COMPARISON OF TWO SUPRAGLOTTIC AIRWAY DEVICES IN MAINTAINING AIRWAY FOR SHORT SURGERIES

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ABSTRACT

Objective: To find the better supraglottic airway device in terms of advantages, and complications, in short surgeries following anesthesia and paralysis.

Study Design: Quasi-experimental study

Place and Duration of Study: Combined Military Hospital Okara and Armed Forces Institute of Urology, Rawalpindi Pakistan, from July 2018 to July 2020.

Methodology: Prospectively, 130 American Society of Anesthesiologist (ASA) 1, 2, and 3 patients, aged 15-60 years, scheduled for short urology or gynecological procedure were randomly divided into Group LMA (Group L, n=65) or i-gel group (Group G, n=65). Laryngeal mask airway and i-gel were inserted in respective groups after anesthesia induction and muscle paralysis. The parameters compared were: simplicity of insertion, time taken for insertion, insertion attempts, device exchanged, and complications rate of each device. The data thus obtained was analyzed with SPSS-16.

Results: LMA group was similar to i-gel group for gender distribution 68 (52%) vs. 62(47%) and surgery type 60 (urology 46.2%) vs. gynecology 70 (53.8%). The successful insertion rate at first attempt (38.4% vs. 40.7%) was similar in both devices. The device was changed in 3.07% of i-gel patient's vs. 6.92% LMA group patients, and complication rate was not substantially different in either group (i-gel 5.3% vs. LMA 6%). The insertion time was less in i-gel group (17.62 sec ± 6.41 vs.22.06 sec ±7.92) which was statistically significant $p \leq 0.05$.

Conclusion: LMA and i-gel are the two supraglottic devices for maintaining airways with different indications from emergency lifesaving to routine surgical procedures but their use in situations like difficult intubation is well known. Both devices have their pros and cons but well-fitted i-gel has edge over LMA because of fewer complications and ease of insertion.

Keywords: i-gel, Laryngeal mask airway, supraglottic devices.

INTRODUCTION

After induction of anesthesia, the airway must be supported with one of three traditional devices which include anesthesia facemask, supraglottic (SGA) airway and endotracheal tube (ETT). The SGA invention has revolutionized anesthesia practice by helping airway maintenance in emergency resuscitation and routine anesthesia cases. Its use in failed intubation cases is proven to be lifesaving[1]. The LMA was invented followed by i-gel which is the second generation of this famous device[2]. Holding a face mask on spontaneously breathing patient's face for short surgical procedures was in practice for a long time with some disadvantages. This practice has been replaced by the use of SGA for all ages[3,4].

SGA is a device that isolates the airway above the vocal cords. They were approved as a substitute for facemask and ETT replacement for failed intubation but soon accepted widely for surgical cases traditionally managed with tracheal intubation[5,6]. They are associated with less sore throat, coughing, and emergence laryngospasm/bronchospasm as compared to ETT[7,8]. Their use for general anesthesia is increasing in the United States and United Kingdom[9].

Classic LMA and i-gel are the two commonly used devices for anesthesia in our hospital and carry definite advantages over ETT. They are recommended and increasingly used now a day for many surgeries[9]. We hypothesized to find which SGA is better for maintaining the airway after induction of general anesthesia with paralysis in short surgical procedures.

METHODOLOGY

After approval of hospital ethical committee this prospective, Quasi-experimental study was started at Armed Forces Institute of Urology, Rawalpindi and Combined Military Hospital, Okara, from July 2018 to July 2020. WHO sample size calculator was used to calculate the sample size of the study which was 100 and the method of convenient sampling was used for selecting patients 10. Prospectively, classic LMA and i-gel were used in the ASA 1, 2, and 3 status patients undergoing either urology or gynecology procedures. Inclusion criteria were all patients declared fit for short surgeries of urology and gynecology. Exclusion criteria were; ASA 4 patients, difficult anticipated intubation,

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edentulous, morbidly obese, and facial trauma patients.

LMA group (n=65) and i-gel group (n=65) had the random selection and one observer noticed the responses for a particular variable till completion of surgery and postoperatively till the patient was fully awake. All responses were written on a pre-decided observer paper for each device and collected data was submitted for analysis. Propofol 2mg/kg, nalbuphine 1 mg/kg, and atracurium 0.25mg/kg were given to each patient for induction before mask ventilation with a mixture of oxygen in isoflurane 1-2%. After an adequate time of mask ventilation, one of either device (LMA or i-gel) was inserted while keeping a record of variables under study. Additional doses of anesthesia drugs were given as and when required to control the depth of anesthesia. Monitoring of vitals and manual controlled ventilation was standard for all patients. Properly sized I-gel (No. 3-4) or LMA (No. 3, 4) was used in each patient. Insertion time was taken starting from device insertion at mouth to the first manual breath to the patient. We measured responses for device type; time taken for insertion, failed insertion, device exchanged and complications rate. SPSS 16 was used for data analysis. Qualitative data were presented as frequency and percentage. Quantitative data were presented as mean and standard deviation. Chi-square test was used to calculate significance and *p*-value ≤0.05 was regarded as significant.

RESULTS

There were no significant differences in the demographic data of both groups where males were 68 (52%) and females were 62 (47%) as shown in Table-I.

Table-I: Cross tabulation of variables.

