Original Article

Evaluation of Four Techniques to Administer Laryngeal Mask Airway

Seyed Jalal Hashemi[1], Hamidreza Shetabi[2], Alireza Babaei Zade[1]

[1]Department of Anesthesia and Critical Care, Faculty of Medicine, Isfahan University of Medical Sciences, Isfahan, Iran, [2]Anesthesiology and Critical Care Research Center, Isfahan University of Medical Sciences, Isfahan, Iran

Abstract

Background: Laryngeal mask airway (LMA) plays a crucial role in the field of modern anesthesia. There are different techniques to administer LMA. Here we aimed to compare the four methods of standard, 90° rotation, 180° rotation, and thumb placement in LMA mast placement.

Materials and Methods: This is a clinical trial that was performed on 257 candidates of elective surgical operations requiring general anesthesia. All patients were categorized into four groups of LMA placement with index finger (standard method), mask placement with 90° rotation, 180° rotation method, and thumb finger group. We collected data regarding the success rates of LMA placement, the need for any manipulation when placing the mask, LMA placement time, failure of mask placement, presence of blood on the LMA, and laryngospasm and sore throats 1 hour after surgery in patients.

Results: The 90° rotation method had a significantly higher first attempt success rate than that in the other three methods (98.4%, $P = 0.02$). Total success rate in 90° rotation method was also significantly higher than the other techniques (100%, $P < 0.001$). The need for any manipulation when placing the mask (1.6%, $P = 0.01$), presence of blood on the LMA mask (1.6%, $P = 0.33$), and frequency of sore throats 1 hour after surgery (21.9%, $P = 0.14$) were also lower in 90° rotation method than that in the other methods.

Conclusion: The 90° rotation method had significantly higher success rate and lower failure rate regarding the mask placement compared to other three methods.

Keywords: General anesthesia, LMA, technique

Address for correspondence: Dr. Alireza Babaei Zade, Department of Anesthesia and Critical Care, School of Medicine, Isfahan University of Medical Science, Hezar Jarib St., Isfahan City, Isfahan Province, Iran.
E-mail: alirezabbz@yahoo.com
Submitted: 13-Jan-2022; **Revised:** 05-Mar-2022; **Accepted:** 14-Mar-2022; **Published:** 25-Apr-2023

Introduction

Airway management in critical situations has always been of considerable importance for all physicians working in various fields.[1] In modern medical science, much emphasis has been placed on appropriate and pragmatic training to evaluate and manage the airway as a necessary training to save a patient's life.[2,3] Airway management can be considered the most essential ability and practical field in the science of anesthesia. Various methods have been introduced to create a safe airway in patients undergoing surgery.[2] Methods of providing a supraglottic airway in anesthesia and airway management are progressively evolving and are emphasized due to their benefits. Complications of intubation with endotracheal tube are laryngospasm, bronchospasm, sore throat, postoperative hoarse voice, and cough.[4,5] The frequencies of these complications have been significantly lower when providing a supraglottic airway.[6]

Among the supraglottic methods, the laryngeal mask airway (LMA) plays a crucial role in the field of modern anesthesia.[7] Recently, there has been an increase in the number

Access this article online

Quick Response Code:

Website: www.advbiores.net

DOI: 10.4103/abr.abr_18_22

How to cite this article: Hashemi SJ, Shetabi H, Babaei Zade A. Evaluation of four techniques to administer laryngeal mask airway. Adv Biomed Res 2023;12:97.

of elective surgeries that require short acting anesthetics mostly without the use of muscle relaxants.[8-10] As a result, a safe way with the least complications is needed to insert the LMA mask.[11]

Since the insertion of the LMA mask is generally done blindly, physicians have always been looking for the best technique to insert the LMA.[12] So far, several methods have been introduced for LMA placement and airway establishment, each of which has been associated with limitations, complications, and advantages.[13,14] These techniques include the standard technique, 90° rotation, 180° rotation, and thumb placement.[15-18]

