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Original Article

Ambu AuraGain versus Intubating Laryngeal Mask Airway (Fastrach) as Conduits for Blind Intubation – A Prospective Randomized Study

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Abstract

Introduction: The original laryngeal mask airway (LMA) was the first supraglottic airway introduced into clinical practice and was invented by DR. Archie Brain in 1981. There have been several modifications to the LMA over the years – camera attachments, conduits for endotracheal intubation, gastric channel, and so on. The present study was done to compare the efficacy of new second-generation SGA Ambu®AuraGain (AAG) and Intubating LMA as conduits for blind intubation.

Materials and Methods: This prospective study was carried out in the "Department of Anesthesiology, Government Medical College, Amritsar," on 60 patients in the age group of 18–60 years of either sex and the American Society of Anesthesiologists Grade I and II. The patients were randomly divided into two groups of 30 each and were comparable in terms of age, sex, duration, and nature of the procedure they underwent. The two groups were comparable in demographic data and patient characteristics.

Results: The successful intubation rate through FT-LMA and AG-LMA was 96.66% and 33.33%, respectively. The difference in the overall success rate of intubation between both groups was highly significant with $P < 0.05$.

Conclusion: Fastrach LMA has a higher success rate of intubation than AAG.

Key words: Airway management, Ambu AuraGain, Fastrach LMA, Intubation

INTRODUCTION

Airway management is the most essential skill that an anesthesiologist has to acquire. The most definite way of securing an airway is by endotracheal intubation. Today, we have far advanced from the conventional old red rubber tube. One such equipment that has stood out from all the other conventional equipment is the laryngeal mask airway (LMA).[1]

Supraglottic airway devices came into existence for short surgeries, and advancement came into supraglottic airway devices for gastric channels, for blind intubation. Supraglottic devices are easy to use and maintain and useful in many difficult situations where direct laryngoscopy is impossible or difficult. They remain above the vocal cords, but provide a hands-free means of ventilation and also cause lesser gastric distension.[2]

There have been several modifications to the LMA over the years, addition of venting ports, intubation aids, camera attachments, ability to use it as an endotracheal intubation conduit, gastric channel, and so on. LMA ProSeal is the most complex of the specialized laryngeal mask devices.[3]

Intubating LMA (FT-LMA) was first described by Brain[1] in 1997; it became available for commercial use in the United States shortly thereafter. It is specially designed to facilitate intubation either blindly or through fiberoptic assistance in a neutral head position similar to the position produced by the neck collar or manual in-line stabilization.[4] FT-LMA has been proven for its role in the anticipated difficult intubations, cervical spine injuries, and limited airway access situations.[5]

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A dedicated wire-reinforced silicone endotracheal tube is advocated for intubation through the FT-LMA. The unique characteristics of this tube are the straight alignment, wire reinforcement, and presence of a conical Touhy-like tip made of silicone, which is less traumatic than a conventional polyvinyl chloride endotracheal tube. However, the low-volume, high-pressure cuff of this tube makes it less suitable for prolonged use. Furthermore, it is very expensive and not so easily available.[6]

Ambu AuraGain (AAG) is a new single supraglottic airway device (SGA) with the gastric channel, made to facilitate ventilation and intubation. Its soft rounded curve follows the anatomy of the airway and ensures rapid placement and provides high seal pressures. It has an integrated gastric access channel; an integrated bite absorption area prevents airway occlusion.

MATERIALS AND METHODS

This study was conducted in the Department of Anesthesia and Intensive Care, Guru Nanak Dev Hospital, attached to Government Medical College, Amritsar, with permission of the Institutional Ethics Committee, Government Medical College, Amritsar. Prior informed consent was taken from all the cases. After obtaining approval from the Institutional Ethics Committee, Government Medical College, Amritsar, we planned to carry out a randomized prospective study of 60 patients of the American Society of Anesthesiologists (ASA) physical status I and II and age group of 18–60 years posted for elective general surgery under general anesthesia. The sample size has been calculated in consultation with the statistician to get the power of the study more than 85%. Written informed consent was obtained from every patient in the vernacular language.

Inclusion Criteria

- Age between 18 and 60 years
- Patients with ASA grade I and II undergoing surgical procedures
- MPG grade I and II
- BMI <35 kg/m^2.

