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Comparison of intravenous lidocaine and intravenous lidocaine/paracetamol in prevention of postoperative sore throat after laryngeal mask insertion

Laringeal maske yerleşim sonrası postoperatif boğaz ağrısı sıklığının önlenmesinde intravenöz lidokain ve intravenöz lidokain/parasetamol kombinasyonunun karşılaştırılması

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Abstract

Aim: Postoperative sore throat after general anesthesia with laryngeal mask airway is a common and undesirable complication. There are many agents and methods to prevent this complication. However, there is no study comparing intravenous lidocaine and lidocaine-paracetamol combination in the literature. The objective of this study was to compare the effects of systemic lidocaine and systemic lidocaine-paracetamol combination on postoperative sore throat in patients who underwent general anesthesia with laryngeal mask airway.

Methods: A total of 80 patients aged over 18 years with ASA I-III who underwent elective inguinal hernia surgery under general anesthesia with laryngeal mask airway were included in this cross-sectional study. Group LidoPara was administered 1 mg kg^{-1} lidocaine + 10 mg kg^{-1} paracetamol, and Group Lido, 1 mg kg^{-1} lidocaine. Resting and swallowing sore throat and hoarseness were evaluated with a 4-point scale at the postoperative 0^{th}, 2^{nd}, 4^{th}, and 24^{th} hours.

Results: Demographic data of the patients were similar (P>0.05). There was no statistically significant difference between the two groups in terms of resting and swallowing sore throat at the postoperative 0^{th}, 2^{nd}, 4^{th}, and 24^{th} hours. No hoarseness was found in both groups at the postoperative 4^{th} and 24^{th} hours.

Conclusion: Combined paracetamol and lidocaine was found to affect postoperative resting and swallowing sore throat similar to lidocaine alone.

Keywords: General anesthesia, Laryngeal mask airway, Lidocaine, Paracetamol, Sore throat

Öz

Amaç: Laringeal maske airway ile genel anestezi sonrası postoperatif boğaz ağrısı sık görülen ve istenmeyen bir komplikasyondur. Bu komplikasyonu önlemek için literatürde pekçok ajan ve metod vardır. Fakat lidokain ve lidokain-parasetamol kombinasyonunu karşılaştıran bir çalışma yoktur. Bu çalışmanın amacı laringeal maske airway ile genel anestezi uygulanan hastalarda, sistemik lidokain ile sistemik lidokain-parasetamol kombinasyonunun postoperatif boğaz ağrısı üzerine etkilerini karşılaştırmaktır.

Yöntemler: Kesitsel çalışmaya laringeal maske airway ile genel anestezi altında elektif inguinal herni cerrahisi olan, 18 yaşından büyük ASA fiziksel statüsü I-III olan 80 hasta dahil edildi. LidoPara grubuna 1mg/kg lidokain+10 mg/kg parasetamol, Lido grubuna 1mg/kg Lidokain uygulandı. Postoperatif 0, 2, 4 ve 24. saatlerde istirahat ve yutma boğaz ağrısı ve ses kısıklığı 4 puanlı bir skala ile değerlendirildi.

Bulgular: Hastaların demografik verileri benzerdi (P>0,05). İki grup arasında postoperatif 0, 2, 4 ve 24. saatlerde istirahat ve yutma boğaz ağrısı yönünden istatistiksel olarak anlamlı farklılık yoktu. Postoperatif 4. ve 24. saatte her iki grupta da ses kısıklığı yoktu.

Sonuç: Kombine parasetamol ve lidokainin postoperatif istirahat ve yutma esnasındaki boğaz ağrısını tek başına lidokain ile benzer şekilde etkilediği görüldü.

Anahtar kelimeler: Genel anestezi, Laryngeal maske airway, Lidokain, Parasetamol, Boğaz ağrısı

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Introduction

Supraglottic airway devices (SGDs) are a group of airway devices that can be inserted into the pharynx to allow ventilation, oxygenation, and administration of anesthetic gases, without the need for endotracheal intubation. The SGDs used most commonly in the operating room are the laryngeal mask airways (LMAs).

