Klinik Çalışma

COMPARASION OF ENDOTRACHEAL INTUBATION, PROSEAL LMA AND SUPREME LMA IN LAPAROSCOPIC CHOLECYSTECTOMY

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ABSTRACT

Purpose: The insufflations of CO_2 into the abdomen during laparoscopic surgery can cause gastric distention and gastroesophageal reflux. Devices used for keeping airway patent in difficult airway cases gained importance. In this study we compared the stress response and side effects of endotracheal intubation, ProSeal LMA and Supreme LMA in laparoscopic cholecystectomy cases.

Methods: A total of 120 adult patients, classified as ASA I-II and undergoing elective laparoscopic cholecystectomy (duration 1–2 h) were randomly allocated to one of three groups: endotracheal intubation group, ProSeal LMA group and Supreme LMA group.

Results: There was no statistically significant difference between the preoperative measurements of cortisol levels in all groups. The cortisol levels 1 min after intubation in group ETT was significantly higher than the cortisol levels measured in group ProSeal LMA and Supreme LMA.

Peripheral oxygen saturation, end-tidal CO_2, peak pressures, gastric and nasopharyngeal pH measurements were not different between groups.

Hoarseness at postop 1 hour was found to be significantly higher in the group endotracheal intubation. Symptoms of hoarseness, sore throat and dysphagia were lower in the group ProSeal LMA and group Supreme LMA than that of the group endotracheal intubation. Insertion duration and insertion attempt number were not different between ProSeal LMA and Supreme LMA groups.

Conclusion: We concluded that PLMA and SLMA can be preferred instead of endotracheal intubation in laparoscopic surgical cases to provide effective ventilation with lesser side effects.

Key words: endotracheal intubation; supreme lma; proseal lma

Endotrakeal Entübasyon, ProSeal LMA ve Supreme LMA'nın Laparoskopik Kolesistektomi Olgularında Karşılaştırılması

Amaç: Laparoskopik cerrahi sırasında karın içine CO_2 insuflasyonu gastrik distansiyon ve gastroözofageal reflüye neden olabilir. Zor havayo-

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lu vakalarında havayolunu açık tutmak için kullanılan cihazlar önem kazanmıştır. Bu çalışmada, endotrakeal entübasyon, ProSeal LMA ve Supreme LMA'nın stres yanıt ve yan etkiler üzerine etkilerini laparoskopik kolesistektomi vakalarında karşılaştırdık.

Gereç ve Yöntem: ASA I-II olan, elektif laparoskopik kolesistektomi (1-2 saat) yapılan 120 erişkin hasta, rastgele üç gruba ayrıldı: endotrakeal entübasyon (ETT) grubu, ProSeal LMA grubu ve Supreme LMA grubu.

Bulgular: Tüm gruplarda preoperatif kortizol ölçümleri arasında anlamlı bir fark yoktu.

Grup ETT'de entübasyon sonrası 1. dk kortizol seviyeleri, ProSeal LMA ve Supreme LMA gruplarında ölçülen kortizol düzeylerinden anlamlı derecede daha yüksekti.

Periferik oksijen satürasyonu, end-tidal CO_2, pik basınçları, gastrik ve nazofarenks pH ölçümleri gruplar arasında farklı değildi.

Postop 1. saatte ses kısıklığı bulundu. ETT grubunda anlamlı olarak yüksek bulunmuştur. Ses kısıklığı, boğaz ağrısı ve yutma güçlüğü belirtileri olan hastaların sayısı, ProSeal LMA ve Supreme LMA grubunda endotrakeal entübasyon grubundakinden daha düşüktü. Yerleştirme süresi ve yerleştirme girişimi sayısı, ProSeal LMA ve Supreme LMA grupları arasında farklı değildi.

Sonuç: PLMA ve SLMA'nın laparoskopik cerrahi vakalarında daha az yan etkileri ile etkili ventilasyon sağlayarak endotrakeal entübasyona tercih edilebileceği sonucuna vardık.