Variable	LMA	I-Gel	Group Total	Total
Gender				
Male	38 (29.2%)	30 (23%)	68 (52%)	130
Female	27 (20%)	35 (26%)	62 (47%)	
Surgery				
Urology	26 (20%)	34 (26.15%)	60 (46.2%	130
Gynecology	30 (23%)	31 (23.8%)	70 (53.8%)	
No of Attempts				
First	50 (38.4%)	53(40.7%)	103 (79.2%)	130
Second	15 (11.5%)	12(9.23%)	27 (20.8%)	
Device changed				
Yes	4 (3.07%)	9 (6.92%)	13 (10%)	130
No	61 (46.9%)	56 (43.07%)	117 (90%)	
Complication				
Yes	7 (5.3%)	6 (4.6%)	13 (10%)	130
No	58 (44.6%)	59 (45.3%)	117 (90%)	

Males in Group L were 38 (29.2%) vs. 27 (20%) females and in Group G were 30 (23%) vs. 35 (26%) respectively. There were more cases of gynecology (53.8%) than urology (46.2%). The total no of insertion attempts (40.7% vs. 38.4%) and complication rate (5.3% vs. 4.6%) like sore throat were more in LMA group. However, the device changed was less in the LMA group (3.07% vs. 6.92%) (Table-I).

Group LMA had insertion time of 22.06 sec ± 7.92 and Group i-gel 17.62 sec ± 6.41 (as shown in Table-II) which showed that LMA took more time for insertion and inflation of cuff but it is not significant on statistical analysis ($p \leq 0.057$).

Table-II: Mean ± SD insertion time.

Device Type	N	Mean ± SD	*p*-value	Sig value
LMA	65	22.06 sec ± 7.92	0.001	0.057
i-Gel	65	17.62 sec ± 6.41	0.001	

DISCUSSION

SGA, when placed correctly, protects the airway from secretions, debris, and blood from the level above the mask[10,11]. The LMA does not reliably seal the esophageal inlet as it was not designed to protect airway against aspiration but when used in case-control studies it was found that the rate of aspiration was similar to other devices which are approximately 2 in 10,000[12,13]. During cardiopulmonary resuscitation, there are more chances of gastric regurgitation with facemask than LMA[14]. Albeit, these devices are very popular now for use in surgical procedures with several advantages like a less cardiovascular response, decrease coughing, fewer chances of bronchospasm/laryngospasm, and better oxygenation till the return of reflexes. Joseph *et al* compared LMA classic with Pro seal LMA (PLMA) in a study in non-paralyzed patients and concluded that LMA insertion is easy and quicker whereas better seal with the advantage of orogastric tube insertion in PLMA (ProSeal LMA)[15]. We studied the same effect but in paralyzed patients and found that the insertion of i-gel was easy and quick comparing LMA. Amr M, while conducting his study concluded that i-gel insertion is easier with fewer chances of gastric insufflation and we had the same finding but with a difference that a better airway seal is maintained in our population with cuff inflation of LMA, not i-gel. Moreover, they performed a study on spontaneously ventilated patients but we used paralysis with muscle relaxant; otherwise, results of both are comparable and the difference could be due to paralysis16.

The hemodynamic stress response to intubation is another concern which is often very marked and supraglottic airway devices have least response. However, SGA has few hemodynamic variations during insertion which is proved in different randomized observational studies[17,18]. This decrease in stress response is another factor for their popularity in anesthesia practice. The endotracheal tubes were famous for their advantage of controlled ventilation but now it is established possible with SGA with the risk of gastric regurgitation and insufflation but it depends upon the proper placement of these devices. A study by Latorre *et al* has proved under direct vision with a fiberoptic bronchoscope that mal-positioning of these devices was 40%[19]. The phenomenon of mal-positioning might be related to poor size selection of SGA and use of i-gel whereas LMA due to its cuff inflation could provide a better seal. Air leak around the cuff of SGA and gastric insufflation are two potential risks that can be minimized with proper placement and size selection. We found difficulty in proper placement in a few patients who were resolved with changing the size or i-gel to LAM and vice versa (Table-I). We did not confirm the placement with fiberoptic and complications were minimal (5.3% vs. 4.6% in LMA vs. i-gel groups). Contraindication to use of SGA includes full stomach or all conditions leading to a full stomach, increased airway resistance, some upper airway obstruction, and restricted mouth opening[20,21]. Similarly, they have complications like aspiration risk, laryngospasm, coughing/gagging, sore throat with variable incidence reporting[22,23]. Nerve injury is also reported due to inflated cuff, most common is neuropraxia[24].

Despite all complications and contraindications, SGA uses have been increasing with more generations of devices to come. Where indicated they have many advantages over ETT with less complication rate. We have seen easy, quick, and less painful insertion with lower sore throat following i-gel but at the cost of merely enough sealing pressure. LMA on the other hand provided more sealing pressure due to inflatable cuff, simply with more complications.

CONCLUSION

LMA and i-gel are the two supraglottic devices for maintaining airways with different indications from emergency lifesaving airway maintenance to routine surgical procedures anesthesia. Their use in situations like difficult intubation is a well-known and easy insertion by laypersons. Both devices have their pros and cons but well-fitted i-gel has edge over LMA because of fewer complications and ease of insertion.

CONFLICT OF INTEREST

None.

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