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Comparison of Complications of Endotracheal Tube and Laryngeal Mask Airway Following Diagnostic Laparoscopy in Infertile Women

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ABSTRACT

The preoperative, perioperative, and postoperative airway management by the anesthesiologist and the use of procedures and medicines that have the least interference with patients' discharge from the hospital are of utmost importance. This can be achieved by the use of laryngeal mask airway and endotracheal tube. This study compared the postoperative complications of diagnostic laparoscopy between two groups of infertile women undergoing this procedure. This study was a double-blind clinical trial carried out on 120 patients undergoing gynecologic surgical laparoscopy. The patients were assigned into two equal groups of 60. The laryngeal classic mask, size 3-4, was applied for patients in group A and the cuffed endotracheal tube, size 7, was used for the patients in group B. All kinds of complications of anesthesia, consumption of anti-emetic drugs, analgesics, and also discomfort and pain in airways were recorded up to 24 hs. Our findings indicated that the relative frequencies of sore throat, voice hoarseness, and cough were statistically different between the two groups at 6 h and 12 h after anesthesia (P=0.001). At 24 h after anesthesia, there was only a significant difference between the two groups regarding sore throat frequency (P=0.003). Also, there was a significant difference between the two groups regarding heart rate (P=0.053) and mean arterial pressure (P=0.011).

Key words: Endotracheal intubation, Classical laryngeal mask airway, Laparoscopy, Airway management

1. INTRODUCTION

The preoperative, intraoperative (perioperative), and postoperative airway management by the anesthesiologist and the use of methods and medicines that have the least interference with patients' discharge from hospital are important (1, 2). Various methods have been offered for airway management the most common of which are the application of laryngeal mask airway, facial mask, and endotracheal tube. Endotracheal tube has been approved as a reliable method of airway maintenance and protection against aspiration during anesthesia. However, direct laryngoscopy and the experience of its use are needed for the use of endotracheal tube. This is an invasive procedure which may lead to untoward sequelae such as damage to the pharynx and larynx, pain, sore throat, voice changes, nausea, vomiting, cough, laryngospasm, and hypoxia (even after short time intubation) (3, 4). The classical laryngeal mask airway is another device for managing the airway during general anesthesia. It has attracted attention due to the lack of the need to laryngoscope and experience, ease of application, and the minimum damage to the trachea. It is increasingly

used as a means of providing a dependable method of airway management for patients (4). Nowadays, regarding the increasing application of laparoscopy in various surgical procedures, specifically gynecologic laparoscopies which are typically ambulatory and of short duration, the laryngeal mask airway could be used instead of endotracheal tube for airway management during anesthesia. Nonetheless, the presence of air leakage around the laryngeal mask cuff may induce the distention of the stomach or lead to insufficient ventilation during positive pressure ventilation compared to the endotracheal tube. Although there is some evidence indicating that the classic laryngeal mask airway is harmless and safe as a means of airway control in gynecologic laparoscopy, most physicians prefer to use the endotracheal tube for airway protection for more assurance (5). This study aimed at assessing the postoperative traumata and complications of the laryngeal mask airway compared to the endotracheal tube. As a rule of thumb, patients undergoing general anesthesia lose their protective airway reflexes. It is assumed that in diagnostic gynecologic laparoscopy, the risk of gastric regurgitation and its entrance into the larynx and lungs is higher due to lithotomy position, lower position of the head, increased abdominal pressure following pneumoperitoneum, the operator's pressure on the abdomen, and the peritoneal irritation (6). The postoperative nausea and vomiting are among the important common complications of gynecologic laparoscopy the incidence of which may even reach to 40-70% in some surgical operations. Its total prevalence is reported to be 20-40%, so, regarding the frequent use of these two surgical modalities and their significance in diagnostic gynecologic laparoscopy, the present study investigated and compared the postoperative complications between two groups of women undergoing diagnostic gynecologic laparoscopy.