Anahtar kelimeler: endotrakeal entübasyon; supreme lma; proseal lma

INTRODUCTION

The oral or nasal airway, face mask, endotracheal tube or the laryngeal mask airway (LMA) are used during administration of general anesthesia to keep airway patent. American Society of Anesthesiologists (ASA) published an algorithm for difficult airway that includes the LMA which is an alternative to endotracheal tube.[1]

LMA is a supralaryngeal airway mask which is inserted after induction of anesthesia without the need for laryngoscopy as there is no insertion to larynx. The insertion of a LMA elicits a much smaller catecholamine response than tracheal intubation thus lower doses of muscle relaxants are needed. Removal of the LMA after recovery from anesthesia was associated with less stimulation of sympathetic system as well.[2]

LMA can be insufficient in patients with high intrathoracic and intraabdominal pressure as well as obese patients where gastric distention can cause complications during surgical invasion. Different types of LMA such as ProSeal LMA (PLMA) and Supreme LMA (SLMA) to allow entrance of nasogastric tube were developed.

The insufflations of CO_2 into the abdomen during laparoscopic surgery can cause gastric distention, gastroesophageal reflux. The airway pressure increases due to increased intrathoracic pressure and ventilation parameters may be adversely affected.[3]

ProSeal LMA is a new supraglottic airway device that can improve use in patients with low lung compliance or above 2 kPa (20 cmH_2O) ventilation pressure is required where LMA is relatively contraindicated. Esophageal drainage tube is positioned in the esophageal sphincter parallel to ventilation tube and prevents the aspiration of gastric content that were passively regurgitated.[4,5] ProSeal LMA and Supreme LMA are alternatives to endotracheal intubation where classic LMA can not be used in laparoscopic cystectomy cases.[6]

The aim of this study was to investigate the use of ProSeal LMA and Supreme LMA during laparoscopic cholecystectomy whether there is lower stress response and side effects or not, which were reported to be lower with classical LMA. We compared stress response and side effects with the use of endotracheal intubation, ProSeal LMA and Supreme LMA in laparoscopic cholecystectomy cases.

METHODS

This prospective randomized study is performed in Anesthesiology and Reanimation Clinics in

between 11 January and 30 September 2009. The study was approved by institutional ethics committee and patients provided written informed consent before inclusion. The study was conducted in adherence with ICH/GCP and local regulations.

120 patients who were aged between 18-70 years, classified as ASA I-II and undergoing elective laparoscopic cholecystectomy (duration 1–2 h) were included in the study.

Exclusion criteria were a history of difficult intubation, respiratory, cardiac or esophageal and gastric disease, coagulation disorders and allergy. Patients with body mass index over 30 kg/m^2, being treated with drugs that can affect the pH of gastric pH such as antacids, H_2 receptor antagonists, proton pump inhibitors and drugs that can effect endocrine response were excluded.

All patients were evaluated initially by medical history and a complete physical examination. Before surgery, the levels of all biochemical tests including complete blood count and urine analysis are performed. Electrocardiography (ECG) and chest x-ray are obtained. Patients with results within normal range were included.

After premedication with 0.9 % isotonic NaCl 2 ml/kg/hr i.v. infusion and i.m. midazolam 0.1 mg/kg, anesthesia was induced with fentanyl 1-2 mcg/kg and propofol 2–3 mg/kg iv 0.5-0.6 mg/ kg rocuronyum and anesthesia was maintained with a 50 % O_2, 50 % nitrous oxide in oxygen, and 1-2 % sevoflurane. Hemodynamic variables were monitored with ECG, systolic and diastolic blood pressure and oxygen saturation (SpO_2).

Patients are randomly allocated to one of three groups: endotracheal intubation (ETT) group, ProSeal LMA group and Supreme LMA group.

Randomization is assigned with the use of closed envelope by the study coordinator. All devices were handled by the same experienced investigator and post operative side effect follow-up is documented by a different investigator. PLMA and SLMA devices are controlled before insertion and lubricated with water based lidocaine gel (Cathejell, Taymedolu saglik urunleri, Istanbul).

Intubation/airway insertion was attempted 120 s after the beginning of injection of rocuronium. Duration of intubation/airway insertion and the times of the successful insertion were recorded. The successful duration of intubation/insertion was defined as the time from the start of the investigators' leaving face mask until the effective airway is ensured. Number of unsuccessful insertion attempts is not put in. If the inserted device has not provided adequate airway, change in its position without moving out of the mouth is defined as reposition. In spite of reposition, if still airway was not adequate, the same device is removed from mouth to re-insert. To remove device from mouth is defined as re-insertion and assigned as number of insertion attempt. If insertion was not possible after three attempts, the patients were intubated with orotracheal tube and excluded from the study.

