) during the immediate and 15-minute post-operative periods. Specifically, Group D experienced significantly higher rates of pain (16.70% vs. 0%), hoarseness (26.70% vs. 3.30%), bleeding (13.30% vs. 0%), and coughing (26.70% vs. 0%), with statistical significance noted at these time points. However, by 30 minutes and 1-hour post-operation, complications were minimal in both groups, and no significant differences were observed. This suggests that the BlockBuster LMA is associated with fewer immediate post-operative complications compared to conventional direct laryngoscopy.

Table 1. Post-operative complications								
	Immediate		15 Minutes		30 Minutes		1 Hour	
	Group D	Group L	Group D	Group L	Group D	Group L	Group D	Group L
Pain to mouth, tongue, or throat	16.70%	0%	3.30%	0%	0%	0%	0%	0%
Hoarseness of voice	26.70%	3.30%	16.70%	0%	0%	0%	0%	0%
Bleeding	13.30%	0%	0%	0%	0%	0%	0%	0%
Coughing	26.70%	0%	13.40%	0%	0%	0%	0%	0%
P Value	**Significant**		**Significant**		**Not Significant**		**Not Significant**	

Discussion

The BlockBuster LMA produced better results than the conventional direct laryngoscope, especially in terms of the first attempt success rate (100% vs. 73%; P = 0.04). Other researchers, including Endigeri et al. [11] and Nazir et al. [12], also reported over 90% success for the first attempt using BlockBuster LMA. The mean time for intubation was significantly shorter with the BlockBuster LMA compared with direct laryngoscopy: 33.29 ± 5.41 seconds compared with 55.38 ± 23.22 seconds (P = 0.04). This is in line with some studies conducted by Endigeri et al. The BlockBuster LMA does indeed easily and efficiently achieve proper intubation with minimal corrective maneuvers. Based on safety and patient comfort, the BlockBuster LMA had an evident advantage with a considerably lower complication profile, such as reduced trauma and sore throat incidence, compared with direct laryngoscopy (P < 0.05).

The results from this study coincide with those of Endigeri et al. [11] and Nazir et al. [12]. This serves as evidence that the BlockBuster LMA provides greater ergonomic advantages. This device's innovative design includes optimum angulation at 27°–30°. This helps avoid mucosal trauma and reduces the difficulty in intubation, making it safer for the patient. The BlockBuster LMA also showed better hemodynamic stability than the direct laryngoscopy. Heart rate, blood pressure, and oxygen levels were constantly checked, and the BlockBuster LMA showed a minimal sympathetic stress response. This is similar to how most supraglottic airway devices work. This stability decreases the risk of hemodynamic complications during intubation and thus deserves the BlockBuster LMA as a potential instrument in the care of patients who are highly sensitive to manipulation of the airway. In general, the BlockBuster LMA is a highly effective, patient-friendly alternative to the conventional direct laryngoscopy. The benefits, which include higher success rates, reduced intubation times, and fewer complications, are well-established and consistent with previous studies. Its clinical effectiveness places it among the best tools for airway management, particularly in complex cases where safety and efficiency are crucial factors. These findings call for its wider use in different clinical settings.

Conclusion

The BlockBuster LMA outperforms traditional direct laryngoscopy methods, offering superior intubation and ventilation outcomes due to its innovative design, including an airway tube with a >95° angle. This design, combined with the tube's flexibility, enhances its suitability for blind intubation. The optimized 27°–30° emergence angle of the endotracheal tube (ETT) further simplifies intubation, leading to higher first-attempt success rates and a reduction in device failures. Overall, the BlockBuster LMA provides a more efficient, reliable, and user-friendly intubation experience, making it a valuable tool in airway management.

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