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Comparison of the Conventional and New Techniques of Laryngeal Mask Airway Insertion in Postoperative Sore Throat

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ABSTRACT

Introduction: The present study aimed to compare the conventional and new techniques of laryngeal mask airway (LMA) insertion in terms of the rate and severity of postoperative sore throat.

Methods: This clinical trial was conducted on 80 patients referring to Khatam-ol Anbia Hospitalin Mashhad, Iran for phacoemulsification. The patients underwent general anesthesia, and the conventional technique was performed by pushing down the LMA with the dominant hand with the simultaneous support of the index finger of the dominant hand. In addition, the new technique was carried out by conducting the LMA with the dominant hand and simultaneous use of the non-dominant hand to prevent the contact of the cuff with the palate and oropharynx tissues. All the variables were assessed one day after the operation.

Results: The rate of postoperative sore throat was 7.5% in the conventional technique and 1.25% in the new technique. Comparison of the rate of postoperative sore throat between the study groups showed a significant difference in this regard (P=0.048). The overall rate of postoperative sore throat one day after the operation was 3.75%, while it was estimated at 3.75% in the conventional technique. However, comparison of the rate of postoperative sore throat between the study groups demonstrated no significant difference in this regard (P=0.077).

Conclusion: Considering the higher effectiveness of the new LMA insertion technique compared to the conventional one technique in the prevention of preventing mucosal bleeding and postoperative sore throat, the new this technique is recommended as a can be used as a safe alternative to for the conventional technique. In the new LMA insertion technique, the this method, the rate of postoperative sore throat decreased due to the declined diminished due to reduced pressure on the tissues of the oropharynx tissues.

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Introduction

The use of laryngeal mask airway (LMA) has been on the rise in recent years. This method is applied for the protection of the airway during surgical operations. However, the insertion of LMA may be challenging and is often associated with several complications, such as sore throat, coughing, bleeding, and abdominal pain. Therefore, use of optimal insertion techniques with minimum complications is of paramount importance (1,2).

Sore throat is a relatively common complication of LMA insertion, which could disrupt disease activity and lead to mortality in some cases

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(3,4). Postoperative sore throat could be caused by pharyngeal trauma, vocal fold edema, mucosal dehydration, and endotracheal cuff pressure on the tracheal mucosal blood flow (5).

Several pharmacological and non-pharmacological methods are used for the reduction of the rate of postoperative sore throat, such as spraying beclomethasone or topical lidocaine (6,7). The non-pharmacological methods in this regard include LMA insertion along with water-soluble gels, insertion after throat relaxation, reduction of cuff pressure, and extubation after cuff deflation (8). Use of such techniques is associated with the lwe rate of damage to the mouth and throat, which is essential to reducing the frequency of postoperative sore throat. Furthermore, numerous techniques have been proposed to improve the success rate of LMA insertion. Factors such as the cuff position, rotation degree during mask insertion, head position, and use of assistive devices play a key role in the ease and effectiveness of LMA insertion (9).

In the conventional method of LMA insertion, the LMA cuff is fully deflated, and its posterior surface is covered with a water-soluble lubricant. Following that, LMA is continuously pressured against the palatopharyngeal curvature with the index finger until observing resistance (9). One of the most important factors in LMA insertion is the method of inserting the LMA, so that sore throat would be lowered if insertion is carried out with less pressure to the mouth and throat (1,10).

Several studies have been focused on the comparison of the mechanisms of assessing airway sealing pressure with LMA (11-14) based on the safety and efficacy of the conventional and non-conventional usage of LMA (15,16) and the importance of LMA insertion by skilled personnel (17,18). Therefore, further investigations are required to properly evaluate these factors.

Unsuccessful, prolonged LMA insertion and multiple attempts are associated with complications in the patients under anesthesia. Currently, new techniques have been proposed for the reduction of sore throat following LMA insertion; however, the effectiveness of these techniques remains unknown (1,10).

The present study aimed to compare the conventional and new LMA techniques in terms of the rate and severity of postoperative sore throat.

Methods

This clinical trial was conducted on 80 patients aged more than 16 years undergoing class I and II anesthesia based on the American Society of Anesthesiologists (ASA) classification at Khatam-ol Anbia Hospital in Mashhad, Iran for phacoemulsification in 2015. The patients were referred to the Ophthalmology Surgery Center of the hospital, which is a governmental healthcare center affiliated to Mashhad University of Medical Sciences. After the primary examinations, the candidates for phacoemulsification were enrolled in the study.