In 90° rotation method, the LMA mask cuff is completely inserted into the mouth and rotated counterclockwise by 90° and pushed forward until resistance is felt in the hypopharyngeal area.[19,20] Using this method increases the success of the mask and reduces the incidence of sore throat. Similarly, the 180° rotation technique is conducted with 180° rotation in the mouth which has been associated with successful results.[19,21,22] In some cases, the standard method of using the index finger to insert the LMA mask is associated with problems. It even sometimes happens that physicians do not feel comfortable when applying the LMA mask from the side of the head. In these cases, an option such as inserting an LMA mask using the thumb is suggested.[23,24]

Comparative studies of these methods have so far shown conflicting results or have been limited to two or three methods, and so far, no study has compared all of these four methods. Therefore, the present study was designed to compare four methods of LMA mask placement with each other in terms of success rate, placement time, and related complications.

Materials and Methods

This is a clinical trial that was performed in November–December 2021 in Al-Zahra hospital affiliated to Isfahan University of Medical Science. The current study was conducted on candidates of elective surgical operations requiring general anesthesia. The study protocol was approved by the Research Committee of Isfahan University of Medical Sciences and the Ethics committee has confirmed it (Ethics code: IR.MUI.MED.REC.1400.611, Iranian Registry of Clinical Trials (IRCT) code: IRCT20190127042511N2).

The inclusion criteria were age between 18 and 80 years, stage 1 or 2 according to American Society of Anesthesiologists (ASA) classification and signing the written informed consent to participate in this study. Patients with the following criteria did not enter the study: difficult airway with mouth opening less than 2.5 cm, having high risk for aspiration, including non-fasting patients, having gastroesophageal reflux disease or pregnancy, patients with a history of sore throat in a recent month, having common cold during the last 10 days, history of head, neck and stomach surgery, difficult intubation (mallampati >3, TMD >6.5), coagulopathy, and body mass index (BMI) > 30 kg/m^2. The exclusion criteria were changing the method of anesthesia, requiring tube placement more than 2 times.

Sample size was calculated with 63 patients in each group according to the sample size calculation formula with a significant level of 95% (z = 1.96), statistical power 80% (z = 0.84), to detect the standardized effect size of at least Δ = 0.5 for all hemodynamic indices with one observation before (v = 1) and 5 observations after intervention (w = 5) and intra-cluster correlation coefficient of P = 0.25.

After obtaining the permission from Ethics Committee of Isfahan University of Medical Sciences, a total number of 264 patients were recruited based on the mentioned criteria. All patients were categorized into four groups using block randomization method. For the block randomization method, the letter A was used to place patients in the "standard" group, the letter B was used for the "90 degree rotation" group, the letter C was used for the "180 degree rotation" group, and the number D was used for the "thumb placement" group. All blocks had equal sizes and we used four blocks (including one person in group A, one person in group B and one person in group C, and one person in group D) to randomize the patients. Also, in order to hide the random sequence on the participants, opaque sealed envelopes sealed with random sequences were used and each sequence was recorded on a card, and the cards were placed in the envelopes respectively. Based on the order of entry of eligible participants in the research, the envelopes were opened in order and the assigned group of the participant was determined. It should be noted that four different anesthesiologists placed the masks in each group. Each of the anesthesiologists was master in one method.

In the standard method, the LMA is inserted using the index finger and advanced to the palatopharyngeal flexion to reach the hypopharynx to eventually reach a true resistance. In the 90° rotation method, the LMA mask is inserted into the mouth in such a way that its inner layer is towards the buccal mucus and the corner of the mouth. The mask is pushed forward until it finally encounters resistance. In the 180° rotation method, the LMA mask is inserted into the mouth with the inner layer facing the hard palate (contrary to the standard method) and pushed forward until it encounters resistance. The LMA mask is then rotated 180° and the cuff is inflated.

The placement of the LMA mask with the thumb is according to the following procedure: In this method, the anesthesiologist is first placed on the patient's face so that it is in front of the patient's chest and right arm. After partially inflating the cuff (equivalent to half the air recommended for inflating the mask), the posterior surface of the cuff will be lubricated with a blue water-based gel. The patient's head is supported by a tight ring while the patient's neck is flex and the patient's head is extended. The tubular part of the laryngeal mask is held in an automatic manner and, unlike the standard method, the part connected to the tube is taken with the thumb. After opening the patient's mouth, the head of the mask is placed opposite

to the inner surface of the upper canines, whereas its opening is towards the front. The mask is then pressed against the hard palate to reach the hypopharyngeal area and resist. In this method, the thumb will be used to apply pressure against the hard palate and push the LMA mask forward.