Exclusion Criteria

- Age <18 or more than 60 years
- History of acid peptic disease and hiatus hernia pregnancy
- Laryngeal pathology
- MPG grade III and IV
- ASA grade III and IV
- BMI >35 kg/m^2.

Preanesthetic Checkup

- PAC, including a detailed history and thorough general physical examination of patients, including airway assessment, was carried out a day before surgery and was recorded
- Every patient was examined to ascertain the history of difficult intubation and was taken for surgery on the basis of mentioned criteria, and the following investigations were carried out.

Table 1: Number of insertion attempts of Fastrach LMA and Ambu AuraGain LMA

Number of insertion attempts	Group FT		Group AG	
	No.	%age	No.	%age
1	27	90.00	28	93.3
2	3	10.00	2	6.66
Total	30	100.00	30	100.00

X^2: 0.218; *P*=0.640 (non-significant)

Table 2: Time of insertion of either device

Group	Time taken (seconds)	
	Mean	SD
Group FT	12.891	1.9038
Group AG	21.08	10.61
P-value	0.0001	

(Highly significant)

Table 3: The success rate of intubation through either device

Groups	Group FT	Group AG	*P*-value	Significance
	%age	%age		
Intubation success	96.6	33.3	X^2: 41.85; *P*=0.001	HS

Table 4: Successful intubation through either device

Intubation success	Group FT		Group AG		*P*-value	Significance
	No.	%age	No.	%age		
Attempt	28	93.33	3	10.00	X^2: 41.85;	HS
Attempt	1	3.33	7	23.33	*P*=0.001	
Failed intubation through either device	1	3.33	20	66.6		

Routine Investigation

Routine investigations were Hb, TLC, DLC, BT, CT, platelets, urine complete examination, FBS, ECG, LFT, RFT, and PTI.

Patients were kept NPO 8 h before surgery. Tab. Alprazolam 0.5 mg at night and in the morning before surgery with a sip of water to prevent anxiety before surgery. The monitoring equipment and anesthetic drugs used during general anesthesia were kept as follows:

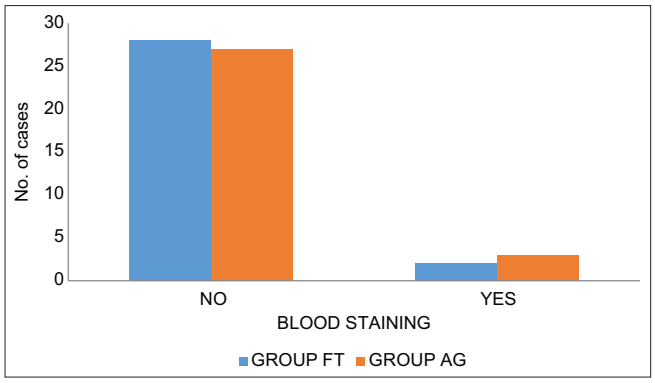

Figure 1: Blood staining in both groups

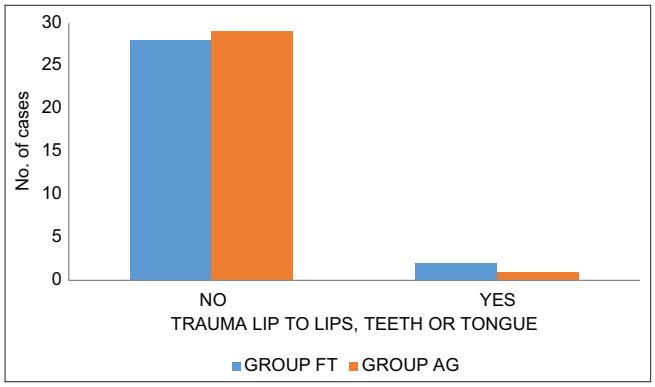

Figure 2: Trauma to the lips, teeth, tongue, or posterior pharyngeal wall in both the groups

i. IV set, Angiocath, fluid, drip stand, disposable syringes, and suction catheter
ii. BP apparatus, ECG electrodes, pulse oximeter, ETCO2, and laryngoscope
iii. On workstation - Inj. Midazolam, Inj. Glycopyrrolate, Inj. Butrum, Inj. Propofol, Inj. Succinylcholine, Inj. Lidocaine, Inj. Vecuronium, Inj. Neostigmine, and lignocaine jelly
iv. Gases isoflurane, N_2O, and oxygen
v. Flexometallic endotracheal tube (No. 7 mm internal diameter)
vi. AAG LMA (No. 4 and 5)
vii. Fastrach LMA (No. 4)
viii. Emergency drugs such as Inj. Atropine, Inj. Adrenaline, and Inj. Noradrenaline.

