Airway Complications Associated with Laryngeal Mask use in Short Surgical Procedures – A Training Perspective

Original Article

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ABSTRACT

Introduction: Laryngeal masks (LMA) are frequently used as primary airway devices for anesthetic management of short procedures. A steep learning curve of insertion and low major complication rates are the main advantages of these devices. However, minor events associated with their mass effect are not rare. The impact of the operator's experience on this subject is also undetermined.

Objective: To assess the predictors of complication occurrence in the hands of anesthesiology residents who provided perioperative management for all cases.

Methods: Study conducted on 75 ASA I-II adult patients scheduled for an elective ureterorenoscopic surgery with an expected procedure time >120 minutes. All patients received GA with PLMA or FLMA inserted. After the recovery of spontaneous breathing, LMA was deflated and removed. Time to eye opening, time to removal of the device after cessation of anesthesia and the total procedure time were noted. Ventilation failure due to loss of airway patency or persistent excessive leak and peri- or postprocedural regurgitation and/or aspiration was specified as major complications. The dental or oropharyngeal mucosal injury was defined as visible bleeding in the oral cavity or blood stain on the removed device. Postoperative cough, hiccup, dysphagia, and dysphonia were grouped under the heading of irritative symptoms. The presence of sore throat was questioned at the 1st and 10th hours of the postprocedural period. The sample population was then split into two regarding the presence of the composite endpoint (Group C, at least one complication present; Group NC, no complications).

Results: Seventy-five ASA I-II patients were enrolled. The appropriate sizes of LMA Proseal™ or LMA Fastrach™ were utilized for establishing airway patency. The sample population was grouped according to the occurrence of at least one pre-specified complication (Group C and NC). Twenty-five events were observed in 20(26.7%) patients. Demographic features were comparable between groups. There were no significant differences in terms of the preferred LMA, operator experience, and ventilator-related parameters between individuals with and without complications. Among the complete set of data, the additional need for anesthetic was the only variable independently associated with outcome (OR:0.19; p= 0.01).

Conclusion: In our population comprising patients undergoing a brief urological procedure under general anesthesia, the only determinant of complication occurrence was the additional need for propofol during the procedure. The choice of the LMA and the experience of the resident were not associated with the composite endpoint.

Key Words: Academic training, Airway management, Balanced anesthesia, Laryngeal masks, Perioperative complications.

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INTRODUCTION

Laryngeal masks (LMA) have been increasingly used as primary or rescue devices for securing airway in advanced cardiovascular life support and elective or emergency anesthetic settings since its introduction to clinical practice in 1980s[1]. Given their beneficial features such as steep learning curve, less airway trauma, better perioperative hemodynamic stability, and shorter emergence times with low complication rates, general anesthesia with an LMA is a considerable option for short surgical procedures and compatible with enhanced recovery after surgery pathways[1-3].

In comparison to classic LMA, more recent devices have additional favorable properties including but not limited to the eliminated need of fiberoptic device assistance, improved laryngeal sealing, and a separate lumen for gastric drainage which reduces the risk of aspiration[4-6]. Atraumatic placement of LMAs and optimization of

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anesthetic and analgesic management for minimizing excessive movement, recall, and postprocedural irritative symptoms are also of crucial importance and necessitate a certain level of expertise[7-9].

While the overall risk of airway related complications is lower for LMAs as compared to endotracheal intubation, minimal traumatic events are still considerably common[2,10,11]. Hence, minor complication occurrences and their predictors should also be addressed from a training prospect.

Within this context, here we aimed to identify the factors determining the LMA-related adverse event occurrence during ureterorenoscopic surgery performed under general anesthesia. For securing airway LMA ProSeal™ (PLMA, Teleflex Incorporated, Wayne, PA, USA) and LMA Fastrach™ (FLMA, Teleflex Incorporated, Wayne, PA, USA) were used due to local availability. Device insertion and perioperative care were provided by anesthesiology residents (with a previous experience of ≥15 LMA attempts) under close surveillance of an experienced anesthesiologist. The presence of any periprocedural complication was described as a composite endpoint. The relationship between the composite endpoint and demographic, operator-related, and procedural features was sought.