All patients were nil per oral (NPO) from 12 pm the night before surgery. At the entrance to the operating room and before surgery, hemodynamic parameters, including systolic and diastolic blood pressure (SBP and DBP), mean arterial pressure (MAP), heart rate (HR), and O2 saturation (O2 Sat), were recorded using a checklist. For all patients, a peripheral vessel (IV line) was taken and subjected to pre-oxygenation. Anesthesia was induced by midazolam at a dose of 0.05 mg/kg, fentanyl at a dose of 2 mcg/kg, propofol at a dose of 2 mg/kg, and cis atracurium at a dose of 0.1 mg/kg. Depending on the weight of patients, a LMA was selected with size of 3 (weight 50–70 kg) or 4 (71 kg and above), and according to the principles of one of the four methods of mask placement in the sniffing position, the mask was placed.

When the LMA mask entered the hypopharynx, the cuff was filled with the right amount of air according to the mask guide. The method used to fill the cuff was "just no leak," during which the cuff was filled until the leak stops and finally the final volume was recorded.

The accuracy of mask placement was measured by the following criteria:

1) Adequate chest expansion and adequate return volume,
2) Adequate oxygenation,
3) The presence of square waves in capnography, and
4) Lack of leak sound from the patient's mouth with a maximum pressure of 15 cmH_2O.

Optimal ventilation was considered if all four criteria are met and sub-optimal was considered if one of the criteria was not met. The need for any manipulation when placing the mask (chin lift, jaw thrust, neck extension, neck flexion, and laryngeal manipulation) was recorded. Evaluation criteria for sealing pressure or oropharyngeal leak pressure (OLP) of the LMA were as follows.

This test was used to determine the maximum available airway pressure before air leakage. To determine OLP, the ventilator was turned off and the APL valve was placed on 30 cm of water and the FGF on 3 liters. The airway pressure was increased to PLATEAU mode or a leak was heard. At this point, the airway pressure was equal to OLP. Higher recorded pressure showed better functions.

The placement time of LMA was recorded from the time the LMA mask was inserted into the mouth to the moment of successful placement. Failure of mask placement was defined as failure of the LMA mask to enter the pharynx, leakage of air, or inadequate ventilation (critical expiratory volume less than 8 ml/kg, and end-tidal carbon dioxide less than 35 mmHg). If the mask failed 3 times, it was considered as a placement failure and the patient was intubated using a laryngoscope and orotracheal tube.

At the end of the surgery and after reaching the recovery criteria, the LMA mask was removed. An anesthesiologist who was unaware of the type of mask placement evaluated the presence of blood on the LMA mask. Patients were also asked about sore throats 1 hour after surgery. We also collected data regarding incidence of laryngospasm in patients.

The obtained data were entered into the Statistical Package for Social Sciences (SPSS) (version 24, SPSS Inc., Chicago, IL). Quantitative data were reported as mean ± standard deviation and qualitative data as frequency distribution (percentage). Independent t-test and Chi-square test were used to analyze the data. *P* value <0.05 was considered as significance threshold.

Results

In the present study, we included 260 patients divided into four groups each containing 65 cases. During the study, three patients were excluded due to changing the anesthesia technique (N = 2) and difficult intubation (N = 1). Data of 257 patients were analyzed. The CONSORT flow chart of patients in shown in Figure 1.

The study population consisted of 149 females (58%) and 108 males (42%) with the mean age of 33.69 ± 8.27 years. Initial analysis of demographic data showed that there were no significant differences between four groups regarding age ($P = 0.36$), gender ($P = 0.61$), and mean BMI ($P = 0.27$). These data are summarized in Table 1.

We also observed no significant differences between four groups of patients regarding the initial vital signs (SBP, DPB, MAP, HR, and O2 sat) [Table 2].