2. MATERIALS AND METHODS

The present study was a randomized double-blind clinical trial conducted in Yazd, central Iran, during December of 2013 to January of 2014 after obtaining informed written consent of the patients and the approval of Committee of Ethics in Yazd's Shahid Sadoughi University of Medical Sciences. The study was carried out on 120 infertile female patients who visited In Vitro Fertilization Center in Yazd for elective diagnostic gynecologic surgical laparoscopy. The patients belonged to class I and class II of American society of anesthesiologists (ASA). The inclusion criteria included infertile women visiting In vitro fertilization (IVF) facility for elective diagnostic surgical laparoscopy. The exclusion criteria included women with a positive history of cardiovascular and pulmonary disorders, body mass index (BMI)>30, having facial anatomical problems, patients with nasogastric tube (NG), sore throat, preoperative nausea and vomiting, pharyngo-laryngeal pathology, history of difficult anesthesia, patients with high aspiration risk, and consumption of antiemetic and narcotics. All the patients were visited by a specialist and underwent comprehensive clinical examinations before participation in the study. They were selected using simple sampling method and divided into two equal groups of 60 using table of random numbers. For airway management, endotracheal tube (ETT) was used for one group and classical laryngeal mask airway (LMA) for the other. Method of anesthesia was the same for all patients. Intubation and laryngeal mask airway placement was performed by trained and experienced anesthetists and the same protocol was applied. Induction of anesthesia was done with anesthetics after initiation of monitoring in the operating room and preoxygentation with 100% oxygen. Gastric tube no. 18 was inserted in the stomach of all patients and removed after evacuation of gastric content. For patients in group A, classical laryngeal mask airway, size 3-4, was applied and filled with 30 cc of air, and then its appropriate placement was approved. For patients in group B, the cuffed endotracheal tube, size 7, was applied. The cuff was filled with sufficient amount of air (endotracheal cuff pressure of 25 mmHg), and subsequently, its correct placement was approved. All the patients were followed up till complete recovery from anesthesia and onset of oral feeding. Any kind of anesthesia complications, consumption of antiemetic and analgesics, and any type of discomfort and pain in the airways were recorded up to 24 h. Regarding double-blindness of the study, this study was double-blind, i.e., the patient and the individual who collected and recorded the data were unaware of the type of device used for airway management. The gleaned data were analyzed using SPSS15 and statistic tests such as t-test, Chi-square (X^2), and Fisher's exact test. $P<0.05$ was considered as the level of statistical significance.

3. RESULTS AND DISCUSSION

Our findings indicated that the mean age of participants was 28.88±4.35 years in LMA group and 27.65±3.58 years in ETT group, the difference between the two groups being statistically not different. There were also no significant differences between the two groups regarding weight, duration of anesthesia, mean arterial blood pressure, mean of hemoglobin saturation with oxygen, and (HR) heart rate (Table 1).

Table 1. Determination and comparison of means of age, weight, and duration of anesthesia in the two groups under study

Variable	weight	age	duration of anesthesia(min)	MAP	O_2sat	Heart beat
LMA	61.93±9.15	28.88±4.35	32.38±4.08	87.41±11.3	98.23±1.77	80.03±25.45
ETT	65.03±9.91	27.65±3.58	34.65±6.22	90.53±9.13	98.63±1.27	83.23±13.19

P-value	0.15	0.173	0.058	0.19	0.251	0.482
*t-test						

Furthermore, there was no significant difference between the two groups regarding relative frequency of nausea and vomiting 6 hs after anesthesia with P-value set at P=0.431 and P=0.193, respectively. Yet, the relative frequencies of sore throat, voice hoarseness, and cough 6 h after anesthesia were significantly different (P=0.001). Additionally, the relative frequencies of nausea and vomiting were not significantly different between the two groups 12 h following anesthesia (P=0.066 and P=0.160, respectively). Nevertheless, the relative frequencies of sore throat, hoarse voice, and cough were significantly different between the two groups 12 hs after anesthesia (P=0.001, P=0.001, and P=0.005, respectively). Moreover, there was no significant difference between the two groups after 24 h following anesthesia regarding the relative frequency of nausea, vomiting, hoarse voice, and cough (P=1, P=1, and P=0.241, respectively), while the relative frequency of sore throat was significantly different between the two groups 24 h after anesthesia (P=0.003, Table 2).

Table 2. Determination and comparison of the relative frequencies of nausea, vomiting, sore throat, hoarseness of voice, and cough between the two groups under study 6, 12, and 24 h after intervention

Time	Variable	Nausea	Vomiting	sore throat	hoarseness	cough
6 h	LMA	8(20%)	3(7.5%)	12(30%)	7(17.5%)	0(0%)
	ETT	11(27.5%)	8(20%)	31(77.5%)	27(67.5%)	11(27.5%)
	P-value	*0.431	*0.193	*0.001	*0.001	**0.001
12 h	LMA	3(7.5%)	0(0%)	9(25.5%)	2(5%)	0(0%)
	ETT	10(25%)	4(10%)	27(67.5%)	18(45%)	8(20%)
	P-value	**0.066	**0.116	*0.001	**0.001	**0.005
24 h	LMA	2(5%)	0(0%)	6(15%)	0(0%)	2(5%)
	ETT	3(7.5%)	1(2.5%)	18(45%)	3(7.5%)	5(12.5%)
	P-value	**1	**1	*0.003	*0.241	**0.432
*Chi-square test, ** Fisher Exact test						

Our findings demonstrated that the mean heart rate (P=0.053) and mean arterial blood pressure (P=0.011) were statistically different between the two groups (Table 3).