Postoperative sore throat (POST) is one of the most common and predictable complications in patients receiving general anesthesia [1]. The incidence of POST can reach 70% after administration of general anesthesia in patients with LMAs for the safety of airway [2]. POST symptoms peak postoperatively within 2 to 6 hours [3].

In the studies, it has been attempted to reduce the incidence and severity of POST with both non-pharmacological and pharmacological methods [4]. Lidocaine is an agent, used with different methods and concentrations against POST, in which it provides a significant reduction [5].

Paracetamol is a potent analgesic and antipyretic agent used for short-term treatment of acute postoperative pain both in adults and children [6]. It significantly decreases the postoperative need for opioids in pain management [7-9]. However, the number of studies investigating its effects on the incidence of POST is limited. In addition, no study investigating effects of the combination of intravenous lidocaine and paracetamol on the incidence of POST was found.

The objective of this study was to compare the effects of systemic lidocaine and systemic lidocaine-paracetamol combination on POST in patients who underwent general anesthesia with laryngeal mask airway.

Materials and methods

The study was conducted after receiving the necessary approval from the Ethics Committee of Necmettin Erbakan University (2019/2037). In this study, medical records of patients undergoing general anesthesia at the University Hospital between January 2018 and November 2018 were retrospectively reviewed. The eligible participants were accepted as adult patients aged over 18 years who had a physical status of ASA I-III, and underwent elective inguinal hernia surgery lasting shorter than 2 hours, under general anesthesia. Patients with a known allergy to lidocaine and paracetamol, pregnant women, patients who underwent emergency surgery, those have experienced sore throat, upper respiratory tract infection within the last month before the surgery, patients at a high risk for aspiration of gastric content (diabetes, gastroesophageal reflux, body mass index (BMI) > 35), and patients with expected airway difficulties requiring tracheal intubation were excluded from the study.

We calculated that a total of 80 patients (40 patients for each group) would be needed to compare the two groups with 80-90% power, 5% type I error level, and 25% effect size with the *F* test. The sample size needed was estimated from a pilot test. A total of 80 patients were included in the study. Demographic data of the patients (age, height, ASA, gender, weight, Mallampati scores) were recorded and the patients were divided into two groups. All patients were administered 1 mg kg^{-1} IV lidocaine after routine monitoring (peripheral blood pressure, electrocardiography, peripheral oxygen saturation). Both lidocaine (Group Lido) and lidocaine-paracetamol (Group LidoPara) groups were administered transversus abdominis plane block for postoperative analgesia. About 30 min before the end of surgery, patients in the LidoPara group received IV paracetamol (10 mg kg^{-1}). Anesthetic induction was provided with the infusion of propofol (2 mg kg^{-1}) and remifentanil (0.3 µg kg^{-1} min^{-1}). Anesthesia maintenance was provided with desflurane and remifentanil. Neuromuscular blockers were not used in any of the patients. Anesthetic depth was decided according to jaw laxity and eyelash reflex. Patients' airway was provided with classical LMAs, which were inserted according to the instructions of the manufacturer by an experienced anesthesiologist. LMAs size was determined based on the patients' weight in line with the recommendations of the manufacturer.

LMAs were inflated until intracuff pressure, measured with a hand-held pressure gauge, reached 30-44 mmHg. An additional inflation of 5 mL was allowed if an air leakage was detected in 20 cmH_20 (14.7 mmHg) positive-pressure ventilation [10]. After the end of anesthesia, LMA was removed when adequate spontaneous ventilation was established.