Evaluation of success rate at the first time of mask insertion showed that the 90° rotation method had a significantly higher

Table 1: Comparison of different demographic data between patients

Variable	Group				*P*
	Standard (*n*=64)	90° rotation (*n*=64)	180° rotation (*n*=64)	Thumb finger (*n*=65)	
Age (years) (mean±SD)	34.18±6.25	33.20±5.17	33.09±9.12	32.15±8.74	0.36
BMI (kg/m^2) (mean±SD)	28.55±4.08	29.07±3.62	27.61±4.20	28.54±4.46	0.27
Gender *n* (%)					
Male	37 (57.8%)	38 (59.4%)	37 (57.8%)	37 (56.9%)	0.61
Female	27 (42.2%)	26 (40.6%)	27 (42.2%)	28 (43.1%)	

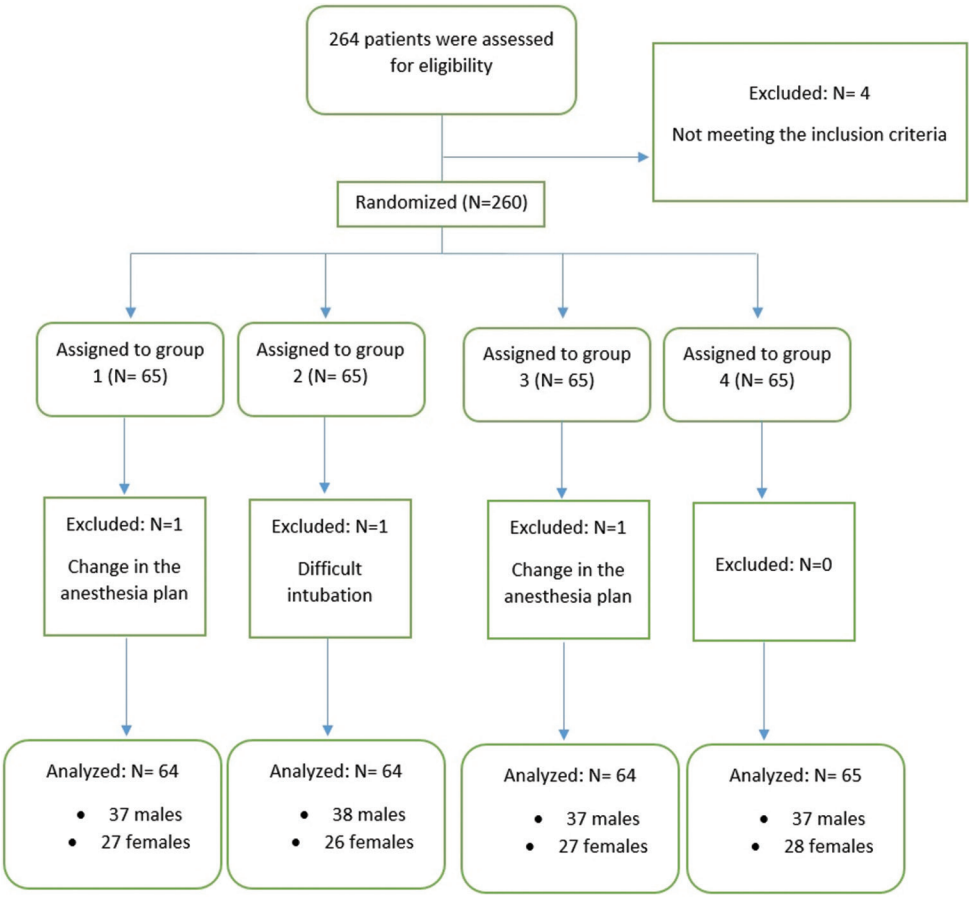

Figure 1: The CONSORT flow chart of patients

Table 2: Comparison of SBP, DBP, HR, and O_2 sat between patients

Variable	Group				*P*
	Standard (*n*=64)	90° rotation (*n*=64)	180° rotation (*n*=64)	Thumb finger (*n*=65)	
SBP (mmHg) (mean±SD)	113.8±10.5	114.2±10.2	117.5±11.7	114.6±12.3	0.42
DBP (mmHg) (mean±SD)	72.7±11.7	75.2±11.0	74.6±8.29	74.8±11.8	0.68
MAP (mmHg) (mean±SD)	100.2±10.7	101.6±11.8	99.3±11.5	101.8±10.6	0.29
HR (Beats/min) (mean±SD)	83.7±13.7	80.2±12.4	82.6±13.1	81.7±11.2	0.34
O_2 sat (mean±SD) (%)	98.5±1.3	98.8±1.1	99.0±0.9	98.7±1.0	0.29