Table 3. Comparison of mean of heart rate (HR), mean arterial blood pressure, and rate of hemoglobin saturation with oxygen between the two groups after anesthesia

Variable / Group	MAP		O2sat		HR	
	mean	SD	mean	SD	mean	SD
LMA	81.71	32.11	99.5	1.26	83.48	11.17
ETT	95.15	5.6	98.7	1.34	89.2	14.67
P-value	0.011		0.233		0.053	
t-test						

The present study aimed at determining and comparing complications of endotracheal intubation and laryngeal mask airway following diagnostic gynecologic laparoscopy in 120 infertile women who visited IVF center. The results of the study showed that the mean heart rate and mean arterial blood pressure were significantly higher in the ETT group following intubation compared to the LMA group. Also, the relative frequency of sore throat, voice hoarseness, and cough were higher in the ETT group 6 and 12 h after anesthesia, the difference between the two groups being statistically significant. In addition, only the frequency of sore throat was higher in the ETT group compared to the LMA group 24 h after anesthesia. The rate of incidence of sore throat in this study was 30% in LMA group and 77.5% in ETT group, showing a significant difference. The study by Higgins et al. reported the rate of sore throat incidence to be 45.4% in ETT and 17.5% in LMA method (7). Moreover, in the study by Evans carried out on 300 patients, the incidence rate of sore throat was reported to be 20% after the use of LMA method and the results were consistent with our findings (8). This means that the use of LMA causes less degrees of sore throat compared to ETT. It was only the study by Splinter that reported a low incidence rate of postoperative sore throat in children aged 3-12 years undergoing minor peripheral surgery, indicating an insignificant difference in the incidence of sore throat between LMA and ETT methods (9). This was not consistent with our findings. This inconsistency may be attributed to the fact that the participants in Splinter's study were children anesthesized with non-cuffed endotracheal tube while the present study used cuffed tube. The study by Griffins and others was conducted on 116 patients. It was revealed that the incidence of postoperative nausea and vomiting was the

same in both methods and the use of laryngeal mask airway did not reduce nausea and vomiting compared to endotracheal tube. Although this study used Proseal laryngeal mask and our study applied classical laryngeal mask airway, the findings of this study were consistent with our results (10). Also, the review study by Yu SH and colleagues compared laryngeal mask airway with endotracheal tube regarding risk factors and airway problems. It reported that the use of laryngeal mask airway reduced, both statistically and clinically, the incidence of laryngospasm, voice hoarseness, and cough compared to endotracheal tube, yet, there was no significant difference between the two groups with respect to nausea and vomiting after surgery. The findings of this study are consistent with ours, too (4). Furthermore, the study by Goolati entitled: "Comparison of Laryngeal Mask Airway with Endotracheal tube in Ophthalmologic Surgeries" suggested that the postoperative cough in the LMA group was less than the ETT group; however, the incidence of postoperative vomiting was greater in the LMA group compared to the other group. The findings of this study were consistent with our results, though, of course, they were inconsistent with respect to incidence of vomiting (11). This may be due to the point that in Goolati's study, there has been the possibility of air leakage and the entrance of air into the stomach. A comparison of hemodynamic changes (HR, MAP, O_2SAT) between the two groups indicated that the rate of arterial oxygen saturation after anesthesia was not significantly different, yet, the means of heart rate and mean arterial blood pressure were greater in ETT group, the difference being statistically significant. Moreover, the studies by Prerena et al. and Yao et al. both of which conducted on groups undergoing gynecologic laparoscopy with LMA and ETT, revealed that the percentage of arterial oxygen saturation in the group with LMA was not significantly different from that of the group with ETT, this being consistent with our study (12, 13). This shows that oxygenation is completed well in both methods. The study by Watcha conducted on LMA and ETT announced that LMA had no effect on patients' HR and BP, while endotracheal tube induced an acute increase in HR and BP of patients during induction of anesthesia (14). Additionally, the study by Ismail on comparison of hemodynamic changes induced by endotracheal tube and laryngeal mask airway indicated that hemodynamic changes were smaller in LMA method compared to ETT method (15). The findings of the two studies mentioned above are in line with ours. Since the course of progress of surgical procedures is towards reducing patient traumata and decreasing mortality and morbidity rates, also regarding the fact that laryngoscopy is an invasive procedure and can cause damage to the teeth and soft oral tissues, and noting further our findings that complications such as incidence of sore throat, voice hoarseness, and cough as signs of traumata, also the smaller incidence of hemodynamic changes in LMA compared to ETT (16-18), it could be concluded that the application of laryngeal mask airway is a suitable method for airway management during laparoscopic surgeries under general anesthesia. As mentioned in some studies (19, 20), LMA can be an appropriate and acceptable alternative to ETT for use in spontaneous ventilation with positive pressure during gynecologic surgical laparoscopy, specifically for short operations. Nevertheless, one of the complications of LMA is air leakage and its entrance into the stomach that leads to gastric content regurgitation. Our study did not measure gastric distension, hence, it is recommended that future studies use greater sample volumes, and more numerous variables, specially stomach distension.

4. CONCLUSION

Application of classical laryngeal mask airway is a suitable method for airway management during surgical laparoscopy in patients under general anesthesia. Furthermore, the laryngeal mask airway can be a safe and reliable alternative to endotracheal tube during gynecologic surgical laparoscopy, specifically for short time operations.

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AUTHORS CONTRIBUTION

This work was carried out in collaboration among all authors.

CONFLICT OF INTEREST

The authors declared no potential conflicts of interests with respect to the authorship and/or publication of this article.

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