Type of the Study

This was a randomized prospective study. Blinding is not possible.

Study Design

A study was carried out by dividing patients into 2 groups of 30 each as follows.

1. Group FT – Blind endotracheal intubation using FT-LMA

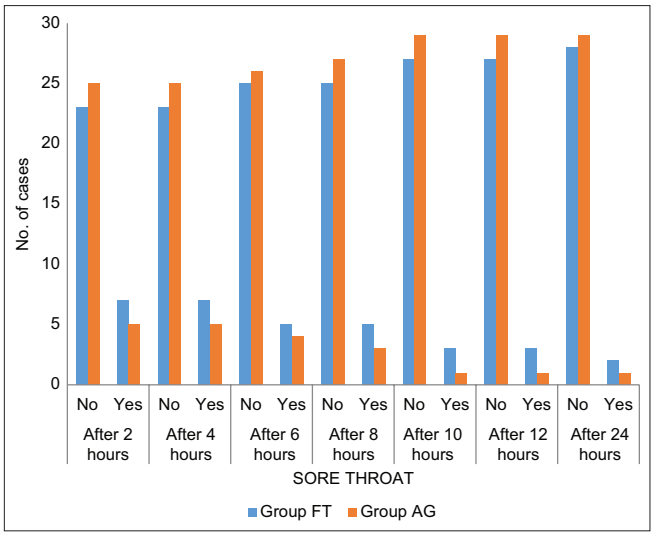

Figure 3: Sore throat (ST) up to 24 h postoperatively

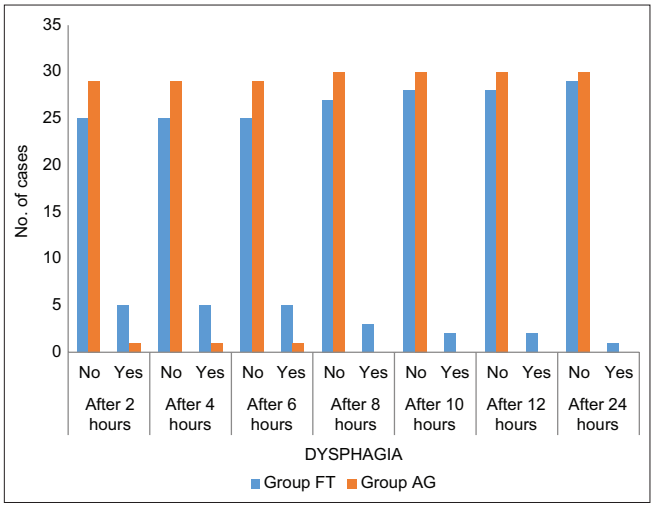

Figure 4: Dysphagia up to 24 h postoperatively

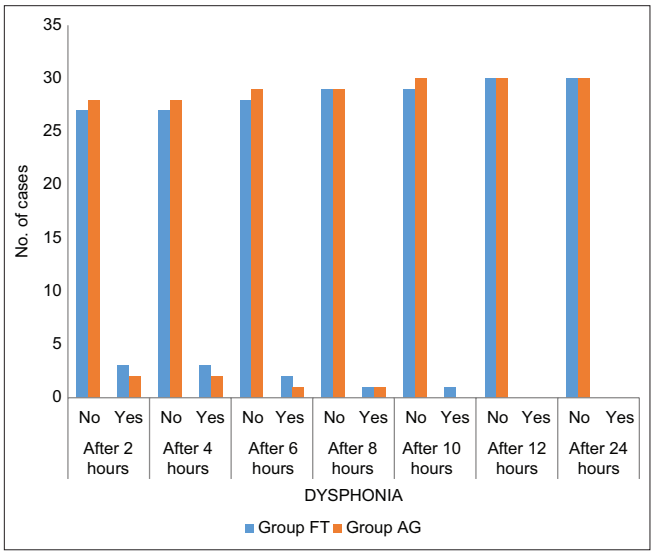

Figure 5: Dysphonia up to 24 h postoperatively

2. Group AG – Blind endotracheal intubation using AAG LMA.

All patients included in the study were kept nil orally for 8 h preoperatively after a thorough preanesthetic checkup and laboratory investigations. An airway examination of the patients was also done.