success rate than that in the other three methods ($P = 0.02$). Total success rate in 90° rotation method was also significantly higher than the other techniques ($P < 0.001$) and patients in this group had significantly lower failure of mask placement ($P < 0.001$). There were no significant differences between the other three methods regarding the total success rate and the success rate at the first try ($P > 0.05$ for all). We also observed that the need for any manipulation when placing the mask was also lower in 90° rotation method that in the other methods ($P = 0.01$), but there were no significant differences between the four groups regarding the placement time of LMA ($P = 0.19$), presence of blood on the LMA mask ($P = 0.33$), and frequency of sore throats 1 hour after surgery ($P = 0.14$). We also had no case of laryngospasm during this study. These data are presented in Table 3.

Discussion

In the present study, we evaluated data of 257 patients that underwent LMA administration by four methods. Based on the results of our study, all patients had similar hemodynamics and vital signs. Evaluation of LMA administration procedure indicated that 90° rotation method had significantly higher success rate and lower failure rate regarding the mask placement compared to other three methods. These patients also required significantly lower rates of manipulation when placing the mask. These data indicated that 90° rotation method had the best success rate among the four methods of LMA placement.

As mentioned earlier, LMA is a suitable option for patients that require short-term anesthesia and there has been an increase

Table 3: Comparison of different outcomes between four groups

Variable	Group				*P*
	Standard (*n*=64)	90° rotation (*n*=64)	180° rotation (*n*=64)	Thumb finger (*n*=65)	
First success rate (*n* (%)	54 (84.3%)	63 (98.4%)	55 (86%)	52 (80%)	0.02
Total success rate (*n* (%)	57 (89%)	64 (100%)	58 (90.1%)	57 (87.7%)	<0.001
Need for manipulation (*n* (%)	5 (7.8%)	1 (1.5%)	5 (7.8%)	5 (7.7%)	0.01
Placement time (second) (mean±SD)	30.26±4.84	29.62±5.18	32.77±4.08	31.30±5.37	0.19
Failure of mask placement (*n* (%)	7 (10.9%)	0	6 (9.4%)	8 (12.3%)	<0.001
Presence of blood on the LMA mask (*n* (%)	2 (3.1%)	1 (1.6%)	1 (1.6%)	2 (3.1%)	0.33
Sore throats (*n* (%)	12 (18.7%)	14 (21.9%)	13 (20.3%)	13 (20%)	0.14

in using this mask. Furthermore, due to this issue that LMA is administered and inserted blindly, a proper insertion method must be selected to provide the best results. There are four major techniques to insert a LMA, and in the present study, we compared the success and failure rates and other outcomes related to these methods. Based on the results of our study, insertion of LMA by 90° rotation method was associated with best results. The next acceptable method of LMA insertion was 180° rotation technique. The placement of LMA by thumb finger was associated with lower success rates than those in the other three techniques.

There have been some previous studies on different LMA insertion techniques. In a recent study by Shyam and Selvaraj in 2021, they evaluated data of 180 patients undergoing anesthesia via LMA insertion. They assessed the success rates of standard, 90° rotational and 180° rotational techniques and reported that 180° and 90° rotation techniques were associated with better results compared to the standard method.[25] In another study by Mahmoodpoor and colleagues, they assessed the standard and two rotational methods of LMA placement in 150 adult patients undergoing anesthesia. Based on the results of this study, inserting the LMA using lateral rotation was associated with higher success rates and lower insertion time. Patients in this group also had the least complications compared to other methods.[26] The results of our study were in line with our findings that demonstrated the effectiveness of 90° and 180° rotation techniques for LMA insertion.