METHODS

Study qualification and patient selection:

The study was conducted in a training center recruiting ten residents annually. A sample size of sixty-two was calculated for a 15% increase in procedure-related complications as compared to the literature data with an alfa error of 0.05 and a beta error of 0.8. By adding a 20% drop-out, ultimate sample size was designated as seventy-five cases. Eighty-four American Society of Anesthesiologists (ASA) I-II adult patients who had been scheduled for an elective ureterorenoscopic surgery with an expected procedure time fewer than 120 minutes were assessed for inclusion eligibility. A fasting period of fewer than 8 hours, an inter-incisor distance of <2.5cm, morbid obesity (body mass index >35kg/m^2), advanced chronic renal disease, cirrhosis, neuromuscular diseases, and history of difficult airway were determined as exclusion criteria. The necessity of administering neuromuscular blockade and change in airway strategy due to unexpected emergent situations were perioperative reasons of exclusion. After nine patients were excluded (4/10 morbid obesity, 1/10 insufficient fasting, 3/10 inadequate mouth opening, and 1/10 history of difficult airway), seventy-five individuals constituted the study population. Regarding the demographic features, age, gender, body mass index (calculated by Du Bois method). ASA class (I or II), Modified Mallampati test score, smoking status, presence of hypertension, diabetes mellitus, chronic pulmonary disease, and coronary artery disease were noted. Ethical approval was received from the local ethical committee of …… (ID: 17-2022, Issued in 24.08.2022). Thus, the study has been carried out per the most recent version of Declaration of Helsinki. Written informed consent was obtained from all participants.

Anesthesia technique, peri- and postoperative recordings:

Once patients were transferred to the operating room, noninvasive hemodynamic monitorization of oxygen saturation, blood pressure, and heart rhythm was conducted and an intravenous line was inserted. Head and neck were neutrally positioned on a standard pillow (7cm in height). All individuals were invariably premedicated with midazolam (0.03mg/kg), fentanyl (2mcg/kg), and lidocaine (1mg/kg) thereafter. After preoxygenation with 80% oxygen for 2 minutes, anesthesia induction was established by propofol (2.5mg/kg). The patients were manually ventilated with a mask in the following minute before device insertion. Loss of eyelash reflexes was verified in the meantime. The selection of PLMA or FLMA was at the experienced anesthesiologist's discretion. The size of the relevant device and the cuff pressure was determined in line with the manufacturer's manual. For PLMA insertion, the introducer was not used as patients favored to this anesthesia method usually fall into low-risk category in terms of ASA class and modified Mallampati scores in our institutional practice which also was the case for our sample population and trading off the possibility of unsuccessful insertion with the risk of traumatization from increased stiffening was unreasonable. The device was introduced after lubrication with sterile 2% lidocaine gel by the resident and the cuff was immediately inflated. The selected device and experience of the resident (junior, ≤2 years or senior >2 years) were recorded.

The LMA was then connected to the ventilator (Dräger Primus®, Dräger Medizintechnik, Lübeck, Germany). Effective ventilation was confirmed by the ability to maintain a tidal volume of 6ml/kg or higher, the presence of phase 3 of the capnogram and bilateral thoracic excursion without audible leakage. Otherwise, the procedure was recorded as an insertion failure. The trainees could make two attempts for insertion. If both failed, the attending physician took over the management and established airway patency. The number of attempts required for successful insertion was recorded.

Lithotomy position was then given to the patient for the transurethral procedure. Anesthesia maintenance was provided by sevoflurane (1.5 MAC) and remifentanil infusion (0.5mcg/kg/min). Volume-control mode with a tidal volume set to 6ml/min (FiO_2:40%) was used for ventilation during the procedure. Neuromuscular blockade was avoided as described in the study protocol. An additional dose of propofol (1mg/kg) was administered when spontaneous breathing or an abrupt visual alteration

of the capnogram was detected. Leakage was identified aurally and/or by the absence of the corresponding increase in pressure curves. Requirement for additional propofol and detected leakage were specified.