Whether LMAs insertion was successful at the first attempt and duration of LMA insertion (minute) was recorded. If LMAs insertion failed after 2 attempts, a different-size LMA was inserted, and whether it was successful was recorded. Endotracheal intubation was performed if LMA insertion failed after 2 attempts. Ventilation setup was made and positive-pressure ventilation was applied after successful LMA insertion (As to provide tidal volume: 6-8 mL/kg; end tidal CO_2: 35-40 mmHg and positive end expiratory pressure (PEEP): 5-8 cm/H_2O). LMA insertion was evaluated with a scale (very easy, easy, difficult, very difficult, impossible) [11].

Complications during and after LMAs insertion (aspiration and regurgitation, hypoxia; peripheral oxygen saturation < 90% with pulse oximeter; bronchospasm, laryngospasm, airway obstruction, cough, gagging, hiccups, subglottic airway device bloodstain, tongue, lips and teeth traumas) were recorded.

Sore throat and hoarseness of the patients were also investigated and recorded at the postoperative 0^{th}, 2^{nd}, 4^{th}, and 24^{th} hours. Sore throat was assessed with a scale as 0: no sore throat; 1: minimal sore throat (complaints of sore throat only on question); 2: moderate sore throat (accompanying sore throat); and 3: severe sore throat (voice change or hoarseness related to sore throat). Hoarseness was evaluated with a scale as 0: no hoarseness; 1: minimal hoarseness (minimal change in the quality of speech given by the patient when questioned); 2 moderate hoarseness (a disturbing change in the speech quality with the patient's view); and 3: severe hoarseness (great change in the quality of speech that was perceived by the observer) [12,13].

Statistical analysis

Data obtained were analyzed using SPSS 18.00 software (Statistical Package for Social Sciences Inc Chicago, IL). Descriptive statistical methods (number, percentage, mean and standard deviation) were used in the evaluation of qualitative

data, and the Pearson chi-square test, in comparison of qualitative data. Conformity of the data to normal distribution was tested with the Kolmogorov-Smirnov test. In the evaluation of quantitative data showing normal distribution, the independent samples t-test was used. A value of $P<0.05$ was considered statistically significant.

Results

A total of 80 patients were included in the study. The mean age was 46.8 (16.9) years in Group LidoPara, and 48.0 (6.5) years in Group Lido ($P=0.749$). Of the patients in Group LidoPara, 30% (n=12) were female and 70% (n=28) were male, while of the patients in Group Lido these rates were 22.5% (n=9) and 77.5% (n=31), respectively. No statistically significant difference was found between both groups in terms of gender ($P=0.446$) and demographic data (Table 1).

The doses of propofol and remifentanil used in the induction of anesthesia were 147.0 (45.4) mg / 17.0 (9.2) µg in Group Lido and 131.8 (40.4) mg / 19.2 (7.1) µg in Group LidoPara respectively ($P=0.121$, $P=0.229$).

The duration of LMA insertion was 1.7 (0.5) minute in Group LidoPara and 1.5 (0.6) minute in Group Lido. No statistically significant difference was found between the groups. Evaluation and success of LMA insertion are given in Table 2.

Table 1: Comparison of demographic data between groups

	Group LidoPara (n=40) mean (SD)/%	Group Lido (n=40) mean (SD)/%	*P*-value
Age (years)	46.8 (16.9)	48.0 (16.5)	0.749
Gender (Female)	12 (30%)	9 (22.5%)	0.446
Weight (kg)	77.2 (17.3)	75.3(13.6)	0.592
Height (cm)	170.7 (10.3)	171.8(8.3)	0.610
ASA I	13 (32.5%)	15 (37.5%)	0.246
II	25 (62.5%)	19 (47.5%)	
III	2 (5%)	6 (15%)	
Mallampati score I	5 (12.5%)	10 (25%)	0.232
II	30 (75%)	23 (57.5%)	
III	5 (12.5)	7 (17.5%)	
MAP(mmHg)	97.3 (12.6)	93.4 (14.7)	0.218
Heart Rate (beats/min)	80.4 (14.1)	75.6 (15.1)	0.152
SpO_2 (%)	96.1 (2.3)	96.6 (2.3)	0.338