The supraglottic airway device size was 3-4 in females, 4-5 in males and cuffs were inflated according to product manufacturer's recommendations. Endotracheal intubation tube size was 7.0-7.5 in females, 8.0-8.5 in males. After insertion of airway device, the air leakage was determined by listening audible sound of gas escaping from the mouth or oscultating over thyroid cartilage. Patients were assisted via mechanical ventilation of 10 ml/kg tidal volume. The position of PLMA and SLMA are confirmed with nasogastric tube insertion.

The airway classification, number of airway device, number and duration of insertion, anesthesia duration were recorded as well as patients' characteristics.

Mean arterial pressure (MAP), and heart rate (HR) were recorded immediately before and 1 min after intubation/airway insertion; 15 min after CO_2 insufflations and immediately after extubation/airway removal. Peripheral oxygen saturation (SpO_2), end-tidal CO_2, PaO_2, $PaCO_2$, pH, and peak airway pressures as well as gastric and nasopharynx pH were recorded.

Arterial blood samples for determination of cortisol levels were drawn before and 1 min after intubation/airway insertion and 15 min after CO_2 insufflations and after extubation/airway removal. The blood samples were collected and immediately centrifuged. All samples were analyzed with radioimmunoassay (RIA) method (Beckman-Coulter U-Nicelldxi 800).

The inspired oxygen concentration, the ventilator variables were monitored continuously and adjusted when peripheral oxygen saturation (SpO_2) ? 95 and end inspiratory carbon dioxide ($etCO_2$) 45 mmHg. Hypoxemia is a determinant of tissue oxygenation considered as arterial partial oxygen pressure (PaO_2). PaO_2 is between 80-90 mmHg when FiO_2 is 0.21. Oxygenation was considered as failed if SpO_2 fell to less than 95 %. It was considered mild if SpO_2 was 90-95 %, moderate if 85-90 % and severe if lower than 85 %. Hypercapnia is the major determinant of ventilation, arterial partial carbon dioxide pressure ($PaCO_2$) and normally is 35-45 mmHg. Over 55 % is the critical value. Patients with $etCO_2$ over 45 % were considered to have hypercapnia; it was considered mild if it was 45-50 %; moderate if 50-55 % and severe if it is over 55 %.

Gastric and nasopharynx pH were recorded before and 15 min after CO_2 insufflations. The pH of gastric, nasopharynx and aspiration fluids are measured by Universalindikator pH 0-14 Merck Germany pH meter and via special pH determination scale.

Patients were not given any analgesia, antiemetic and any drug that can change gastric acidity. Laryngospasm, bronchospasm, hypoxia, hypercapnia, aspiration, cough, hiccup, nausea and vomiting were documented. After extubation and blood drawn for cortisol measurement, post operative analgesia was maintained by i.m. 1 mg/kg Contramal. After extubation, patients with cough, vomiting, laryngospasm, positive pressure ventilation (PPV) and needed to re-intubate were noted.

Sore throats, hoarseness, dysphagia (absence, low, moderate, high) are documented to assess upper airway trauma in postoperative 1 and 24 hour.

The study was designed to have 95% power with a 0.01 error level to detect a difference of 19% for side effects between endotracheal intubation (ETT) group, ProSeal LMA group and Supreme LMA group, with two-sided · levels of 0.05. Using sample size calculation for independent proportions, we estimated a sample size of a minimum of 30 participants in each group. In our study, we monitored the incidence of side effects related to airway devices in each group. Therefore we had 40 patients to document side effects in a larger population than we had calculated.

Data were analyzed with SPSS (Statistical Package for Social Sciences) 17.0 programme. All data were expressed as means, standard deviation, and frequency. Statistical significance was accepted as $p<0.05$. The comparisons between groups were tested using independent t-test or one-way analysis of variance (ANOVA). The comparisons within groups were tested using paired t-test. Non-parametric data were analyzed with Chi-square test.

RESULTS

Demographical data of study population

No significant differences were detected among the three groups with respect to age, weight, height, BMI, gender and ASA physical classification (Table 1).