As shown in our study, placement of LMA by 90° rotation technique had a higher success rate and lower failure compared to other techniques. A study was performed by Dhulkhed and colleagues in 2017 on 120 patients. The effectiveness and success rates of 90° rotation and standard LMA insertion techniques were evaluated. Based on the findings of this study, 90° rotation technique had a higher success rate at the first insertion attempt and was associated with lower complications.[19] These data are consistent with the findings of our study.

Similar results were reported by Park and others in 2015 by evaluating data of 13 clinical randomized trials. It was demonstrated that the success rate at the first attempt was significantly higher with the rotation technique than with the standard technique and this technique required significantly lower failure and insertion time.[27] The important point of our study was that we evaluated and compared four insertion techniques in patients while most previous studies have compared two or three of these methods. In a meta-analysis by Yoon and colleagues in 2019, the various techniques for LMA insertion were evaluated. Based on this study, all techniques are associated with acceptable success rates and highly dependent on the administrator's skills. On the other hand, it was stated that 90° rotation technique could be easier to accomplish in different studies.[28] Park and colleagues also reported similar results in a study of neonatal airway managements.[29]

Another important issue is that we observed no significant differences between the four methods regarding placement time of LMA, presence of blood on the LMA mask, and frequency of sore throats 1 hour after surgery. This issue could have high clinical importance and we suggest that the anesthesiologists should pay more attention to the use of 90° rotation technique in candidates of LMA insertion. It is believed that the 90° rotation technique was more successful in patients because of the wedge-shaped and sloping shape of LMA in 90-degree position and guidance in the path of hypopharynx and less trauma to the tissues. The limitations of our study were restricted study population and conducting this study in a single center. Another limitation of this study was that mask placements were performed by four different anesthesiologists. Each specialist conducted one method. It is believed that conducting the placements by only one specialist could decrease the chances of bias in similar studies.

Conclusion

The 90° rotation method had a significantly higher success rate and a lower failure rate regarding the mask placement compared to the other three methods. These patients also required significantly lower rates of manipulation when placing the mask. These data indicated that the 90° rotation method had the best success rate among the four methods of LMA placement.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients

understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Financial support and sponsorship

This study was granted by Isfahan University of Medical Sciences.

Conflicts of interest

There are no conflicts of interest.

