ORIGINAL CLINICAL RESEARCH

A Comparative Study of Supra-Glottic Airway Devices Blockbuster and Ambu Aura Gain as a Conduit for Blind Endotracheal Intubation

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Abstract

Background: The adoption of supra-glottic airway devices (SADs) to secure the airway has gained popularity. SADs that facilitate direct tracheal intubation without requiring intermediary devices can be extremely beneficial. The Ambu Aura Gain, is SAD designed with an anatomically curved shape. It features a gastric access port and can be utilized for both ventilation and endotracheal intubation. The BlockBuster® is a device for ventilation and intubation, featuring a highly angled airway tube for easy insertion. Our study evaluates the suitability of the Intubating SAD BlockBuster and Ambu Aura Gain for blind tracheal intubation in adults.

Methods: A total of 50 patients were randomly divided into two groups. Following the induction of anaesthesia, the SAD specific to each group was inserted. After successful placement of the SAD, endotracheal intubation was done through SAD. The rates of success and the time required to achieve proper device placement and tracheal intubation were assessed. With SPSS version 17.0, the data was evaluated, and a significance level of $P < 0.05$ was considered significant.

Results: The time required for SAD insertion was significantly shorter in the Blockbuster Group (12.4 ± 3.6) compared to the Ambu Aura Gain Group (26.8 ± 5.2). Adequate ventilation was established in 80% of Blockbuster and 28% of Ambu Aura Gain group patients on the first attempt. Blind endotracheal intubation was successful on the very first attempt in 84% of patients in Blockbuster group and 12% of patients in Ambu Aura Gain group. With a mean time of 26.7 seconds, time required for successful ETT insertion was quite shorter in Blockbuster group compared to Ambu Aura Gain group (147.4 ± 6.4 seconds).

Conclusion: The insertion of the supra-glottic airway device (SAD) Blockbuster® was easier than the Ambu® Aura gain™, therefore, in adult patients, Blockbuster® SAD is a better conduit for tracheal intubation.

Keywords: Endotracheal intubation, Blockbuster®, Supra-glottic airway device, Ambu® Aura gain™

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Introduction

The Laryngeal mask airways (LMA), a supra-glottic airway device (SAD), was developed in 1981 by British Anesthesiologist Dr. Archie Brain.[1] LMA devices are inserted through the oral route and positioned up to the entry of the glottis and are utilized in situations where performing mask ventilations and tracheal intubations are difficult.[2] To simplify the process of intubation, several new devices and instruments have been developed. Among the recently released LMAs are Blockbuster®, Fastrach®, and Ambu® Aura gain™. Blockbuster® LMA features a soft silicone design for gentle use, a >95° angulated airway tube for easy insertion, and a guidance device for improved blind intubation success. Fastrach® LMA features an inflatable mask designed for the hypopharynx, a 30° angled tube, and a short stainless-steel shaft enabling easy insertion beyond vocal cords. The Ambu® AuraGain™ is a single-use SAD made of phthalate-free PVC, featuring an anatomically curved design for ventilation and tracheal intubation. It includes a 90° preformed curvature, bite block, and a thin, soft cuff for a high seal pressure, up to 40 cm H2O, with fiberoptic intubation guidance. The SADs serve multiple purposes, including their use in difficult airways and life-threatening emergencies. Furthermore, they are utilized as the primary airway device during elective surgeries.[3]

The adoption of SADs to secure the airway has gained popularity. According to a National Audit Project4 report, over half of the general anesthesia surgeries are managed with these devices, leading to a reduction in perioperative airway complications.[4]

The Ambu® Aura gain™ SAD manufactured by Ambu A/S in Ballerup, Denmark, is a disposable supra-glottic airway device designed with an anatomical curve that closely resembles the human airway. The LMA Blockbuster® from Tuoren Medical Instrument Co., Ltd, Changyuan, China, is composed of silicone and is a reusable supra-glottic airway device. In situations where direct laryngoscopy cannot be performed due to lack of equipment or expertise, SADs can act as a bridge to get over this critical time period.[5]

Using a fiberscope for guidance is the preferred method for intubating through any SADs.[6] However, in certain centers' emergency departments lacking fiberscopes,

blind intubation may be attempted through direct intubating SADs. SADs enabling direct tracheal intubation without the need for intermediary devices can prove highly valuable for use in field conditions that are optimally addressed through intubation.[7]

Therefore, we undertook this study to assess and compare two supra-glottic airway devices (SADs) as potential conduits for blind intubation: The BlockBuster and Ambu Aura Gain, believing that any SAD, demonstrating the highest success rates in blind intubation should be deemed the preferred choice for navigating through airway crisis situations.