Heart rate, mean blood pressure, and peripheral pulse oximetry readings at baseline and 1, 5, 10, 20, and 30th minutes of the procedure were held. The ventilation variables recorded at 1, 10, and 30th minutes of the procedure were as follows: Inspiratory and expiratory tidal volumes, peak, plateau, and positive end expiratory pressure measurements, end-tidal CO_2 values, flow rate, and respiratory frequency displayed on the anesthesia circuit.

Intravenous paracetamol (10mg/kg) was administered 10 minutes before the estimated time for completion of the procedure for postoperative analgesia and anesthesia was terminated. After the recovery of spontaneous breathing, LMA was deflated and removed. Time to eye opening, time to removal of the device after cessation of anesthesia and the total procedure time were noted.

Definition of outcome variables:

Ventilation failure due to loss of airway patency or persistent excessive leak and peri- or postprocedural regurgitation and/or aspiration was specified as major complications. The dental or oropharyngeal mucosal injury was defined as visible bleeding in the oral cavity or blood stain on the removed device. Postoperative cough, hiccup, dysphagia, and dysphonia were grouped under the heading of irritative symptoms. The presence of sore throat was questioned at the 1st and 10th hours of the postprocedural period. Laryngospasm and bronchospasm were distinctively specified and treated with intravenous prednisolone (2mg/kg bolus injection). Short-acting beta-mimetic inhalants were also used for the latter. A composite endpoint was defined for the presence of at least one of the events described above. As per definition, the presence or absence of any event was counted instead of the number of events for the same individual. The sample population was then split into two regarding the presence of the composite endpoint (Group C, at least one complication present; Group NC, no complications).

Statistical analysis

Statistical analyses were carried out by using SPSS (version 17.0, SPSS Inc., Chicago, IL, USA). The data were presented as mean±standard deviation and median [IQR] for continuous variables and percentage for categorical variables. The normal distribution of the data was assessed by the Shapiro-Wilk test. Respecting the discrimination between patients with and without complications, the student's *t*-test was used for comparing the means of the numeric variables that showed normal distribution, while the Mann-Whitney *U* test was used for non-normally distributed samples. The frequencies of categorical variables between the groups were distinguished by the chi-square test. Finally, logistic regression analyses were performed for the differentiated parameters deemed statistically significant in a head-to-head comparison of the patients with and without complications. Within this context, additional propofol need and heart rate at the 10th minute were tested to be designated as an independent predictor of complication occurrence. Statistical significance was accepted to be present if the relevant test result reached a *p*-value <0.05 for all analyses.

RESULTS

Patient demographics and procedural features:

The data of seventy-five patients (46.6±12.1 years, female constituting 28%) were collected for analyses. The rate of successful device insertion was 84% (*n*= 63, 94.3% for FLMA, and 75% for PLMA) and 93.3% (*n*= 70, 97.1% for FLMA, and 90% for PLMA) at the first and second attempts; respectively. The airway could be secured with the selected LMA by the staff anesthesiologist in the five cases who could not be ventilated by the residents within two attempts. Thirty-five patients (46.7%) fell into ASA class II in the sample population. The mean procedure time was 46,4±22.9 minutes. PLMA and FLMA were utilized in 53.3% and 46.7% of the population; respectively. In the operation room, 41.3% (*n*= 31) of the procedures were performed by senior residents. The rate of successful insertion at first attempt and within two attempts were comparable between junior and senior residents (86.4% vs. 80.6, *p*= NS and 95.5% vs. 90.3%, *p*= NS).

Distribution of the complications:

Twenty-five events were observed in twenty patients. The distribution of the complications was displayed in Figure (1). Six patients described sore throat after the procedure. Of those, three patients experienced sore throat at the first hour, one patient only at the 10th hour, and two patients at both time points. Severe complications such as periprocedural device failure due to dislocation and regurgitation of the gastric content were not observed in our population.