MAP: Mean Arterial Pressure, ASA: American Society of Anesthesia score, SpO_2: Peripheral Oxygen Saturation

Table 2: Evaluation of LMA insertion and comparison of the success of insertion between groups

	Group LidoPara (n=40)/%	Group Lido (n=40)/%	*P*-value
LMA placement success			
First Placement Successful	30 (75%)	33 (82.5%)	0.807
Second Placement Successful	5 (12.5%)	4 (10%)	
Different Size LMA First Placement Successful	2 (5%)	1 (2.5%)	
Endotracheal Intubation	3 (7.5%)	2 (5%)	
Evaluation of LMA placement			
Very Easy	27 (67.5%)	25 (62.5%)	0.865
Easy	8 (20%)	10 (25%)	
Difficult	3 (7.5 %)	4 (10%)	
Very Difficult	0 (0 %)	0(0 %)	
Impossible	2 (5%)	1 (2.5%)	
LMA size			
3	2 (5%)	1 (2.5%)	0.436
4	16 (40%)	22 (55%)	
5	22 (55%)	17 (42.5%)	
AIR VOLUME (ml) (Average 30-44 mmHg pressure)	26.4 (5.3)	24.4 (4.7)	0.091

Complications developed during and after LMA insertion were evaluated, and cough was observed in 1 (2.5%) patient, hiccups in 3 (7.5%) patients and subglottic airway device bloodstain in 2 (5%) patients in Group LidoPara, whereas cough was observed in 1 (2.5%) patient, hiccups in 1 (2.5%) patient and subglottic airway device bloodstain in 1 (2.5%) patient in Group Lido ($P=0.634$).

Minimal hoarseness was found in 1 (2.5%) patient in Group LidoPara and 3 (7.5%) patients in Group Lido at the postoperative 0^{th} hour ($P=0.305$). While no hoarseness was observed in Group LidoPara, minimal hoarseness was found in 3 patients in Group Lido at the postoperative 2^{nd} hour ($P=0.07$). No hoarseness was observed in both groups at the postoperative 4^{th} and 24^{th} hours.

The overall incidence of sore throat in groups LidoPara and Lido were 9 (22.5%), and 13 (32.5%), respectively. No statistically significant difference was found between both groups in terms of resting and swallowing sore throat at the postoperative 0^{th}, 2^{nd}, 4^{th}, and 24^{th} hours (Table 3).

Table 3: Comparison of postoperative resting and swallowing sore throat

	Group LidoPara (n=40)	Group Lido (n=40)	*P*-value
Overall incidence	9 (22.5%)	13(32.5%)	0.317
Sore Throat at Rest			
Postoperative 0 h (none/mild/moderate/severe)	34/2/4/0	32/6/2/0	0.256
Postoperative 2 h (none/mild/moderate/severe)	33/3/4/0	30/8/2/0	0.214
Postoperative 4 h (none/mild/moderate/severe)	34/5/1/0	36/3/1/0	0.757
Postoperative 24 h (none/mild/moderate/severe)	40/0/0/0	39/1/0/0	0.314
Sore Throat at Swallowing			
Postoperative 0 h (none/mild/moderate/severe)	33/6/1/0	34/3/3/1	0.365
Postoperative 2 h (none/mild/moderate/severe)	30/7/3/0	25/14/1/0	0.150
Postoperative 4 h (none/mild/moderate/severe)	30/7/3/0	30/8/2/0	0.875
Postoperative 24 h (none/mild/moderate/severe)	38/2/0/0	39/1/0/0	0.556

Discussion

In the present study, no difference was observed between the combined use of intravenous paracetamol and lidocaine, and lidocaine alone in terms of reducing the overall incidence of POST. Combined paracetamol and lidocaine were found to affect sore throat during postoperative rest and swallowing in a similar way to lidocaine alone.