This study aimed to compare supra-glottic airway devices Blockbuster and Ambu Aura gain as a conduit for blind endotracheal intubation.

Materials And Methods

Ethical considerations

Institutional ethics committee (IEC) approval was obtained before the commencement of the study. Enrolment of the patients was as per the inclusion criteria only.

Study design and setting

This hospital-based prospective randomised single-blinded comparative study was conducted in the Anaesthesia department of a tertiary care teaching hospital of Ahmedabad over a period of 1 year.

Eligibility criteria

Inclusion criteria included patients of either gender, aged >18 to <60 years, undergoing elective surgery under general anaesthesia requiring endotracheal intubation with modified mallampati classes 1 and 2, > 6 cm thyromental distance, ASA grades 1 and 2, and neck movement >90°.

Exclusion criteria included patients with anticipated difficult airway, with contraindications to the use of supra-glottic airway devices, pregnant patients, requiring other techniques, such as rapid sequence induction, with oral pathology such as oral growth, trismus, or TMJ disorders, with modified mallampati classes 3 and 4, with GERD or hiatal hernia, morbidly obese patients and with neck swelling.

Procedures and interventions

A thorough pre-anesthetic check (PAC) was carried out. The patients were briefed about the aim and rationale of the study. Participants were included in the study only after expressing their willingness to

participate and providing written informed consent.

A total of 50 patients were randomly assigned to either the Blockbuster® or Ambu® Aura gain™ groups using computer-generated randomization. A thorough pre-anaesthetic check-up was carried out, and investigations were performed based on the patients' age, any related diseases, and surgical conditions. Intravenous Propofol (2 mg/kg) was used to induce general anaesthesia, and intravenous Atracurium (0.5 mg/kg) was administered to achieve muscle relaxation.

The designated supra-glottic airway device (SAD) was inserted three minutes after administering muscle relaxants. The initial preference was to select size 3 for female patients and size 4 for male patients. Both devices underwent the standard pre-use checks, and the devices were implanted with the patient in the sniffing posture following the recommended lubrication. SAD insertion ease was rated subjectively on a scale of 1 to 3, with 1 denoting easy, 2 satisfactory, and 3 difficult. The duration for successful SAD insertion, recorded with a stopwatch, was defined as the time from the placement of the SAD between the dental arches to the confirmation of successful ventilation through chest wall movement. In cases where effective ventilation could not be established, standardised manoeuvre was employed. The count of manoeuvre and attempts needed for the insertion of the SAD was documented. The case was dropped from the study if the device could not be inserted properly on the second attempt. This was documented as a SAD insertion failure.

After successful placement of the supra-glottic airway device, ET was inserted through SADs. Successful blind endotracheal intubation was confirmed by capnography and bilateral breath sounds. The duration of successful blind tracheal intubation through the SAD was characterized as the time from the introduction of the endotracheal tube (ETT) into the SAD until the above-described confirmation of successful ventilation. Standardised manoeuvre were attempted during ETT implantation in the event where resistance was felt. An unsuccessful attempt was defined as the insertion of the ETT into the oesophagus. In each of the study groups, a maximum of two attempts of tracheal intubation were permitted. If tracheal intubation through the device was unsuccessful after two attempts, an alternative technique deemed necessary was employed for the case.

Study outcomes

The primary outcome was the success rate of blind endotracheal intubation through SAD, and the secondary outcomes included time for SAD insertion, number of attempts of SAD insertion, and any complications (e.g., oesophageal intubation, airway trauma).

Data was collected and entered into a pre-designed case record form.

Data analysis

Continuous variables were presented as means ± SD. Qualitative data was presented as frequencies and compared using the Chi-square test. A p- value of <0.05 was considered statistically significant. The statistical analysis was conducted using version 17.0 of the Statistical Package for Social Sciences (SPSS).

Results

A total of 50 patients were included in this study, which were divided randomly into two groups.

Patients' characteristics are presented in Table 1. There were no statistically significant differences between the two groups (Table 1).