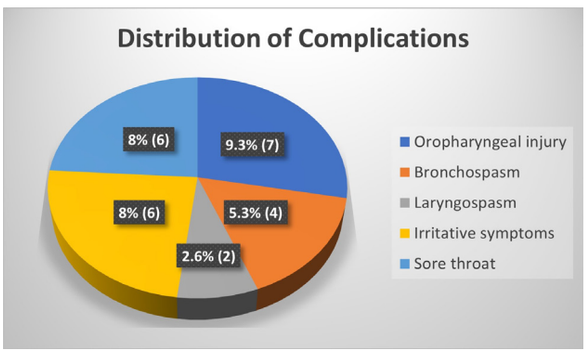

Fig. 1: Pie chart demonstrating the distribution of the complications in the study population.

Comparison of the patients with and without complications:

The participants were allocated into two groups according to the complication occurrence. Group C (which required the presence of at least one event) comprised twenty patients. Fifty-five event-free individuals constituted Group NC.

The demographic characteristics of the groups were similar. Procedure time and device selection for the cases involved in both groups were also comparable (Table 1). There was no statistically significant difference between the groups in terms of the ratio of senior residents participating in the care team (%, 45 vs. 40 for Group C and NC; respectively, p= 0.70). Success rates for device insertion and ventilation were 85.5% vs. 80% for the first attempt (p= 0.57) and 94.5% vs. 90% for two attempts (p= 0.77).

Table 1: Demographics of the study population, operator- and procedure-related features:

	Overall (n= 75)	**Group C (n= 20)**	**Group NC (n= 55)**	***P* value**
Patient demographics				
Age, years; Mean±SD[a]	46.4±12.1	46.3±15.9	46.4±10.6	0.97
Female gender; % (n)[b]	28(21)	29.1(16)	25(5)	0.73
BMI, kg/m^2; Mean ± SD[a]	27.6±4	26.4±5	28±3.6	0.13
ASA Class II; % (n)[b]	46.7(35)	40(8)	49.1(27)	0.49
MMT score; Median [IQR][c]	2[0]	2[0.8]	2[0]	0.11
Smoking history; % (n)[b]	33.3(25)	45(9)	29.1(16)	0.2
Hypertension; % (n)[b]	18.7(14)	10(2)	21.8(12)	0.25
Diabetes mellitus; % (n)[b]	12(9)	5(1)	14.5(8)	0.26
Chronic pulmonary disease; % (n)[b]	4(3)	5(1)	3.6(2)	0.79
Coronary artery disease; % (n)[b]	5.3(4)	5(1)	5.5(3)	0.94
Operator and procedure related features				
LMA type – PLMA, % (n)[b]	53.3(40)	45(9)	56.4(31)	0.38
Senior resident as provider; % (n)[b]	41.3(31)	45(9)	40(22)	0.70
Success rate at first attempt; % (n)[b]	84(63)	80(16)	85.5(47)	0.57
Success rate within two attempts; % (n)[b]	93.3(70)	90(18)	94.5(52)	0.77
Leakage; % (n)[b]	8(6)	5(1)	9.1(5)	0.56
Additional dose of anesthetic; % (n)[b]	14.7(11)	30(6)	9.1(5)	0.02
Procedure time; Mean±SD[a]	46.4±22.9	40.4±17.8	48.6±24.2	0.31
Time-to-eye opening, min; Mean±SD[c]	7.1±2.8	7.5±3.5	6.9±2.5	0.90
Time-to-LMA removal, min; Mean±SD[c]	6±3.5	6.8±5	5.8±2.8	0.80

a: Student's t test was used for comparison; b: Chi-square test was used for comparison; c: Mann-Whitney U test was used for comparison; BMI: Body mass index; LMA: Laryngeal mask; MMT: Mallampati test.

Heart rate and blood pressure gradually decreased after the induction of anesthesia in both groups. Among the full set of data for intraoperative hemodynamical recordings, solely heart rate at the 10th minute discriminated the groups significantly (bpm, 73.9±13.8 vs. 68.9±11.8, for groups C and NC; respectively. p= 0.04) (Figure 2).

An audible leakage was detected in 6(8%) cases. None of these events led to ventilation failure as stated above. Effective ventilation was reestablished by minor manipulation and slightly increasing cuff pressure for these patients. The observed rate of perioperative leakage was comparable among groups (5% vs. 9.1%; p= 0.56).

