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Comparison of the Effects of Endotracheal Tube and Laryngeal Mask Airway on Immediate Postoperative Complications in Elective Operations.

Dadmehr H*, Negargar S**, Mahmoodpoor A***, Ghaderi B±, Anvari H**, Rahmani A$^{\mu}$.

*Anesthesiologist, Tabriz University of Medical Sciences,**Associate Professor, Department of Anesthesiology, Tabriz University of Medical Sciences, ***Assistant Professor, Department of Anesthesiology, Critical Care Medicine fellow, ± Masters in Anesthesiology, Tabriz University of Medical Sciences, $^{\mu}$ Registered Medical Nurse, Tabriz, Iran.

Correspondence: Dr. A. Mahmoodpoor, MD. FCCM, Mailing Address: General ICU, Shohada hospital, El-Goli street, Tabriz, Iran, Telephone: +98(914) 1160-888, Fax: +98(411) 332-8009, E-mail: amahmoodpoor@yahoo.com.

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Abstract:

Objectives: To compare the laryngeal and gastro-intestinal complications of using ETT and LMA after elective orthopedic operations.
Materials & Methods: Eighty patients who were candidate for elective orthopedic operation and were in class 1 and 2 of ASA, participated in this study and. Patients randomized into two groups. Laryngeal Mask Airway(LMA) was used in one group and Endo Tracheal Tube(ETT)in the other one. Postoperative complications including nausea, vomiting, coughing and sore throat were assessed in all patients during the first 24 hours.
Results: Cases of nausea, vomiting and sore throat in LMA group were less than ETT group. However, this difference wasn't statistically significant. But cough incidence in ETT group was significantly further than the LMA group.
Conclusion: There was no significant difference between the LMA and ETT regarding mentioned complications in the first 24 hours after the surgery. Of course more research is recommended in this area, considering the limitations and contrasting evidence.

Keywords: Anesthesia, Endotracheal Tube, Laryngeal Mask Airway, Complications

Introduction:

Laryngeal mask airway (LMA) was introduced by Dr. Brain in 1980s and caused a revolution in airway management.[1] Today, this device has a special position in anesthesiology procedures and among many of anesthesiologists.[2, 3] LMA provides a proper way for ventilating the patient while protecting his or her airway.[4]

Nowadays, LMA is used as a proper device for protecting the patient's airway during many of the operations.[5-10] However, American society of anesthesiologists,[3] Australian and European council of resuscitation, and American heart Association [11] approve the usage of LMA only in emergency situations and in cardio-pulmonary resuscitation. The reason for this issue seems to be the inadequate evidence on the efficacy and safety of LMA.

Many studies were conducted on usage of LMA for protecting the patients' airway during surgery and showed that this device has many benefits including easier insertion, no need for laryngoscope,[12] fewer homodynamic complications,[13] and less harmful complication for the larynx and vocal cords.[8, 14] Furthermore, LMA is better tolerated by patients (12) and learning of its usage is easy for physicians and other health care providers.[15-20] Also, LMA is a cost beneficent device.[21]) It needs to be mentioned that some complications have also been reported for LMA. The most important of these complications are related to digestive system including vomiting and aspiration [12, 22] and to larynx including sore throat, coughing, vocal cord paralysis,[23, 24] and acute epiglottis [25].

Digestive complications such as nausea and vomiting and laryngeal complications such as coughing and sore throat are most common complications after general anesthesia. Nausea and vomiting usually happen in one third of patients after the general anesthesia26 and can be followed by serious complications such as aspiration, pneumonia and even rupture of esophagous.[27] The sore throat and other laryngeal complications also happen in 60% of patients in the post general anesthesia period.[28] It should be mentioned that such complications can result in delay of patients' discharge, increased health care costs, and decreased patients' satisfaction.[29-38] Therefore, any effort taken to decrease such complications would be important.

Several studies have been conducted related to comparison the digestive and laryngeal postoperative complications by using ETT and LMA. In a group of studies no difference has been observed in postoperative complications. For example, in a study conducted by Splinter and Smallman, no difference was indicated between ETT and LMA regarding the sore throat and coughing in the postoperative period.[39] Other studies have indicated that the risk of complication after use of LMA were further than ETT.[40, 41] Finally, some other studies have reported that a risk of nausea, vomiting,[42] sore throat,[43-48] and coughing [2, 45, 49, 50] after use of LMA were less than ETT.

As it turned out, in spite of the increase in the application of LMA, there is still controversy about the efficacy of LMA in

comparison to ETT. This problem restricts the wide application of LMA. Therefore, the aim of present study was to compare the digestive (nausea and vomiting) and laryngeal (sore throat and coughing) complications by using ETT and LMA in postoperative period of selective orthopedic operations.

Methods:

Study design and setting

This research was a double-blinded clinical trial. The study was conducted in the operation room in Shahid Mobasher Kashani educational hospital in Hamedan.

Participants

In this study 80 patients that were candidate to elective surgery allocated in this study. Patients were divided into two groups. The airway of one group during operation was managed by ETT(Supa Company, Iran) and was managed by LMA(Intersurgical, England) in another group. The inclusion criteria for patients included having selective orthopedic operation, conducting the operation by general anesthesia, being in the class of I or II of ASA, being in the age range of 14 to 55 years, and fasting for 8 hours before the operation. The exclusion criteria for the patients included using the corticosteroids before or during the operation, having the history of nausea, vomiting, cough, and sore throat after the previous operations (if has a pervious surgery), and having the history of motion disease.

