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Comparison Between Lidocaine Inhalation and Intravenous Dexamethasone in Reducing Postoperative Sore Throat Frequency After Laryngeal Mask Insertion

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Abstract

Background: The frequency of postoperative sore throat (POST) after laryngeal mask airway insertion (LMA) was relatively high. Lidocaine might reduce the pain and inflammatory response. Additionally, inhalation form might result in a better distribution, which results in a better airway analgesia and minimal systemic effect.

Objectives: To compare the incidence of sore throat post LMA insertion after 1.5 mg/kg of lidocaine inhalation and 10 mg of intravenous dexamethasone.

Methods: This was a single-blinded randomized clinical trial, which included 128 patients who underwent ophthalmic surgery under general anesthesia with LMA insertion. Inclusion criteria were individuals 18 - 65 years old, ASA 1 or 2, Mallampati class I or II, and no sore throat before surgery. After University of Indonesia Research Ethical Committee approval and informed consent, all subjects were randomly divided into two groups: lidocaine inhalation group, which would receive lidocaine inhalation 2% 1.5 mg/kg (additional NaCl 0.9% until total 6 mL volume) and intravenous 2 mL NaCl 0.9%, and dexamethasone group, which would received NaCl 0.9% inhalation (6 mL volume) and dexamethasone 10 mg intravenously 10 minutes before LMA insertion. POST incidence and pain severity assessment were done 2 hours postoperatively. Statistical analysis were done with SPSS version 21.

Results: There were 10.9% of subjects in the lidocaine inhalation group and 9.4% subjects in the dexamethasone group who suffer from POST postoperatively ($P > 0.05$). The median of POST pain in the lidocaine inhalation group was 0 (0 - 1), whereas in dexamethasone group it was 0 (0 - 3). This study did not find any side effects on both groups.

Conclusions: Lidocaine inhalation 1.5 mg/kg was proportional to intravenous dexamethasone 10 mg in reducing the incidence and severity of POST after LMA insertion.

Keywords: Laryngeal Mask Airway, Sore Throat, Lidocaine, Dexamethasone

1. Background

The use of laryngeal mask airway (LMA) might decrease the risk of post-operative sore throat (POST), however, the incidence was still was around 6% - 44% (1). Several measures had been considered to reduce the incidence of POST after LMA insertion, including the insertion technique, which compared fully-deflated cuff with partially-deflated cuff and intraoperative pressure control on the LMA cuff (2, 3). Pharmacologic methods were also used, e.g. NSAID lozenges (flurbiprofen) (4), lidocaine gel or spray, topical steroid (betamethasone gel on LMA cuff), and intravenous dexamethasone. However, none of them significantly decreased the incidence of POST (5).

Intravenous dexamethasone remains the common medication used for POST cases and administered as a standard of procedure in some hospitals. Since the existence of golden standard for POST prevention was not yet established, intravenous dexamethasone had been regularly used as comparison. Sun et al. mentioned that intravenous dexamethasone decreased the number and the degree of POST (6).

Lidocaine is one pharmacologic alternative in reducing POST. Lidocaine, given in inhalation form, can work as analgesics, reduces the inflammatory response, especially in the airway, and has less systemic effects. Systemic lidocaine effects ranges widely from a mild headache until decreased consciousness due to elevated toxic metabolite lev-

els of lidocaine. There is lidocaine induced depressed contractility of heart muscles due to disturbance of Na^+ ion channel that might lead to fatal effects, such as hypotension and ventricular fibrillation (7).

2. Objectives

This study aimed to compare the frequency of POST after laryngeal mask insertion after 1.5 mg/kg lidocaine inhalation and 10 mg intravenous dexamethasone given prior to LMA insertion.

3. Methods

This study was a single-blinded randomized clinical trial, which included 128 adults scheduled for ophthalmology surgery with general anesthesia and used LMA as their airway management in the Kirana Eye Center at the Ciptomangunkusumo Hospital Jakarta on April 2017 until May 2017.