Ventilation Parameters

No significant difference or irregularity in any variable for ventilation or oxygenation was detected. Measurements of SpO_2, $etCO_2$ and peak pressure in all groups are shown in Table 2 and 3, respectively.

Stress response

There was no statistically significant difference between the preoperative measurements of cortisol levels in all groups (Table 4). The cortisol le-

vels 1 min after intubation in group ETT was significantly higher than the cortisol levels measured in group PLMA and SLMA (p=0.04). In the group PLMA and group SLMA, while there was no change in cortisol level after intubation, 15 min after CO_2 insufflations and after extubation, cortisol levels were found to be higher than the levels measured preoperatively.

Table 1: Demographical data of the groups

		Group ETT	Group PLMA	Group SLMA	P value
		mean(SD)	mean(SD)	mean(SD)	
Age (year)		48.85±12.61	47.25±13.78	46.50±13.13	0.848
Height (cm)		166.75±8.27	168.80±10.26	166.15±07.42	0.605
Weight (kg)		72.40±8.38	72.85±9.02	70.70±10.72	0.750
BMI (kg/m^2)		25.99±1.88	25.51±1.62	25.53±2.83	0.732
		n (%)	n (%)	n (%)	
Gender	**Female**	32 (%80)	28 (%70)	30 (%75)	0.766
	Male	8 (%20)	12 (%30)	10 (%25)	
ASA I		12 (%30)	8 (%20)	12 (%30)	0.711
ASA II		28 (%70)	32 (%80)	28 (%70)	

Mean arterial pressure of the group ETT was significantly higher than the MAP of the group PLMA 1 min after intubation (p<0.05). After extubation, MAP of group ETT was significantly higher than that of the group PLMA (p<0.05). There was no statistically significant difference between groups in other time measurements (Figure 1).

The heart rate measurements did not differ significantly between groups (p>0.05; Figure 2).
Gastric and Nasopharyngeal pH determination revealed no statistically significant difference between groups.

Assessment of side effects

There was no significant difference between all groups in terms of sore throat at postop 1 hour and postop 24 hour (p=0.843, p=0.804, respectively).
Hoarseness at post op 1 hour was present in 18 (45%) patients in group ETT, in 4 (10%) patients of group PLMA and 2 (5%) patient of group SLMA. It was significantly different between groups (p=0.003). At postop 24 hour, hoarseness was present in only 2 patient of group ETT and none of the patients in group PLMA and SLMA experienced hoarseness (p=0.362). The hoarseness frequency was found to be lesser in group ETT when compared to other groups.

Dysphagia at post op 1 hour was present in 22 (55%) patients in group ETT, 16 (40%) of group PLMA and 10 (25%) of group SLMA at low level (p=0.235). At post op 24 hour, dysphagia was present in 4 patients in group PLMA. It was not noted in group ETT and group SLMA at post op 24 hour (p=0.126).

Successful intubation/insertion

Number and duration of insertion attempts in PLMA and SLMA groups.

The mean duration of insertion in group PLMA (31.90 ± 3.54 sec) and in group SLMA (32.90 ± 4.67 sec) were not statistically different (p=0.451).

First time success rates were 28 of 40 (70 %) in group PLMA and 32 of 40 (80 %) in group SLMA. Eight (20 %) patients in group PLMA and six (15 %) patients in group SLMA required a second attempt, and four patients in group PLMA and two (5 %) in group SLMA required third attempt. The insertion attempt number was not statistically different between groups (p=0.737).

All the ETT intubations were successful in the

Table 2: SpO_2 and $etCO_2$ measurements of groups

		Group ETT mean(SD)	Group PLMA mean(SD)	Group SLMA mean(SD)	*P* value
Preoperative	SpO_2	98.90±1.37	98.50±1.36	99.15±1.04	0.270
	$etCO_2$	NA	NA	NA	
1 min after intubation	SpO_2	99.70±0.66	99.90±0.45	99.90±0.31	0.339
	$etCO_2$	30.75±3.78	29.15±3.48	28.80±3.61	0.202
Prior to CO_2 insufflation	SpO_2	99.84±0.38	99.75±0.64	99.55±0.61	0.250
	$etCO_2$	28.00±3.78	28.00±3.69	27.20±2.88	0.703
15 min after CO_2 insufflation	SpO_2	99.20±0.95	99.10±0.85	99.10±0.91	0.922
	$etCO_2$	30.90±2.47	30.60±2.95	30.95±2.59	0.905
After extubation	SpO_2	98.40±1.76	99.05±1.45	99.15±0.88	0.156
	$etCO_2$	NA	NA	NA	

first attempt and the mean duration was 28 ± 2.1 sec.