In the operation theater,
- Routine monitoring (ECG, pulse oximetry, NIBP, and ETCO2)
- An intravenous line was secured with 20-gauge Cannula
- IV fluids were started.

Premedication:
- Intravenous midazolam 1 mg
- Intravenous glycopyrrolate 0.2 mg
- IV fentanyl 2 mcg/kg.

Preoxygenation was done for 3 min with 100% oxygen using a facemask. Anesthesia was induced with I/V propofol 2 mg/kg and isoflurane 1–2%. After confirming mask ventilation, Inj. Vecuronium 0.1 mg/kg I/V was administered for muscle relaxation.

At the completion of the laryngoscopy, face mask was applied again, and 3–5 inflations of 100% oxygen were given. Then, with the patient's head in a neutral position, by standing at the head end of the patient, an appropriate size AAG or FT was inserted. Correct placement of the device was confirmed by easy bag ventilation and normal square-wave capnogram.

Insertion Technique for Supraglottic Airway Device FT/AG

An ideal FT-LMA or AAG LMA size was chosen according to the weight of the patient. The cuff of FT-LMA or AAG LMA was deflated, and the mask was lubricated using 2% lignocaine jelly. While maintaining the neutral head position of the patient, the mask of FT-LMA or AAG LMA was flattened against the hard surface, and it was inserted with a rotational movement along the hard palate and the posterior pharyngeal wall. After its insertion, the cuff was inflated, and proper placement of the device was confirmed by observing the chest rise and noting the presence of a normal capnograph trace. If the first attempt of the insertion of a supraglottic device was unsuccessful, a second attempt was undertaken. If the supraglottic device was not placed in two attempts, or oxygen saturation fell to 90%, the procedure was abandoned, and the patient was intubated through direct laryngoscopy, and was called a failure case of study and was included in the study.

After the successful placement of the supraglottic airway device, blind intubation of the trachea was attempted with an endotracheal tube with curvature facing anterior in the first attempt, and the tube was rotated 180° for the next two attempts.

In case of failed insertion or intubation, direct laryngoscopy and intubation is the alternative approach between the supraglottic device insertion and blind intubation attempts; patients were ventilated with 100% oxygen and an additional bolus of propofol 20–40 mg I/V was given to ensure adequate anesthetic depth.

Statistical Analysis

Duration of intubation was taken as the outcome measure of interest for the purpose of sample size calculation. The sample size was calculated keeping in view at most 5% risk, with a minimum of 80% power and 5% significance level (significant at a 95% confidence interval). Data were recorded in a Microsoft Excel spreadsheet and analyzed using the IBM SPSS Statistics for Windows, Version 23.0. Armonk, NY: IBM Corp., Chicago. Continuous data were presented as mean with standard deviation. Categorical data were expressed as numbers and percentages. Power analysis was done to calculate the power of the study, which was 95% by taking α error 0.05. The *P*-value was then determined to evaluate the level of significance. The results were analyzed and compared to previous studies to draw relevant conclusions.

RESULTS

Comparing the number of attempts for the insertion of FT-LMA and AG-LMA, the result was 100% ($P > 0.005$). The successful intubation rate through FT-LMA and AG-LMA was 96.66% and 33.33%, respectively. The difference in the overall success rate of intubation between both groups was highly significant with $P = 0.001$

The time of insertion was measured in seconds from the time the device was picked up by the operator until the square wave of the capnograph trace was obtained. The mean time of insertion between the groups was statistically significant ($P < 0.05$).