The inclusion criteria included men or women aged 18 - 65 years old, physical status American Society of Anesthesiologist (ASA) I or II, person with Mallampati class I or II, no sore throat prior to the procedure, willing to participate, and signed the informed consent. The exclusion criteria included patients with cardiovascular diseases, history of using analgesics or steroids before procedure, former airway and craniofacial surgery, suffering upper airway infections, pregnant, BMI > 30 kg/m^2, actively smoking, and suffering from gastroesophageal reflux. Patients who had LMA insertion attempts more than once, patients had surgery more than 150 minutes, had mechanical ventilation post procedure, vomit during this study, and had complications that led to application of endotracheal tube would be dropped out from this study.

Patients were randomly allocated into two groups, lidocaine inhalation group and dexamethasone group, with simple random sampling method. Ten minutes before induction, after intravenous catheter 18G or 20G and standard monitor had been applied, patients in lidocaine inhalation group would had lidocaine inhalation 2%, 1.5 mg/kg (additional NaCl 0.9% 2 - 3 mL in total 6 mL volume) and intravenous 2 mL NaCl 0.9% by using disposible inhalation mask for 5 - 10 minutes. Patients in dexamethasone group would have NaCl 0.9% inhalation (NaCl 0.9% 6 mL) in a similar way and additional intravenous dexamethasone 10 mg. All medications were prepared by pharmacist and concealed from patients and researcher. Anesthesia induction was performed with midazolam 0.05 mg/kg, fentanyl 2 mcg/kg, propofol 1% 2 mg/kg, and atracurium 0.5 mg/kg. LMA was then lubricated with NaCl 0.9% and insertion attempts were done by senior and competence anesthesiology residence with a standard way 3 minutes after atracurium injection; LMA cuff was inflated with cuff pressure $\pm$ 40 mmHg. After the LMA was in its good position and no air leakage found, LMA was fixed and secured. Anesthesia maintenance was done with O_2 50% compressed air-isoflurane 1.2% atracurium. A total of 30 minutes before the end of the surgery, 1 gram of intravenous paracetamol was administered. After a reversal of muscle relaxant with 0.04 mg/kg, atropine 0.02 mg/kg, and the patient could breathe spontaneously, LMA cuff would be deflated and patients would be extubated. In the recovery room, two hours after the surgery and patients had been fully alert (Aldrette score 10), POST incidence and severity were recorded.

Data was collected and analyzed with Statistical Package for Social Scientists version 21.0. Categorical data was analyzed with Chi-square test or Fischer test if the expected count data of less than five exceeded 20%.

4. Results

Demographic characteristics of the subjects, consisting age, gender, bodyweight, height, body mass index (BMI), physical status ASA (American Society of Anesthesiologist), and surgery duration on both groups (Table 1).

Assessment on frequency of POST after LMA insertion, according to numerical rating scale (NRS), and done in two hours post procedure (Table 2). The median pain scale at rest in the lidocaine group was 0 (0 - 1), which was not statistically different with median pain scale in dexamethasone group, which was 0 (0 - 3). The median swallowing pain scale in the lidocaine group was 0 (0 - 4), which was not statistically significant different (Table 3).

There was no mouth or tongue stiffness or irritation as lidocaine inhalation side effects were found. In the lidocaine inhalation group, mild till moderate bitterness was reported by several patients. Since it was not expected in the beginning of the study, any detail information and statistical calculation regarding this condition were not included.

5. Discussion

POST was a complication that might occur after insertion of LMA on patients undergoing general anesthesia, and was related to mucosal damage and mechanical damage due to friction and pressure between the device and LMA cuff pressure with pharyngeal mucosa during insertion and anesthesia, which lead to inflammation and triggered several postoperative symptoms, such as sore throat, dysphagia, and dysphonia (8, 9).

Table 1. Characteristics of Trial Subjects

	Lidocaine Inhalation Group (N = 64)	Intravenous Dexamethasone Group (N = 64)
Age[a], y	43.5 (17 - 63)	43.5 (17 - 65)
Gender[b]		
Male	37 (57.8)	36 (56)
Female	27 (42.2)	28 (43.8)
Height[a], cm	164.5 (155 - 172)	163 (144 - 174)
Body weight[a], kg	60 (52 - 72)	60 (45 - 80)
Body mass index[c], kg/m^2	22.04 ± 1.12	22.53 ± 2.11
Physical status ASA[b]		
ASA 1	25 (39.1)	21 (32.8)
ASA 2	39 (60.9)	43 (67.2)
Surgery time[a], min	65 (35 - 105)	70 (30 - 105)

[a]Values are expressed as median (minimum value - maximum value).
[b]Values are expressed as No. (%).
[c]Values are expressed as mean ± SD.