DISCUSSION

Endotracheal intubation is the most commonly preferred method in general anesthesia during laparoscopic surgery to facilitate airway safety. The increased thoracic pressure due to intraabdominal pressure and gastroesophageal reflux, older age and obesity, comorbidities require airway support.

Maltby and colleagues reported that ProSeal LMA and ETT to provide equally effective pulmonary ventilation without clinically significant gastric distension in all non-obese patients and they suggested laparoscopic surgery to test the effectiveness of supraglottic airway devices used in positive pressure ventilation.[4]

Goldmann K and Jakob C suggested that more effective seal of the PLMA, as indicated by a higher mean airway leak pressures (P_{leak}), might make it a more suitable supraglottic airway in patients with poor pulmonary compliance that may require higher peak airway pressures to ventilate, such as patients with cystic fibrosis or bronchopulmonary dysplasia.[7]

In this study we compared the effects on stress response, ventilation parameters, gastroesophageal reflux and postoperative patient satisfaction of ProSeal LMA and Supreme LMA as alternative to endotracheal intubation in laparoscopic cholecystectomy cases.

Mean arterial pressure and heart rate were also recorded to monitor possible hemodynamic changes due to insertion of ProSeal LMA, Supreme LMA and endotracheal tube during general anesthesia. MAP in the group ETT was significantly higher than the MAP in the group PLMA 1 min after intubation and after extubation. In the group ETT, MAP before CO_2 insufflations was found to be lesser than the preoperative MAP measurements. In group PLMA, MAP measurements 1 min after intubation and before CO_2 insufflations, were significantly decreased when compared to preoperative MAP measurements. In the group SLMA, patients' MAP values before CO_2 insufflations was significantly lower than the values of preoperative MAP, whereas MAP measurements after extubation was significantly higher than the preoperative MAP measurements. Heart rate measurements did not statistically differ among the groups. While heart rate measurements 1 min after intubation was significantly higher than the preoperative heart rate measurements in SLMA and ETT groups, it was not statistically different from the preoperative values in PLMA group.

It was reported that heart rate 5 min after PLMA and MAP after 1-5 min were significantly decreased.[8]

Mean arterial pressure, heart rate, epinephrine and norepinephrine levels remained significantly lower than pre-induction values following the insertion of the PLMA especially in patients with cardiovascular disease where the least stress responses could be beneficial.[9] The cardiovascular response to application of laryngoscopy and endotracheal intubation was twice as much as application of LMA and hemodynamic and catecholamine response were found to be minimal with LMA insertion.[10] The increased catecholamine level is associated with the intensity of the stimulus exerting against the base of the tongue, arterial hypertension and tachycardia during direct laryngoscopy.[11]

In the current study, blood cortisol measurements were performed preoperatively, 1 min after intubation, 15 min after CO_2 insufflations and after extubation to assess the stress response to PLMA, SLMA and ETT insertion during general anesthesia. There was no statistically significant difference between the preoperative measurements of cortisol levels in the groups. The cortisol levels 1 min after intubation in group ETT was significantly higher than the cortisol levels measured in group PLMA and SLMA. However in the group PLMA and group SLMA, while there was no change in cortisol level after intubation, 15 min after CO_2 insufflations and after extubation, cortisol levels were found to be higher than the levels measured preoperatively.