POST is a complication that might occur after insertion of LMA on patients undergoing general anesthesia and is related to mucosal and mechanical damage due to friction. The pressure between the device and LMA cuff pressure may cause irritation in the pharyngeal mucosa during insertion and administration of anesthesia, which lead to inflammation and trigger several postoperative symptoms, such as sore throat, dysphagia, and dysphonia [1]. Although many attempts have been made to reduce the incidence of POST, its prevention has proven impossible [5].

Multimodal approaches for postoperative pain management have been investigated [9,14], but research on the preventive effects of using two different pharmacological modalities on POST is limited.

Intravenous lidocaine has analgesic, antihyperalgesic and anti-inflammatory properties [15]. The exact mechanism of the prevention of a sore throat by I.V. lidocaine is not clearly known. With the use of lidocaine, trachea will not be stimulated during intubation, which may result in less trauma and inflammation of the trachea. The effect of I.V. lidocaine on POST may be attributed to the lack of stimulation of the laryngeal or tracheal mucosa [16]. The mechanism of Lidocaine when alternating neuronal signal conduction, is blockage of the voltage gated Na+ channel, which is responsible for signal propagation. At a certain level of blockade, the postsynaptic nervous membrane would not be able to be depolarized, and action potential would fail to deliver [17].

The use of lidocaine to prevent postoperative sore throat is a common clinical practice. A meta-analysis by Cochrane Collaboration states that topical and systemic lidocaine treatment generally reduces the risk of POST [5].

Paracetamol has an analgesic effect caused by inhibition of cyclooxygenase. Paracetamol is more effective than placebo in reducing symptoms of acute sore throat [18]. When used for postoperative pain, it is usually administered before the procedure [19,20]. Considering that the maximum analgesic effects of paracetamol is reached 1-2 hours after infusion [20], paracetamol was infused about 30 min before the end of surgery in our study to prevent POST.

Based on the fact that the POST mechanism is an inflammatory process due to mucosal and mechanical damage after LMA placement [1], paracetamol was administered in combination with lidocaine in our study. In a similar study, it was shown that combined infusion of paracetamol and dexamethasone reduced the incidence of POST without serious side effects. The protective effects of combined paracetamol and dexamethasone on POST continued for up to 6 hours postoperatively. It reduced the resting POST incidence at the 1st and 6th postoperative hours by 15% and 17%, respectively [21].

Our study had a lower incidence of POST than other studies [22,23]. In our study, the overall incidence of POST in Group LidoPara was 10% lower than in Group Lido. Although the incidence of POST was lower in the LidoPara Group compared to the Lido Group, this decrease was not statistically significant. The severity of POST was assessed at rest and swallowing. Only mild to moderate sore throat was observed in all patients. There was no significant difference between the two groups during rest and swallowing. In our study, no difference between the groups was attributed to the use of lower doses of paracetamol compared to the literature.

Some studies have reported that tracheal cuff pressure may also affect POST formation. After placement of LMAs, the cuff should be inflated to a target cuff pressure of about 44 mmHg or to the minimum pressure required to form an adequate seal [10,24]. In our study, LMA placement method and LMA cuff pressure were standardized in all patients. A superior aspect of this study was that the abdominal plan block was performed in all patients with the assumption that the POST pain score may vary depending on postoperative analgesics given at the end of the operation.

Limitations

This study has several limitations. First, the effects of paracetamol alone could not be evaluated. Second, comparison with a control group could not be made.

Conclusions

Based on many studies reporting benefits of total and systemic lidocaine therapy in reduction of postoperative sore throat, in the present study comparing the effects of the use of lidocaine alone and in combination with paracetamol, the incidence of POST in resting and swallowing was low with both applications, and both methods produced similar results. Postoperative hoarseness was minimal in both groups.

Further high-quality and randomized controlled studies on the use of topical and systemic lidocaine in reduction of sore throat will be useful. Other drug therapies such as steroids and non-steroidal anti-inflammatory drugs can be more actively studied.

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