The patients were assured of confidentiality terms regarding their medical information, and the disclosure of financial or non-financial conflicts was respected. The sample size of the study was calculated based on a similar study conducted by Mizutamari et al. (19) and estimated to be 40 subjects per each group using the following formula:

$N=(Z\ 1-\alpha/2)2 \times 62 / d2$

$Z1-\alpha/2=1.96$

$6=SD=10$

$d=0.3*SD=3$

$n\approx40$

$N\ total=40*2=80$

The exclusion criteria of the study were as follows: 1) presence of cold and sore throat; 2) prescription of dexamethasone or hydrocortisone during or after anesthesia; 3) use of nasogastric tubes (with angiography catheter in-situ); 4) surgery duration of more than 20 minutes and 5) use of an oxygen flash before applying the laryngeal mask. In addition, the patients with invasive airway suctioning and those expected to undergo difficult intubation were excluded from the study. All the patients received general anesthesia, and informed consent was obtained from all the subjects prior to enrollment.

All the patients were administered with propofol (1-2 mg/kg), atracurium (0.5 mg/kg), and fentanyl (1 mcg/kg due to the minimal use of intraoperative analgesia during surgery). In addition, the patients remained unconscious with the administration of propofol (100-200 mcg/kg per minute).

In the present study, we used laryngeal masks (Pertex®, Ireland) with proper sizes for the patients, and cuff inflation was applied in accordance with the instructions of the manufacturer. Before LMA insertion, the patients were randomly divided into two groups of conventional and new techniques. In the conventional LMA insertion technique, the laryngeal mask was inserted with the dominant hand, along with the use of the index finger of one hand, on the proximal non-laryngeal surface of the LMA cuff (Figure 1). In the new LMA insertion technique, the laryngeal mask was pushed down with the dominant hand, along with the use of the index finger of the other hand, so that the non-dominant hand would prevent contact of the cuff with the palate and oropharynx tissues (Figure 2).

All the LMAs were covered with lidocaine gel before surgery. The patients requiring more than

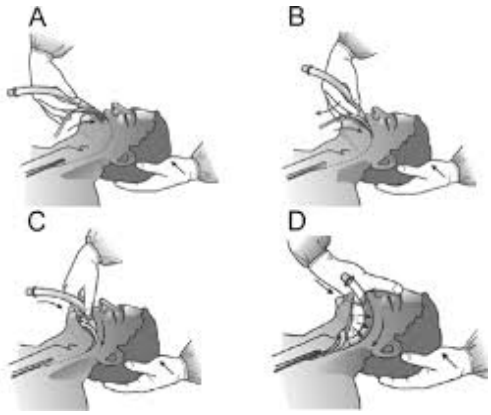

Figure 1. The conventional technique of laryngeal mask airway insertion (form Ramaiah, R. et al: Extraglottic airway devices: A review. International Journal of Critical Illness and Injury Science. 2014;4: 77-87).

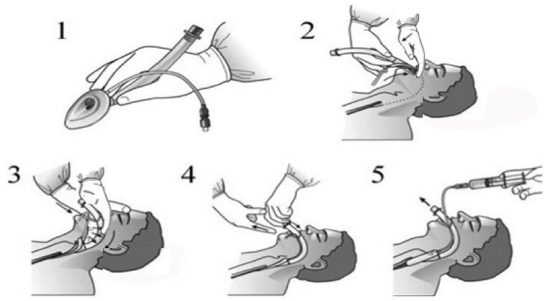

Figure 2. The new laryngeal mask airway insertion technique (modified form Ramaiah, R. et al: Extraglottic airway devices: A review. International Journal of Critical Illness and Injury Science. 2014;4: 77-87).

twice the insertion or those who were ventilated with high airway pressure (more than 20 centimeters of water) during LMA insertion were excluded from the study. The insertion was performed by a skilled anesthesiologist.

The prevalence and severity of postoperative sore throat were evaluated after recovery (mild sore throat: brief, dull pain, moderate sore throat: tangible pain, severe sore throat: inability to swallow the saliva due to severe pain). Furthermore, abdominal pain and the LMAs covered with blood were evaluated as the main variables. The rates of postoperative sore throat, abdominal pain, and blood on the LMAs were measured one day after the operation.

Statistical Analysis

Data analysis was performed in SPSS version 16 using descriptive statistics (frequency, mean, and standard deviation). In addition, Chi-square was used for the analysis of the obtained data. In all the statistical analyses, P-value of less than 0.05 was considered significant.

Results

The mean age of the patients was 67.47±12.88 years, and the mean age of the subjects in the new and conventional technique groups was 69.62±12.45 and 65.32±13.24 years, respectively. No significant difference was observed between the groups in terms of age (P=0.147). In total, 37.5% of the patients were male, and 62.5% were female. The frequency distribution of the male and female patients in the conventional technique group was estimated at 20% and 30%, respectively. Moreover, the frequency distribution of the male and female patients in the new technique group was 17.5% and 32.5%, respectively. No significant difference was observed between the study groups in this regard (P=0.644).