Postoperative emergence times (represented by time-to-eye opening and time-to-device removal) did not statistically differ between groups. However, the need for additional propofol during the procedure was higher in Group C (%, 30 vs. 9.1) and this difference reached statistical significance (p= 0.02). The abovementioned comparisons were also listed in Table (1). Comparison of oxygenation and perioperative ventilator-related parameters did not yield a statistically significant difference (Table 2).

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Binary and multiple logistic regression analyses were performed to identify the independent predictors of complication occurrence (Table 3). An additional dose of anesthetic requirement and heart rate at the 10th minute were engaged in the analyses. An additional dose of the anesthetic requirement was designated as the only determinant of complication occurrence in our sample population (OR= 0.90. CI 95% [0.054–0.672]; p= 0.01).

Table 2: Oxygenation and ventilator-related parameters:

	Overall (n= 75)	**Group C (n= 20)**	**Group NC (n= 55)**	***P* value**
SaO_2-baseline; Median [IQR][a]	98[2.5]	98[3.3]	98[2]	0.98
SaO_2-1min; Median [IQR][a]	99[2]	98[3]	99[2]	0.34
SaO_2-5min; Median [IQR][a]	99[2]	98[2.3]	99[2]	0.81
SaO_2-10min; Median [IQR][a]	98[2]	98[2.5]	98[1]	0.73
SaO_2-20min; Median [IQR][a]	98[1.5]	98.5[2.5]	98[1]	0.65
SaO_2-30min; Median [IQR][a]	98[3]	98[3]	98[3]	0.97
TVinsp-1min; Median [IQR][a]	500[25]	500[0]	500[25]	0.14
TVinsp-10min; Median [IQR][a]	500[25]	500[6.3]	500[50]	0.74
TVinsp-30min; Median [IQR][a]	500[14]	500[0.8]	500[50]	0.83
TVexp-1min; Median [IQR][b]	479[58]	498.5[66.5]	475[59]	0.23
TVexp-10min; Median [IQR][b]	494[54]	496[38.8]	494[57]	0.92
TVexp-30min; Median [IQR][b]	497[38.5]	500[22.5]	495[53]	0.58
PeakP-1min; Median [IQR][b]	16[4]	14.5[4.3]	16[3]	0.21
PeakP-10min; Median [IQR][b]	16[3]	15.5[6.5]	16[2]	0.48
PeakP-30min; Median [IQR][b]	16[3.5]	15.5[5.3]	16[3]	0.92
PlatP-1min; Median [IQR][b]	15[4]	14.5[4.3]	15[4]	0.40
PlatP-10min; Median [IQR][b]	15[3]	15.5[5.5]	15[3]	0.40
PlatP-30min; Median [IQR][b]	16[4]	15[5.3]	16[3]	0.32
PEEP-1min; Median [IQR][b]	5[0.5]	5[0.3]	5[1]	0.89
PEEP-10min; Median [IQR][b]	5[1]	5[1]	5[1]	0.75
PEEP-30min; Median [IQR][b]	5[1]	5[1]	5[1]	0.94
$ETCO_2$-1min; Mean±SD[a]	36.8±3.4	36±4.1	37±3.1	0.42
$ETCO_2$-10min; Mean±SD[a]	34.9±3	34.6±3.6	35±2.8	0.64
$ETCO_2$-30min; Mean±SD[a]	34.3±3	34.1±3.3	34.3±2.9	0.84
FR-1min; Median [IQR][b]	3[1.1]	3[1.3]	3[0.9]	0.88
FR-10min; Median [IQR][b]	2.5[1]	2.5[1.7]	2.5[1]	0.97
FR-30min; Median [IQR][b]	2.5[1]	3[2]	2.5[1]	0.09
RF-1min; Median [IQR][b]	12[1]	12.5[1]	12[1]	0.73
RF-10min; Median [IQR][b]	12[1]	12[1]	12[1]	0.77
RF-30min; Median [IQR][b]	12[1]	12.5[1]	12[1]	0.67

a: Mann-Whitney *U* test was used for comparison; b: Student's *t* test was used for comparison; ETCO2: End-tidal carbon dioxide; FR: Flow rate; LMA: Laryngeal mask; PEEP: Positive end-expiratory pressure; PeakP: Peak pressure; PlatP: Plateau pressure; RF: Respiratory frequency; TVinsp: Inspiratory tidal volume; TVexp: Expiratory tidal volume.