Study procedure

Before induction of anesthesia the heart rate and blood pressure of all patients were assessed. After induction of the anesthesia an anesthesiology resident placed the ETT and LMA(Weight based size based on factory recommendation) in the airway of the patients of two groups. The heart rate and blood pressure of the patients were also assessed in the first 15 minutes after the induction of aesthesia. Then after the operation and transferring the patients to the recovery room and also until 24 hours after operation, all patients were monitored for development of postoperative complications including nausea, vomiting, coughing, and sore throat. It needs to be mentioned that all the assessments before, during, and after the operation were done by a staff member (who had an associate degree in anesthesiology) that was totally unaware of assigning of the patients in two groups. This staff member assessed all patients in 3 hours intervals for 24 hours after surgery. The interview method was used to study the postoperative complications of this study. Pain management was performed with paracetamol, and breakthrough pain was treated with bolus doses of morphine sulfate. We used metoclopramid and dexamethasone for treatment of PONV.

Anesthesia protocol

Anesthesia induction and its maintenance were same for all patients. Induction of anesthesia for each patient was done by injection of Thiopental (5 to 7 mg per kilogram) fentanyl (1µg per kilogram) and Succinylcholin (1mg per kilogram). The maintenance of anesthesia was done through breathing Halothane.

Ethical considerations

The regional ethic committee in Hamedan University of Medical Science reviewed and approved the study. Participation in this research was voluntary and all the patients have signed the informed consent forms. The patients were also introduced regarding the aims of the research and were informed that their incorporation won't be interfering on their medical treatment.

Data analysis

Data was analysed using the SPSS statistical software (SPSS 13.0, SPSS; Chicago, IL). Descriptive statistics including frequency, percentage, mean and standard deviation were used for data description. Inferential statistics including independent sample t-test and chi-square tests were used to compare the postoperative complications of ETT and LMA groups. A P-value less than 0.05 were considered statistically significant.

Results:

The average age of patients in ETT group was 40.12±8.50 years and for LMA group was 38.60± 9.84 years (df = 78, t = 0.74, and P=0.46). The patients in ETT group consisted of 26 males and 14 females while there were 23 males and 17 females in the LMA group which had no significant difference (df =1, P=0.64). The average weight of patients in the ETT group was 71.20±6.86 kilogram and 70.30±5.51 kilogram for LMA group (df = 78, t = 0.52, and P=0.60).

The results of changes in heart rate and blood pressure of patients in ETT and LMA groups are shown in table 1. This table shows that immediately after placing the tube, the heart rate and blood pressure of patients in ETT group was significantly higher than patients in LMA. On the other hand, 15 minutes after placing the tube there were no significant differences between heart rate and blood pressure of patients in two groups. As shown in table 2, there was no significant difference between the patients of two groups regarding sore throat. However, cough incidence has significant differences between two groups; as patients in ETT reported further incidence of coughing in postoperative period.

Discussion:

According to the results of present study, in the first 24 hours after surgery the number of patients suffering from digestive complications was less in the LMA group than in ETT group. Nevertheless, this difference was statistically insignificant. Some previous studies [42, 51] have also indicated that the risk of nausea and vomiting with LMA is less than when ETT is used. On the other hand, some other studies [40, 41] have showed that the risk of postoperative nausea and vomiting by using LMA was more than ETT. Therefore, although present study indicated no statistically significant difference between two devices regarding postoperative nausea and vomiting, the risk of occurrence of complications by using LMA was less than ETT. One of the reasons for the insignificant difference between two groups seems to be the small sample size of patients. The probable reason for justifying the low risk of nausea and vomiting in using LMA seems to be the presence of its balloon in the larynx area which can

decrease the risk of nausea and vomiting due to the lower stimulation of the larynx. But, in using ETT the balloon inflates in trachea and can be stimulating and so increases the risk of postoperative nausea and vomiting.[52]

The results of the study indicated that in the first 24 hours after the surgery there was no significant difference between the patients of two groups regarding sore throat, but the difference regarding coughing was significant and the rate of coughing among the patients of LMA group was much less than that of ETT group. So many other studies [2, 53] have also shown similar results. Zimmert and Zwirner [43] showed that the rate of laryngeal complications in the postoperative period was less in LMA group compared with ETT. Also, they reported that in ETT group six patients and in LMA group only one patient developed injury in larynx area.[43] On the other hand, the study of Splinter and Smallman indicated no difference between LMA and ETT regarding postoperative coughing and sore throat.[39] It seems that for insertion of LMA there is no need for laryngoscope and the LMA doesn't pass the larynx area. These factors may result in decreasing laryngeal complications.[51]

The comparison of the homodynamic changes indicated that the heart rate and blood pressure of patients after insertion of ETT were significantly more than LMA group. But, 15 minutes later there was no significant difference in homodynamic of two groups. The previous studies [5, 50] have also indicated that in insertion of LMA the homodynamic changes were less than ones in insertion of ETT. Minimal manipulation and stimulation of larynx and trachea seems to be the main reason for the low rate of homodynamic changes in using LMA.[50]

This study has a number of limitations. First, the sample size of patients may be small. Difference between the observed complications of two groups might be clearer if the sample size was larger. Second, in present study only the digestive and respiratory complications and only up to 24 hours after the surgery were studied and the delayed complications were not studied. Third, the information about postoperative complications was gathered through self reports of patients and more objective methods were not used to validate complications. Therefore, conducting other study with larger sample size and more objective methods for assessing patients' outcomes is suggested. Also, long-term complications of LMA and ETT need to be assessed in other studies.

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