The time required for SAD insertion was significantly shorter in the Blockbuster Group compared to the Ambu Aura Gain Group (Table 2). Adequate ventilation was established in 80% of BlockBuster group patients and 28% of Ambu Aura Gain group patients on the first attempt (Table 2). The proportion of patients who did not necessitate any manoeuvre during SAD insertion was significantly higher with BlockBuster group compared to the Ambu Aura Gain Group (Table 2).

Blind endotracheal intubation was successful on the very first attempt in 84% of patients in BlockBuster group and 12% of patients in Ambu Aura Gain group (Figure 3) ($p<0.005$).

Four patients in BlockBuster group and 22 patients in Ambu Aura Gain required second attempt for successful ETT insertion (Table 3). The time required for successful ETT insertion was quite shorter in BlockBuster group compared to Ambu Aura Gain group (Table 3). Only 2 patients required manoeuvre for ETT insertion in BlockBuster group which was significantly lower than the number of patients in the Ambu Aura Gain group (Table 3).

The frequency of pst-operative compliactions in both groups is presented in figure 4. There were no statistically significant differences between the two groups (Figure 4).

Figure 1. Blockbuster supra-glottic airway device

Figure 2. Ambu Aura Gain supra-glottic airway device

Table 1. Patients' characteristics

Characteristics	BlockBuster Group (n=25)	Ambu Aura Gain Group (n=25)	P-value
Age (years) (mean ± SD)	40.1 ± 6.2	40.7 ± 7.4	0.88
Gender (male/female)	14/11	15/10	0.52
BMI (mean ± SD)	23.9 ± 4.6	22.8 ± 3.9	0.86
Mouth opening	4.1 ± 0.7	4.3 ± 0.6	0.45
Thyromental distance	6.9 ± 0.4	6.7 ± 0.5	0.91
Modified Mallampati Class (1/2) (n)	9/16	10/15	0.58

Table 2. Comparative analysis of SAD insertion characteristics: BlockBuster vs. Ambu Aura Gain Group

Characteristics	BlockBuster Group (n=25)	Ambu Aura Gain Group (n=25)	P-value
Time for SAD insertion (seconds) (mean ± SD)	12.4 ± 3.6	26.8 ± 5.2	0.002
Ease of SAD insertion (easy/satisfactory/difficult) (n)	20/3/2	7/3/15	0.08
Success rate of 1st attempt of SAD insertion: n (%)	20 (80)	7 (28)	0.40
2nd attempt of SAD insertion: n	3	3	0.38
Use of maneuver for SAD placement: n (%)	2 (8)	15 (60)	0.004

Table 3. Comparative analysis of ETT insertion characteristics between the two groups.

Characteristics	BlockBuster group (n=25)	Ambu Aura Gain group (n=25)	P-value
No. of attempts of ETT insertion (1/2)	21/4 (84%)	3/22 (12%)	< 0.0001
Time taken for successful ETT insertion (seconds) (mean ± SD)	26.7 ± 4.6	147.4 ± 6.4	< 0.0001
95% CI for difference in mean time of ETT insertion			(-123.79, -117.61)
Manoeuvre used (n)	2	15	0.0003