Table 3: Peak Pressure values

	Group ETT	Group PLMA	Group SLMA	P value
	Mean (SD)	Mean (SD)	Mean (SD)	
1 min after intubation	19.25±5.68	17.80±6.78	18.55±4.15	0.720
Prior to CO_2 insufflation	22.10±6.81	19.55±4.65	19.65±5.51	0.288
15 min after CO_2 insufflation	27.75±6.15	25.10±5.24	25.70±5.86	0.320

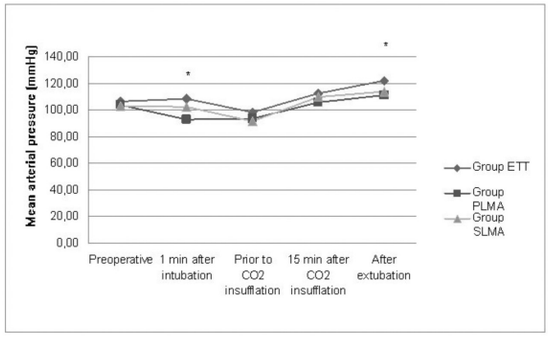
The major cause of sympathoadrenal response after tracheal intubation is the tissue irritation in the supraglottic area stimulated by direct laryngoscopy.[12]

In our study, to assess the ventilation changes, SpO_2 and $etCO_2$ parameters are determined. There was no significant difference between the SpO_2 values measured concurrently in the groups. In the group ETT and group PLMA, the SpO_2 levels 1 min after intubation and before CO_2 insufflations were found to be higher than the SpO_2 levels measured preoperatively. In the group SLMA, SpO_2 levels 1 min after intubation was significantly higher than the preoperative SpO_2 levels. Likewise concurrent et CO_2 levels between groups were not significantly different. In each group, $etCO_2$ level 1 min after intubation

Table 4: Levels of Cortisol in groups

	Group ETT	Group PLMA	Group SLMA	P value
	Mean (SD)	Mean (SD)	Mean (SD)	
Preoperative	12.92±3.99	13.68±4.73	14.02±4.86	0.542
1 min after intubation	16.22±3.22	13.89±6.76	13.25±6.14	0.04
15 min after CO_2 insufflation	19.74±7.86	21.24±6.15	20.88±6.26	0.589
After extubation	28.96±7.49	26.01±6.67	27.89±7.42	0.183

+Cortisol reference range: 6.7- 22.6 mcg/dL



* p < 0.05 Group PLMA compared to ETT group

Figure 1. Mean Arterial Pressure measurements of groups

was found significantly to be higher than the level before CO_2 insufflations. In the group PLMA and group SLMA, $etCO_2$ level 15 min after CO_2 insufflations was significantly higher than the level 1 min after intubation. There was no significant difference between the groups in terms of SpO_2 and $etCO_2$ levels.

Maltby and colleagues measured SpO_2, $etCO_2$, airway pressure and gastric distention in a study to investigate whether PLMA and LMA can be alternatives to ETT in gynecological laparoscopy cases. They reported that PLMA and LMA can be safety used in gynecological laparoscopy cases.[13]

80 patients aged between 18-80 year with ASA I-II were included in the study by Brimacombe and colleagues.[5] In the study where PLMA and LMA were compared in laparoscopic cholecystectomy, it was supposed that PLMA is safer than

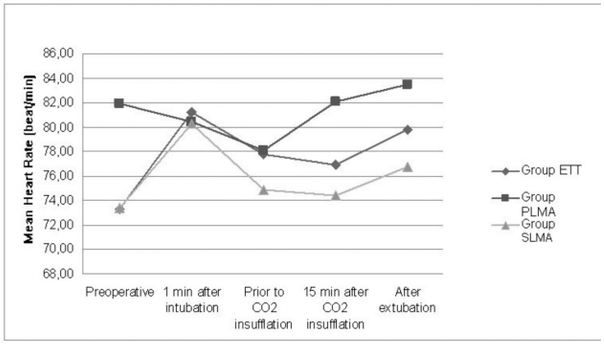


Figure 2*:* Heart rate measurements of groups

the LMA in terms of SpO_2 and $etCO_2$.

Maltby et al compared PLMA and ETT to assess pulmonary ventilation and gastric distention during laparoscopic cholecystectomy.[4] In non-obese patients, they concluded that PLMA provided similar pulmonary ventilation and no difference in gastric distention when compared to ETT. Cook TM and colleagues reported two patients with difficult airway in intensive care unit to have airway maintenance with PLMA without any complication until opening of percutaneous tracheostomy.[14]

In our study peak pressure values in the groups did not differ significantly. In each three group, peak values when compared to 1 min after intubation, peak values measured 15 min after CO_2 insufflations were found to be significantly higher than the values measured 1 min after intubation. In another study where PLMA and LMA were compared in laparoscopic cholecystectomy cases, the mean of Pmax was 18 cmH_2O before carboperitoneum and 24 cmH_2O during carboperitoneum with PLMA.[15]

We measured pH in our study in stomach and nasopharynx and they were not different between groups before and 15 min after CO_2 insufflations with respect to gastroesophageal reflux. No pH change was determined in each three group after carboperitoneum to weigh on gastroesophageal reflux.