The mean body mass index (BMI) of the patients in the conventional and new technique groups was 27.72±5.09 and 26.93±4.39 respectively. No significant difference was denoted between the groups in terms of the BMI (P=0.179). The LMA sizes four and five were applied in 80% and 20% of the patients, respectively. In addition, LMA size four was applied in 37.5% and 42.5% of the patients in the conventional and new technique groups, respectively, while LMA size five was utilized in 12.5% and 7.5% of the patients in the conventional and new technique groups, respectively. No significant difference was observed between the groups in terms of the LMA size (P=0.264).

According to the findings, the overall rate of postoperative sore throat was 8.75%, which was estimated at 7.5% in the conventional technique group and 1.25% in the new technique group. Comparison of the rate of postoperative sore throat showed a significant difference between the groups (P=0.048). However, no significant difference was denoted between the groups in term of the severity of postoperative sore throat (P=0.148).

One day after the operation, the rate of sore throat was estimated at 3.75% and 3.75% in the conventional technique group, while none of the patients in the new technique group had postoperative sore throat. Comparison of the rate of postoperative sore throat between the groups showed no significant difference in this regard (P=0.077). In addition, no significant difference was observed between the groups in term of the severity of postoperative sore throat (P=0.77). The frequency of the severity of postoperative sore throat in the study groups is presented in Table 1.

In the present study, the overall rate of postoperative abdominal pain was 6.25%, while it was estimated at 3.75% and 2.5% in the conventional and new technique groups, respectively. Comparison of the rate of postoperative abdominal

Table 1. The frequency of severity of sore throat in each group.

	Sore throat								
	Total			The conventional technique group			The new technique group		
	Mild	Moderate	Severe	Mild	Moderate	Severe	Mild	Moderate	Severe
After operation	2.5%	2.5%	3.75%	1.25%	2.5%	3.75%	1.25%	0	0
One day after operation	3.75%	0	0	3.75%	0	0	0	0	0

pain between the groups showed no significant difference in this regard (P=0.644), and none of the patients had abdominal pain one day after the operation.

Blood on LMA was observed in 8.25% of the patients. In addition, the rate of LMA blood-staining was 7.5% and 1.25% in the conventional and new technique groups, respectively. Comparison of the groups indicated a significant difference in this regard (P=0.048).

Discussion

According to the results of the present study, the study groups had no significant differences in terms of the age, gender, BMI, and LMA size, indicating that these factors had no effects on the final results. The majority of the studied patients were elderly with the mean age of 67.5 years. Although the number of the female patients was higher than the male patients, no significant difference was observed between the groups in this regard. In addition, the score of BMI was approximately 27, which was normal based on the age of the patients.

In the new technique group, a larger number of the patients experienced postoperative sore throat compared to the conventional technique group. However, the severity of postoperative sore throat had no significant difference between the groups. Furthermore, no significant differences were denoted between the groups in terms of the rate and severity of sore throat one day after the operation. Similarly, no significant difference was observed between the groups in terms of postoperative abdominal pain, and none of the patients reported abdominal pain one day after the operation. In addition, the presence of blood on the LMA was less in the new technique group compared to the conventional technique group.

In line with the results of the present study, Peirovifar et al. compared the postoperative complications of LMA and endotracheal tube (ETT) during low-flow anesthesia, reporting that the rate of sore throat was lower in the LMA group compared to the ETT group. Moreover, the mentioned research indicated that the rate of the other postoperative complications was lower in the LMA group compared to the ETT group (20). In another study, Seet et al. reported fewer pharyngolaryngeal complications in the LMA intracuff pressure group compared to the conventional technique group (21).

In a research in this regard, Choi et al. compared the streamlined liner of the pharynx airway (SLIPA) with ProSeal laryngeal mask airway (PLMA) in the patients under general anesthesia in term of the hemodynamic responses to insertion, ventilatory efficiency, and positioning as confirmed by fiberoptic bronchoscopy. In the mentioned study, the presence of bleeding and severity of sore throat and other complications were also evaluated. The obtained results showed no significant differences in the mean rate of sore throat and other complications between the groups. On the other hand, blood stain was observed in almost half of the patients in the SLIPA group, which was higher than the PLMA group. This finding is consistent with the results of the present study (22).

LMA creates more pressure than intubating laryngeal mask airway against the cervical vertebrae, so that it could cause posterior displacement in the cervical spine, which reflects the importance of the LMA insertion technique (5). Therefore, several studies have used various techniques for the insertion of LMA. Conventional techniques are routinely used for LMA insertion. Previous studies have estimated the success rate of conventional techniques to be 76-96% (23). However, LMA insertion in the current research was conducted by the simultaneous movement of both hands, so that the non-dominant hand would prevent the contact of the cuff with the palate and oropharynx tissues.