Table 2. Comparison of POST Frequency After LMA Insertion[a]

POST on second hour	Lidocaine Inhalation Group (N = 64)	Intravenous Dexamethasone Group (N = 64)	P Value[b]
No	57 (89.1)	58 (90.6)	0.500
Yes	7 (10.9)	6 (9.4)	

[a]Values are expressed as No. (%).
[b]Chi-square test.

Table 3. Comparison of POST Pain Scale After LMA Insertion[a]

	Lidocaine Inhalation Group	Intravenous Dexamethasone Group	P Value[b]
Pain scale at rest (NRS)	0 (0 - 1)	0 (0 - 3)	0.134*
Pain scale at swallowing (NRS)	0 (0 - 2)	0 (0 - 4)	0.899*

[a]Values are expressed as median (minimum value - maximum value).
[b]Mann-Whitney test.

Lidocaine and dexamethasone could be used to prevent and reduce inflammation due to mucosal damage. Lidocaine also had an analgesic effect that could reduce pain (10, 11). Lidocaine alternate neuronal signal conduction, by blocking the voltage, gated Na^+ channel, which was responsible for signal propagation (12). In a certain amount of blockade, postsynaptic nervous membrane would fail to be depolarized, and potential action would fail to deliver (7). Lidocaine has its anti-inflammation action by decreasing inflammatory mediators, i.e. leukotriene B_4, which stimulates polymorph nucleus leukocytes (PMN) (13).

Dexamethasone, on the other hand, could reduce POST frequency after LMA insertion by its ability to inhibit leukocytes migration to inflamed tissues and inhibiting the release of cytokines by maintaining cell integrity. Dexamethasone also inhibited arachidonic acid metabolism and leukotriene B_4 production as well as prevented interleukin-2 formation. Zhou found that dexamethasone 0.2 mg/kg bodyweight intravenously could reduce significantly POST frequency after LMA insertion (14, 15). Nevertheless, dexamethasone should be carefully administered due the hypertension, peptic ulcer, and increased insulin effects (16).

This study found that the use of lidocaine inhalation and intravenous dexamethasone was equally effective in reducing POST frequency after LMA insertion. POST severity was assessed at rest and during swallowing. We found that all patients only suffered in mild pain (pain score < 4) at rest and during swallowing; there was no significant difference between the two groups (Table 3). The low POST severity score in all subjects might be due to postoperative analgesic, paracetamol that was given at the end of

surgery.

Although lidocaine inhalation was given preoperatively, lidocaine inhalation effect could extend and still equal to dexamethasone postoperatively. This might be due the shorter duration of surgery in this study, which were all less than 105 minutes, and still in lidocaine half-life time i.e. 150 minutes. Lidocaine inhalation effect to prevent POST in surgery longer than 150 minutes should be investigated further. If the POST is mainly due to inflammation after LMA insertion, lidocaine should still have its effect postoperatively.

We found no irritation, stiffness, and allergy as lidocaine inhalation side effects. Several patients in this study stated that they had a mild to moderate bitterness taste, however, it was still tolerable.

Lidocaine inhalation and intravenous dexamethasone can easily be obtained in hospitals. However, lidocaine inhalation could become an alternative to dexamethasone, and reducing systemic corticosteroid side effects. Lidocaine inhalation was also easily applied, had a quick onset, with minimal systemic effect, inexpensive, and has no airway irritation effect.

However, this study had several limitations. Assessment was done once and only in the second hour postoperatively due to high POST frequency in this period. Further studies should be done within the first 24 hours. Additionally, the blinding mechanism was confounded by the fact that lidocaine inhalation generated mild to moderate bitterness taste. Therefore, further studies should evaluate the after taste of the lidocaine inhalation.

5.1. Conclusion

Administration of 1.5 mg/kg lidocaine inhalation was comparable to 10 mg intravenous dexamethasone in reducing POST frequency after LMA insertion. There was no lidocaine inhalation side effects found in this study.

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