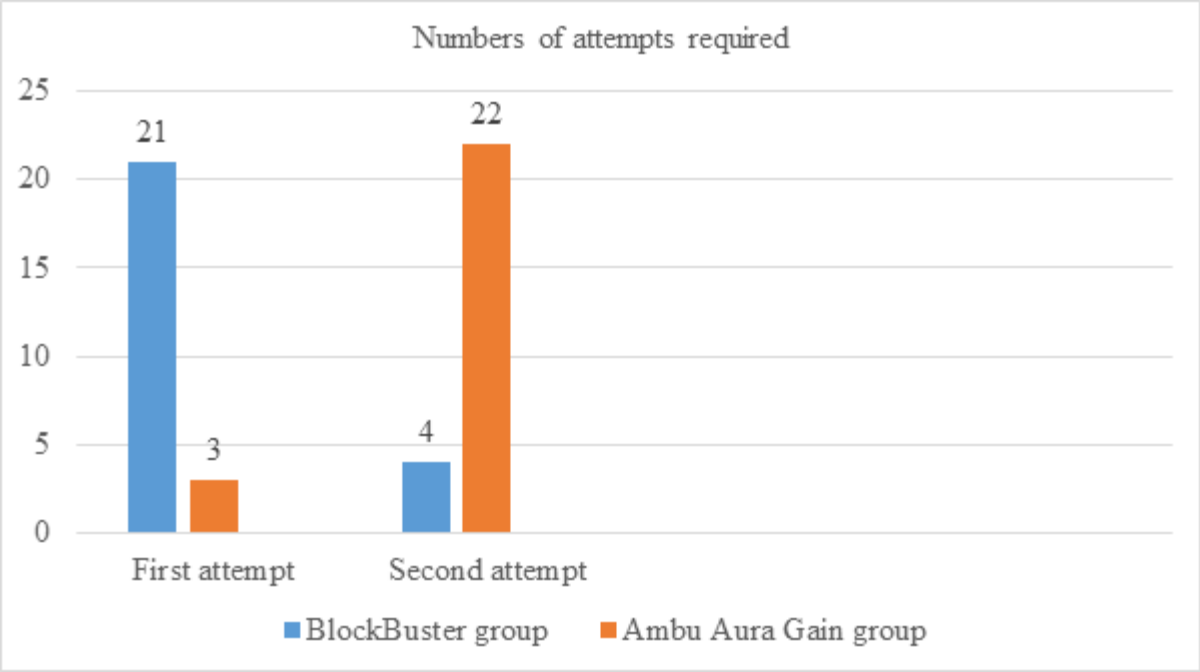

Figure 3. Number of successful attempts required for blind endotracheal intubation in two groups.

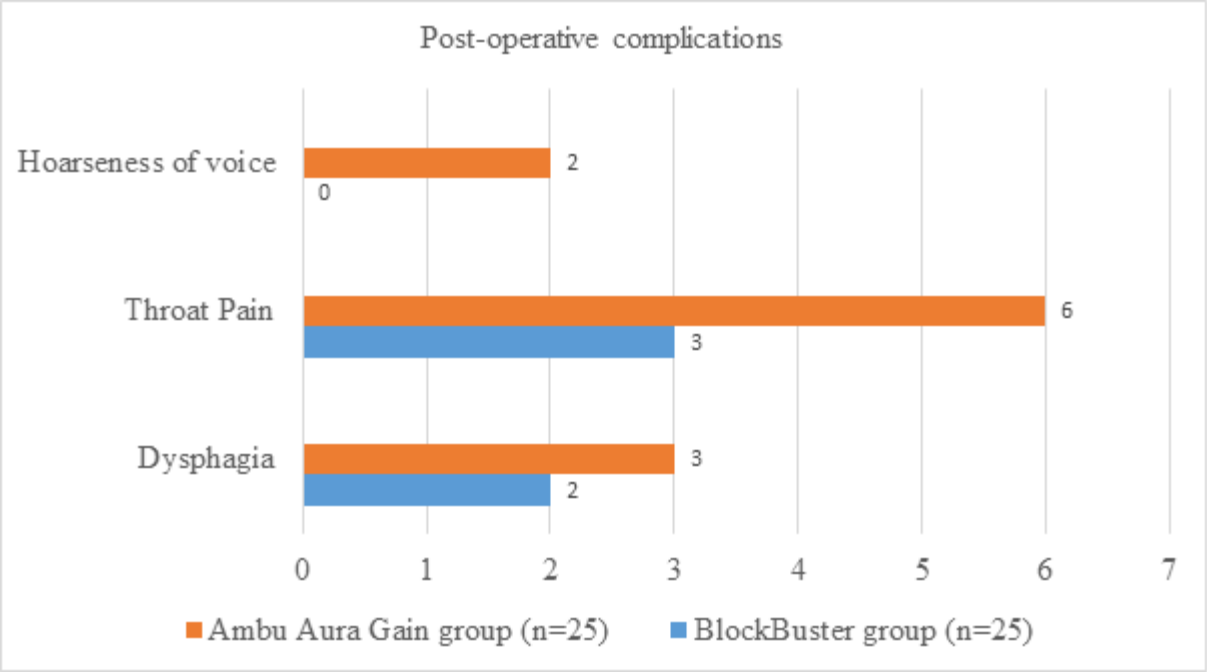

Figure 4. Frequency of post-operative complications in the two groups: BlockBuster and Ambu Aura Gain.

Discussion

In the current study, the performance and effectiveness of two different SADs were assessed by evaluating various factors such as the success rate of intubation on the first attempt using the SAD, the ease of placing the SAD, the duration of intubation through the SAD, visualizing the glottis through the SAD, and the occurrence of any complications.