Keller and colleagues examined in cadavers the aspiration of regurgitated fluid by using PLMA.[16] They measured the fluid volume and esophagus pressure below (inside esophagus) and above (oropharynx) PLMA with the drainage tube clamped (PLMA clamped) and unclamped (PLMA unclamped) over a range of cuff volumes. They concluded that with the esophagus drainage tube in cases where intraabdominal pressure is high, the regurgitated fluid flow from tube preventing passing to nasopharynx and causing airway protection.

PLMA may be applied in laparoscopies and lower abdominal surgical interventions, but it sho-

uld not be applied in patients with increased aspiration risk.[17] Gastric aspiration secondary to malposition during laparoscopic cholecystectomy in one patient was reported with PLMA application. Therefore the control of gastric drainage tube and its position is greatly important.

In the current study to assess side effects between groups, we noted sore throat, hoarseness and dysphagia at postoperative 1 hour and 24 hour. Although the distribution of sore throat and dysphagia at postop 1 hour and 24 hour in each group was not statistically different, the number of patients expressing low level dysphagia in group ETT at postop 1 hour was found to be higher than that of the other two group. Hoarseness at postop 1 hour was significantly different between groups. The distribution of hoarseness at postop 1 hour in the group ETT is found to be different than the other two groups as being higher than the others. Postop 24 hour hoarseness is not significantly different between groups.

Patients were examined before and 18-24 hour after postanesthesia care and asked for sore throat, hoarseness and dysphagia in a study of Brimacombe and colleagues where PLMA with classic LMA were compared in 384 adult patients with ASA I-II undergoing general anesthesia for minor surgical interventions in a multicentre trial. [5] Symptoms were graded as low/moderate/high and the incidences were similar in all groups concluding that greater sample size is required. In another prospective study SLMA application to 30 female patients with normal airway examination, three of them experienced sore throat (10%) and none of the patients described hoarseness and dysphagia.[18]

We compared PLMA and SLMA with respect to insertion time and insertion rates. The mean insertion times of the groups were not significantly different. Mean insertion time for PLMA was 31.90±3.54 sec, and for SLMA 32.90±4.67 sec. In group PLMA, insertion was successful in the first attempt in 28 patients (70%), in second attempt in 8 patients (20%) and third attempt in 4 patients (10%). In group SLMA, insertion was successful in the first attempt in 32 patients (80%), in second attempt in 6 patients (15%) and third attempt in 2 patients (5%). During insertion of PLMA, a metal apparatus called introcuder is used to facilitate the insertion.

In the study by Timmerman and colleagues 30 patient with general anesthesia was applied SLMA.[18] They reported that they were successful in first attempt in 27 patient (90%), the rest 3 was in the second attempt (10%).

LMA was found to be easier and quicker to insert at first attempt, but without considering difficulty in insertion of PLMA, after third attempt success rate of PLMA and LMA were similar. [5] These studies are parallel to our findings.

In our study, after intubation, as a result of bradycardia in total of 4 patients, 2 in group PLMA and 2 in group SLMA, were treated with 0.5 mg iv atropine. Intraoral positions were verified by orogastric tube was insertion to all PLMA and SLMA patients.

In 12 patients, respiratory rate was increased 15 min after CO_2 insufflations as etCO_2 levels were recorded ?40 mmHg. In two patients where it continued, it was asked surgical team to lower intraabdominal pressure. In 2 patients in group ETT, bronchospasm was observed. A total of 3 patients had vomiting after extubation; 1 patient in group ETT and 2 patients in group SLMA, however no aspiration was observed.

CONCLUSION

In our study, it was shown that PLMA and SLMA caused lesser stress response and side effects when compared to ETT application. There was no significant difference between PLMA and SLMA with respect to ventilation parameters, gastroesophageal reflux, insertion rate and attempts. As a result, we concluded that PLMA and SLMA can be preferred instead of endotracheal intubation in laparoscopic surgical cases.

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