References

1. Vaz F. Airway Management. ENT: An Introduction and Practical Guide. CRC Press; 2017. p. 151-3.
2. Baker P. Assessment before airway management. Anesthesiol Clin 2015;33:257-78.
3. Brown EN, Pavone KJ, Naranjo M. Multimodal general anesthesia: theory and practice. Anesth Analg 2018;127:1246.
4. Glosser L. Assessment of endotracheal tube intubation. Review of existing scales. Disaster Emerg Med J 2017;2:91-3.
5. Hyzy RC, Manaker S, Finlay G. Complications of the endotracheal tube following initial placement: Prevention and management in adult intensive care unit patients. Crit Care Med 2017;24:25-30.
6. Kumar CM, Seet E, Van Zundert TC. Measuring Endotracheal Tube Intracuff Pressure: No Room for Complacency. Springer; 2021. p. 3-10.
7. Jannu A, Shekar A, Balakrishna R, Sudarshan H, Veena G, Bhuvaneshwari S. Advantages, disadvantages, indications, contraindications and surgical technique of laryngeal airway mask. Arch Craniofac Surg 2017;18:223-9.
8. van Esch BF, Stegeman I, Smit AL. Comparison of laryngeal mask airway vs tracheal intubation: A systematic review on airway complications. J Clin Anesth 2017;36:142-50.
9. Disma N, O'Leary JD, Loepke AW, Brambrink AM, Becke K, Clausen NG, De Graaff JC, Liu F, Hansen TG, McCann ME, Salorio CF. Anesthesia and the developing brain: a way forward for laboratory and clinical research. Paediatr Anaesth 2018;28:758-63.
10. Suzuki M, Larkum ME. General anesthesia decouples cortical pyramidal neurons. Cell. 2020;180:666-76.
11. Stevanovic A, Rossaint R, Fritz HG, Froeba G, Heine J, Puehringer FK, *et al*. Airway reactions and emergence times in general laryngeal mask airway anaesthesia: A meta-analysis. Eur J Anaesthesiol 2015;32:106-16.
12. Polat R, Aydin GB, Ergil J, Sayin M, Kokulu T, Öztürk I. Comparison of the i-gelTM and the Laryngeal Mask Airway ClassicTM in terms of clinical performance. Rev Brasil Anestesiol 2015;65:343-8.
13. Krecmerova M, Schutzner J, Michalek P, Johnson P, Vymazal T. Laryngeal mask for airway management in open tracheal surgery—a retrospective analysis of 54 cases. J Thorac Dis 2018;10:2567-72.
14. Bauer M, Bernstein K, Dinges E, Delgado C, El-Sharawi N, Sultan P, Mhyre JM, Landau R. Obstetric anesthesia during the coronavirus disease 2019 pandemic. Anesth Analg. 2020;131:7-15.
15. Pournajafian A, Alimian M, Rokhtabnak F, Ghodraty M, Mojri M. Success rate of airway devices insertion: Laryngeal mask airway versus supraglottic gel device. Anesthesiol Pain Med 2015;5:e22068.
16. Lu W, Zheng J, Gao L, Wang Y. A comparison of classic laryngeal mask airway insertion between lightwand-and standard index finger–guided techniques. J Clin Anesth 2016;33:309-14.
17. Kitz M. Airway Management. Mount Sinai Expert Guides: Critical Care. 2021. p. 1-9.
18. Boroda N, Malesinska M, Kars MS, Smith LP. The use of laryngeal mask airway for adenoidectomy. Int J Pediatr Otorhinolaryngol 2018;107:42-4.
19. Dhulkhed PV, Khyadi SV, Jamale PB, Dhulkhed VK. A prospective randomised clinical trial for the comparison of two techniques for the insertion of Proseal laryngeal mask airway in adults-index finger insertion technique versus 90° rotation technique. Turk J Anaesthesiol Reanim 2017;45:98-102.
20. Nalini KB, Shivakumar S, Archana S, Rani DCS, Mohan CVR. Comparison of three insertion techniques of ProSeal laryngeal mask airway: A randomized clinical trial. J Anaesthesiol Clin Pharmacol 2016;32:510-4.
21. Solanki SL, Johnson JE, Samantaray A. Supraglottic airway devices: Placement and pharyngeal seal matters! Indian J Anaesth 2020;64:649-52.
22. Lavand'homme P, Estebe JP. Opioid-free anesthesia: a different regard to anesthesia practice. Curr Opin Anaesthesiol 2018;31:556-61.
23. Aghdashi MM, Hasanloei MAV, Abbasivash R, Shokouhi S, Gharehvaran SS. Comparison of the success rate of laryngeal mask air way insertion in classic & rotatory methods in pediatric patients undergoing general anesthesia. Anesthesiol Pain Med 2017;7:e38899.
24. Lim G, Facco FL, Nathan N, Waters JH, Wong CA, Eltzschig HK. A review of the impact of obstetric anesthesia on maternal and neonatal outcomes. Anesthesiology 2018;129:192-215.
25. Shyam T, Selvaraj V. Airway management using LMA-evaluation of three insertional techniques-a prospective randomised study. J Anaesthesiol Clin Pharmacol 2021;37:108-13.
26. Ghai B, Makkar JK, Bhardwaj N, Wig J. Laryngeal mask airway insertion in children: comparison between rotational, lateral and standard technique. Paediatr Anaesth 2008;18:308-12.
27. Park SK, Choi GJ, Choi YS, Ahn EJ, Kang H. Comparison of the i-gel and the laryngeal mask airway proseal during general anesthesia: A systematic review and meta-analysis. PLoS One 2015;10:e0119469.
28. Yoon SW, Kang H, Choi GJ, Ryu C, Park YH, Baek CW, *et al*. Comparison of supraglottic airway devices in laparoscopic surgeries: A network meta-analysis. J Clin Anesth 2019;55:52-66.
29. Park RS, Peyton JM, Kovatsis PG. Neonatal airway management. Clin Perinatol 2019;46:745-63.