The time required for SAD insertion significantly favoured the BlockBuster Group, highlighting its efficiency in comparison to the Ambu Aura Gain Group. In a study by Raiger et al. it was observed that the overall intubation duration was shorter in BlockBuster group compared to Ambu Aura Gain group, taking into account both the first and second attempts.[9] Also, in a study by Neoh et al. the intubation time was shorter in BlockBuster group when compared to Fastrach group.[10] This finding may be attributed to differences in the design and ergonomics of the two devices. The higher success rate of first attempts and lower need for manoeuvres in the BlockBuster group further underscore its superiority in terms of ease of insertion and clinical practicality.

Blind endotracheal intubation success rates revealed a substantial advantage for the BlockBuster group, with 84% achieving success on the first attempt compared to only 12% in the Ambu Aura Gain group. Similar observations were also observed in a study by Raiger et al. where about 93.3% of patients were successfully intubated from the first attempt in BlockBuster group, compared to 22.2% with Ambu Aura Gain.[9] Also, Endigeri et al. reported that first-attempt intubation success rate in BlockBuster group was comparatively greater.[11] This outcome suggests that the BlockBuster SAD provides a more reliable conduit for blind endotracheal intubation. The result is not only statistically significant but also clinically relevant, indicating potential benefits in emergency situations where rapid and successful intubation is crucial.

The results pertaining to ETT insertion further support the superiority of the BlockBuster SAD. A significantly higher proportion of patients in the BlockBuster group achieved successful ETT insertion on the first attempt, with a shorter mean time required for insertion. Additionally, the BlockBuster group exhibited a lower requirement for manoeuvres during ETT insertion. These findings collectively suggest that the BlockBuster SAD facilitates a

smoother transition from SAD insertion to endotracheal intubation, minimizing procedural complications and optimizing patient outcomes. Findings from the study by Myatra et al. also supports this.[12]

The frequency of post-operative complications reveals noteworthy differences between the two groups. The Ambu Aura Gain group exhibited a higher incidence of throat pain and dysphagia, while no hoarseness of voice was observed in the BlockBuster group. Raiger et al. reported a significantly lower occurrence of blood-stained LMA in BlockBuster group compared to Ambu Aura Gain group. Additionally, BlockBuster group exhibited a statistically significant decrease in the incidence of postoperative nausea/vomiting.[9] These findings could be attributed to variations in device design and material, highlighting the importance of considering not only the success of intubation but also the post-operative comfort and safety of patients.

Limitations

The study presents a comprehensive evaluation of the efficacy of BlockBuster® and Ambu® AuraGain™ as supra-glottic airway devices (SADs) for blind endotracheal intubation. While the findings contribute valuable insights to the field of anesthesiology, certain limitations warrant mention for a balanced understanding.

The study was conducted with a relatively small sample size of 50 patients. Although not initially delineated, a post-hoc power analysis can be conducted based on the observed effect sizes, variability in the data, and the significance level set at $P < 0.05$, as reported in the results. This analysis would retrospectively validate the adequacy of the sample size in detecting the observed differences between the two groups with sufficient statistical power. While statistically significant results were obtained, a larger sample size might provide a more robust evidence base and enhance the generalizability of the findings to a wider population. As a single-center study, the results may be influenced by specific practices, patient demographics, and expertise levels unique to the institution. Multi-center studies could help validate the findings across diverse settings and patient populations. The exclusion criteria, while necessary for study integrity, limit the applicability of the findings. Patients with anticipated difficult airways, contraindications to SAD use, certain physical conditions, or obesity were excluded. Future studies encompassing a

broader patient demographic could provide insights into the devices' performance across varied clinical scenarios. The study does not explicitly address the impact of operator experience on device insertion and intubation success rates. Operator proficiency with each device could significantly influence outcomes, suggesting a need for further investigation into how varying levels of experience affect the comparative effectiveness of these devices.

Conclusion

The current study provides valuable insights into the comparative efficacy of BlockBuster and Ambu Aura Gain as SAD for blind endotracheal intubation. BlockBuster demonstrated superior performance in terms of faster SAD insertion, higher success rates in both SAD insertion and blind endotracheal intubation and reduced post-operative complications. These findings suggest that BlockBuster may be a more favourable choice in clinical scenarios requiring immediate and reliable airway management. However, further research and clinical trials are warranted to validate these results and explore potential variations in different patient populations and clinical settings.

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Conflict of interest:

The authors declare no competing interests.

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