In group FT, intubation was successful in the first attempt in 28 (93.33%) patients, and in the 2nd attempt, no successful intubation in 2 (0.00%) patients. Intubation was not possible through LMA and was intubated through direct laryngoscopy in 2/30 (6.66%) patients. In group AG, intubation was successful in the first attempt in 3 (10%) patients, and in the second attempt in 7 (23.33%) patients, intubation was not possible through LMA and was intubated through direct laryngoscopy in 20/30 (66.6%) patients. The difference between successful

intubation devices through either device in both groups was statistically significant, $P = 0.001$.

The variation in the mean arterial pressure, HR, ETCO2, and SPO_2 in the group FT and AG from the baseline, till the end of surgery, remained non-significant ($P > 0.05$) (Figures 1-5 and Tables 1-4).

DISCUSSION

In our study, in the first attempt, insertion of Fastrach LMA was seen in 27 out of 30 (90%) patients, and in the second attempt seen in 3 out of 30 (10%) patients. In AAG LMA, insertion in the first attempt was seen in 28 out of 30 (93.3%) patients, and in the second attempt in 2 out of 30 (6.66%) patients. Our results are consistent with the study conducted in 2018 by Siamdoust *et al*.,[7] in which they compared the success rate of intubation between the LMA Fastrach and air-Q ILA in patients undergoing elective surgery during general anesthesia; they were able to insert in all patients, and out of which, 61/63 (96.8%) were inserted in the first attempt. In another study conducted in 2019 by Sudheesh *et al*.,[8] in which Fastrach LMA and AAG LMA were used in 60 patients; out of which in FT-LMA, 57/60 (95%) and 3/60 (5%), and in AAG, 56/60 (93.33%) and 4/60 (6.66%).

The time of insertion was measured in seconds from the time the device was picked up by the operator until attaching it to the breathing circuit. In groups FT-LMA and AG-LMA, the mean time for device insertion was 12.82 ± 1.90 s and 21.08 ± 1.60 s, respectively. The difference between the time taken for LMA insertion between both groups was non-significant. Our findings were supported by the study conducted in 2019 by Schiewe *et al*.,[9] in which they compared blind tracheal intubation through FT-LMA and AMBU AURA-I. The mean time for the insertion for FT-LMA was 15.2 ± 7.0 s, which is comparable to our study. Our findings were supported by the study conducted in 2021 by Sarma *et al*.,[10] in which they compared the mean time for the insertion of AAG, ILMA, and I-gel for blind tracheal intubation. The mean time for the insertion for AAG LMA was 25.07 ± 11.61 s.

The success rate was the ability to establish a definitive airway through blind tracheal intubation through either of device irrespective of the number of attempts taken.

In group FT, 28/30 (93.3%) were intubated successfully using FT-LMA. Our study results are in concordance with the studies conducted by Darlong *et al*.,[11] in which a comparison of FT-LMA and Cobra PLA as an aid for blind tracheal intubation was done. The overall success rate of blind tracheal intubation through FT-LMA was 90% (27/30), which is consistent with our study.

In another study conducted by Langeron *et al*.,[12] in which a comparison of the FT-LMA with the fiberoptic intubation in anticipated difficult airway management was done, intubation was successfully done using FT-LMA in 48/51 (94%), which is similar to our study.

In another study conducted by Sudheesh *et al*.,[8] in which they compared AAG versus intubating LMA as conduits for blind tracheal intubation, the success rate for blind intubation through FT-LMA and AG-LMA was 96.6% and 36.6%. Our study results are consistent with this study.

A particular set of complications can occur at any time during the insertion of the device. Since the larynx and pharynx are areas that are richly supplied by the plexus of nerves that originate from the vagus and glossopharyngeal, they can get easily injured if the proper technique of device placement is not employed. These injuries are only identified post operatively after cessation of anesthesia.[13]

The patient may complain of sore throat, dysphagia which would mean pain during swallowing, and dysphonia which could be due to injury of the superior, inferior, or recurrent laryngeal nerve.

Limitations of the Study

- We studied only low-risk patients (ASA I and II) who had normal airways with MPG grade I and II.
- Our data being derived from a single center may have referral bias
- The inferior success rate of blind intubation with AAG may be due to its malleability, following exposure to body temperature, and minor distortions in placement while passing the ETT, when compared with a more rigid ILMA.

CONCLUSION

We can say that Group FT with ease of insertion, for adequate ventilation but blind tracheal intubation through Group AG has a lower success rate compared to Group FT.

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