Table 3: Results of the logistic regression analyses for anticipating complication occurrence:

	OR	CI 95%	*P* value
Binary Logistic Regression Analysis			
Additional dose of anesthetic	0.233	0.062 – 0.879	0.03
HR-10min	1.043	1.000 – 1.087	0.05
Multiple Logistic Regression Analysis			
Additional dose of anesthetic	0.190	0.054 – 0.672	0.01
HR-10min	1.006	0.990 – 1.022	0.49

CI: Confidence interval; HR: Heart rate; OR: Odds ratio.

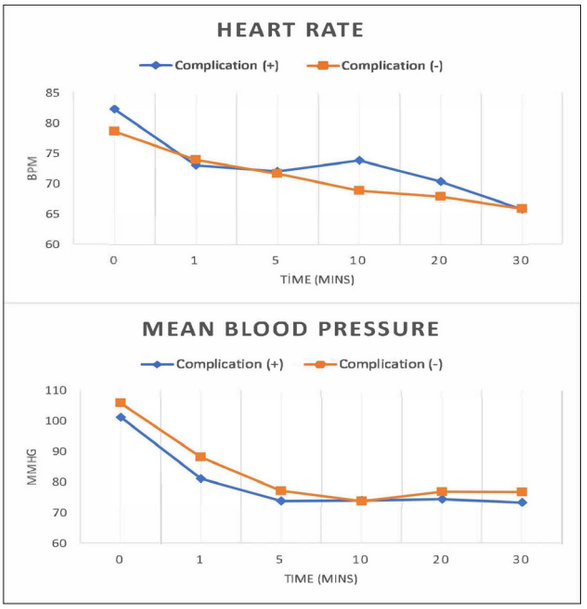

Fig. 2: Plot graphs demonstrating the average heart rate and mean blood pressure of the groups with and without complication occurrence at subsequent time-points during the procedure. Average heart rate was significantly higher at 10th minute in patients with a complication (p= 0.04).

DISCUSSION

Both as primary or rescue devices, LMAs are considerably effective in providing ventilation especially for short procedures and/or anticipated or known difficult airways[1,2]. The literature data reveals a reduced risk of clinically significant complications as compared to endotracheal intubation and remarkably high success rates even for novice operators which favor their use in elective and emergency settings[12,13]. Regarding these features, LMA utilization is an essential skill to be acquired during residency training. Although presence of a steep learning curve for LMA insertion was acknowledged by several studies, safety endpoints for the procedures performed by inexperienced providers were not well-established[1,4,12,14]. Here we aimed to focus on complication occurrence and its predictors in patients undergoing short urological procedures who were ventilated with PLMA or FLMA. In line with the literature data showing a severe event rate <1% for the patients ventilated with a LMA, failure of ventilation due to device dislocation and gastric insufflation or aspiration were not observed in our sample population. The composite endpoint was reached in twenty patients (26.7%). The expertise of the resident anesthesiologist (senior or junior) did not have an influence on event rates which confirmed the presence of rapid learning phase for LMA insertion. The success rate of insertion within two attempts was 93.3% in our study. No absolute device failure was observed since the staff anesthesiologists were able to ventilate the remaining patients at the third attempt.

Given the relative technical ease associated with LMA use, several publications assessed the performance of inexperienced personnel. According to the findings of Nakanishi *et al.,*[14] an acceptable failure rate of 20% for PLMA insertion could be achieved after 20±8 cases for novice residents. They stated that 30±10 cases were required for reaching proficiency. Another study enrolling novice residents showed a significant increase in success rate which had been observed after completion of forty cases as compared to the first five cases[15]. It should also be emphasized that insertion success has a considerable variability among different devices as well as the method of insertion (i.e., utilization of the finger, bougie, or the dedicated introducer for PLMA insertion) in addition to the operator's experience[16]. In our study, successful insertion at first and second attempts was 94.3% and 97.1% for FLMA and 75% and 90% for PLMA. Neither the selected device, nor the success rates for insertion had a major influence on adverse event occurrence.