In a study in this regard, Brimacombe investigated the effect of the head position, reporting that the smooth insertion of LMA could influence the success rate of the insertion. The success rate of LMA insertion has been reported to be higher with the use of an inflated cuff and partially inflated cuff compared to the conventional technique (23).

According to a study by Krishna et al., the ease of LMA insertion without the support of the index finger was equal with the conventional technique.

However, the rate of postoperative sore throat was insignificantly higher in the conventional technique group compared to the new technique group (24).

In a study by Soh et al., the use of a 180-degree rotation after insertion or the reverse technique was effective in all the patients. According to the findings of the mentioned study, the success rate of the reverse technique was higher than the standard technique (25). In addition, another similar study indicated that the highest success rate of insertion was achieved with the use of a 180-degree rotation method, along with a partially inflated cuff. On the other hand, the lowest rate of postoperative complications was reported in this technique(1). In this regard, Yun et al. compared the use of a 90-degree rotation with a 180-degree rotation after insertion, reporting that the rate of pharyngeal trauma was higher in the 90-degree rotation technique compared to the other technique, and insertion with the 90-degree rotation technique was comparatively easier (26). In the present study, an empty cuff was inserted without rotation, which is easier compared to the other insertion techniques.

In a study by Walkeling et al., LMA was inserted using the standard uninflated technique and a fully inflated cuff. Although no difference was denoted in the effectiveness of the conventional method and inflated cuff, the rate of postoperative sore throat and blood staining on the mask were lower in the inflated cuff group (27). Similar findings were obtained in the research by Navaratram et al. after using an inflated cuff along with a head tilt and jaw thrust (28), which is in congruence with the results of the present study.

The findings of Mizutamari et al. demonstrated no significant difference between three techniques of LMA insertion (LMA insertion with an inflated cuff, a partially inflated cuff, and a tracheal tube) in terms of the frequency of blood stains on devices and severity of postoperative sore throat. Furthermore, the use of LMA was reported to increase the severity of postoperative sore throat more significantly compared to the use of a tracheal tube on the first postoperative day (5). This finding is inconsistent with the results of the present study, which could be due to the methodological differences between our research and the mentioned study. The insertion of LMA by the dominant hand was evaluated in the present study; however, the effect of the inflated cuff on the damage rate was not investigated.

In a study by Dingley et al., the Portex introducer (a spoon-shaped device) was used to insert the LMA into the correct position, which was associated with the success rate of 96%. In the conventional technique performed by non-skilled healthcare providers, this rate was reported to be 68% (29). However, Dingley et al. claimed that the incidence of postoperative sore throat was lower in the conventional technique, while the blood-stained LMA was less frequent with aided insertion (30). In the current research, the dominant hand was used with the support of the index finger of the non-dominant hand simultaneously, which might have acted as the Portex introducer used in the study by Dingley et al. (29).

Inconsistent with the findings of the current research, Choo et al. reported no significant correlations between the ease of insertion, postoperative sore throat, and local trauma. However, LMA insertion was associated with redness. The findings of the mentioned study suggested that the LMA technique should be applied with increased pharyngeal tone, hypertrophy, peritonsillar, and high-rising epiglottis (3). According to the results of the present study, this technique could reduce postoperative sore throat and bleeding.

In another research in this regard, Yodfat et al. claimed that the use of stylet to make a 90-degree angle near the larynx could increase the first-attempt success rate of LMA insertion, thereby decreasing mucosal trauma (3,7). In the mentioned study, laryngeal mask was inserted using the conventional method in the first group, while the mask was pushed downward with the dominant hand, along with the use of the index finger of the other hand, so that the non-dominant hand could prevent the contact of the cuff with the palate and oropharynx tissues in the new technique.

According to the results of the present study, applying less pressure during LMA insertion could decrease the complications of LMA insertion while entering the pharyngeal space. However, the prolonged use of LMA was not possible since the rigidity of its breathing tube might have led to posterior pharyngeal pressure necrosis. In general, correct LMA positioning and the routine monitoring of LMA cuff pressure should be considered in the use of insertion techniques.

Recommendations and Limitations

Some of the limitations of the present study were the small sample size and failure to follow-up the patients. Therefore, it is recommended that further investigations be conducted on larger samples sizes and various age ranges regarding the new methods of LMA insertion with fewer complications so as to confirm our findings.

Conclusion

Considering the higher effectiveness of the new LMA insertion technique compared to the con-

ventional technique in the prevention of postoperative mucosal bleeding and sore throat, this technique could be applied as a safe alternative to the conventional technique in order to diminish the rate of postoperative sore throat due to lower pressure on the oropharynx tissues.

Acknowledgements

None.

Conflict of Interest

The authors declare no conflict of interest.

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