LMA has also been demonstrated to provoke less stress response and yields better hemodynamical stability as compared to laryngoscopy[8]. These favorable features can also be translated to decreased emergence times[9,17]. However, implementing a standardized anesthetic regimen to the perioperative care algorithms which can be applied to all clinical scenarios seems unlikely due to varied doses of anesthetic requirements between devices[6,7,18]. In light of these findings, Institutional consensus and the mode of training come forward in this case to construct the optimal management strategy. Since the complications observed during ventilation via an LMA mostly consist of subjective complaints rather than devastating ones jeopardizing airway security, one must unequivocally put the establishment of anesthesia with adequate depth in the center of care. Identification of the additional need

for propofol as an independent predictor of complication occurrence in this study supports this statement.

Despite the relative ease of LMA insertion demanding less expertise as compared to that of endotracheal tubes, the procedure is not complication free[2,10-12,18,19]. Fortunately, the adverse events related to the device use are mostly minor and the occurrence rates are better established in the anesthesia setting particularly for short procedures[5,18-20]. However, there is a considerable diversification of the identified event rates between different studies. This instance can be explained by the wide spectrum of the device chosen, method of insertion, operator expertise, and definition of endpoints[17-20].

To our knowledge, previous publications in the literature were not focusing on the anticipation of complications associated with LMA use during anesthesiology training. Nevertheless, several authors presented the event rates observed in their sample population. The complication rate in procedures performed by first-month residents was reported as 10.2% for PLMA in the study published by Klaver *et al.,*[4]. The authors elected dysphagia, frenulum lesions, bradycardia, luxation, glottic closure, and aspiration as adverse events of interest. The incidence of dysphagia was significantly higher in patients ventilated by Laryngeal Tube-S than that of PLMA. The incidence was determined as 3% for PLMA in this study which was remarkably lower as compared to previous data (up to 26%). The Cochrane systematic review comparing PLMA and classic LMA did not reveal any significant difference between these devices in terms of complications including oropharyngeal injury, sore throat, gastroesophageal regurgitation, coughing, bronchospasm, and excessive leak[9]. In another article published by Vaidya *et al.,*[5], comparable frequencies for subjective laryngopharyngeal complaints (~20%) and phonetic analysis results were obtained between I-gel and PLMA. The rate of sore throat was reported as 26.3% and 23.6% in two different studies[2,21]. In our study, the frequency of sore throat and irritative symptoms was only 8% (n= 6). It has been well described that the medications selected for induction and maintenance of anesthesia have a considerable influence on occurrence of airway reactions[9,17]. Accordingly, the intensive multimodal anesthesia regimen may elucidate low self-reported complication rates. The cumulative event rate comprising oropharyngeal injury, bronchospasm, laryngospasm, sore throat, and irritative symptoms was 26.7% (n= 20) in our sample population.

There are some limitations of the current study. First, the device selection was unstandardized and dependent on the operator's discretion. Nonetheless, it did not have a significant impact on complication occurrence. Secondly, we appreciate that the influence of individual operator skills and learning curve slopes cannot be completely neutralized in studies involving relatively inexperienced personnel. Our study did not have sufficient power to designate the performance of each operator as a determinant. Finally, regarding the existing evidence which had suggested the inefficacy of methods for monitoring the depth of anesthesia in short procedures followed with LMA, we opted out of using these modalities[22-24].

CONCLUSION

The minor event rate associated with LMA use was comparable with previous reports and was not affected by the choice of LMA and the experience of the provider. The only independent predictor of LMA-associated complication was the need for an additional dose of anesthetic in our study.

LIST OF ABBREVIATIONS

ASA: American Society of Anesthesiologists; **FLMA:** Laringeal mask, Fastrach™; **LMA:** Laringeal mask; **PLMA:** Laringeal mask, ProSeal™.

CONFLICT OF INTERESTS

There are no conflicts of interest.

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