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Study on nebulized or sprayed lidocaine as anesthesia for esophago-gastro duodenoscopy (EGD)

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Abstract
Endoscopy of the gastro intestinal tract is an invasive technique resulting in gag reflex, bradyarrhythmias and unpleasant symptoms. This study aimed to comparison of the effectiveness; successful completion of the endoscopic procedure of spraying and nebulized lidocaine for patients undergoing endoscopy and patient respone to topical pharyngeal anesthesia (TPA). A total of 220 patients undergoing elective EGD, with a history of neither lidocaine intolerance nor irritable airways due to smoking, chronic obstructive pulmonary disease (COPD), upper respiratory infection, asthma, cardiac and pulmonary diseases and allergy to lidocaine were included. All patients were randomized into two groups: A where 5 puffs (10 mg/puff) of spraying lidocaine were administered four times at 5-minute intervals, up to a total dose of 200 mg, and B-where 250 mg of nebulized lidocaine was administered via a nebulization. The co-researcher assessed the ease of esophageal instrumentation as either difficult, poor, fair or excellent. Both the endoscopist and the patients expressed their satisfaction by using the numerical rating scale The endoscopist expressed her satisfaction with instrumentation, which showed no significant difference between group A and group B as 83.6$\pm$8.3 and 81.5$\pm$10.6, respectively. However, nebulized lidocaine had significant advantages over spraying lidocaine, with better acceptance in patients undergoing EGD. Nebulized Lidocaine is equally effective to spraying lidocaine in terms of endoscopist response to EGD but is more tolerable to patient in terms of administration, taste of medication, sensation and post procedural sore throat and dysphagia.

Keywords: Esophago-gastro-duodenoscopy, topical pharyngeal anesthesia, sprayed lidocaine, COPD

Introduction
Endoscopy of the gastro intestinal tract is an invasive technique resulting in gag reflex, bradyarrhythmias and unpleasant symptoms. Esophago-gastro duodenoscopy (EGD) is performed under the topical anesthesia of the pharynx or parenteral administration of sedative drugs [1, 2], or both. Topical pharyngeal anesthesia (TPA) and/or conscious sedation are used in patients before the procedure. Conscious sedation increases the patient's tolerance and acceptance for EGD [3]; however, it has several disadvantages, such as prolonged duration of the procedure, increased cost, and increased complication risk [4]. TPA eases endoscopy in the absence of conscious sedation [5, 6]. Lidocaine is most commonly used for topical anesthesia. The gel, spray, and inhaler forms of lidocaine are commercially available, and the spray form is more preferred [7, 8]. There is no satisfactory study regarding the form having a better efficacy.

An effective topical anesthesia significantly reduces patient discomfort, thereby making it easier for the patient to tolerate the operation and providing a comfortable working environment for physicians and nurses. For therapeutic procedures total intravenous anesthesia (TIVA) is used but for diagnostic procedures TPA is a good alternative to conscious sedation. Spraying lidocaine was found to be an annoying maneuver to patients, since it might produce an unexpectedly stressful reflex with pain during swallowing. Some patients complained of pungent taste or smell of drug flowing in their throat [9, 10]. Some gastroenterologist experience dissatisfaction during the instrumentation [11]. Moreover, the efficacy of lidocaine appeared to decrease in cases of patient's hyper secretion or anatomical variability as well as quick swallowing of the drug [2].

Nebulized lidocaine has been claimed usefulness in modalities such as bronchoscopy, endobronchial culture without any complications, or patient discomfort [12, 13]. Though lidocaine has a very low blood level because of nebulization, it dramatically decreases

systemic pain [14]. Interestingly, nebulized lidocaine appeared efficient in suppressing gags and cough reflexes as well as airway anesthesia [15]. This study aimed to comparison of the effectiveness; successful completion of the endoscopic procedure of spraying and nebulized lidocaine for patients undergoing endoscopy and patient response to TPA.

Material & Methods

A total of 220 patients were enrolled in the study between January 2018 and January 2019. The patients were recruited at the outpatient clinic (OPD) by the co-researcher on the day of appointment. The project was explained in detail to the participants who were interested in the project. All patients took home all documents to study the information. Inclusion criteria were patients aged between 18 and 65, underwent elective EGD, American Society of Anesthesiologist (ASA) physical status class I/II, without a history of lidocaine intolerance, and able to complete questionnaires. Exclusion criteria were patients with irritable airways due to smoking, chronic obstructive pulmonary disease (COPD), upper respiratory tract infection, or asthma, cardiac or pulmonary diseases, and allergy to lidocaine. Withdrawal or termination criteria were patients' refusal to continue under the study, bronchospasm, signs of lidocaine overdose or toxicity including tinnitus, light-headedness, circum-oral numbness, visual disturbances, involuntary muscle spasm, convulsions, cardiac depression, and cardiac arrest.

At the endoscopy center on the day of EGD, the volunteers signed the informed consent. All patients were randomized into two groups as A-spraying lidocaine and B-nebulized lidocaine. No premedication was given. Intervention in group A, the co-researcher administered five puffs of spraying lidocaine (10 mg/puff) four times at 5-minute intervals, up to the total dose of 200 mg. The drug was sprayed at the tonsils, anterior pillars, and base of tongue. In group B, patients in the semi-sitting position received 250 mg of nebulized lidocaine via a nebulization kit with 7 liter per minute (LPM) of oxygen via face mask for 15 minutes. The administration of lidocaine in both groups was finished five minutes before the start of EGD. A supplemental oxygen (3 LPM) via nasal cannula was administered to all patients who had already been monitored with electrocardiography (EKG), heart rate (HR), pulse oximetry (SpO2), and non-invasive blood pressure (NIBP) every five minutes. The procedure was performed by endoscopist. During procedure, the co-researcher who was blinded to the lidocaine administration technique assessed the ease of esophageal instrumentation as following [19]; difficult, poor, fair or excellent. Step 1 = Difficult for esophageal instrumentation was defined as patient refused esophageal instrumentation. Step 2 = Poor was defined as patient had gag reflex and needed sedation. Step 3 = Fair was defined as patient had mild gag reflex. Step 4 = Excellent was defined as patient had no gag reflex. After the procedure, the endoscopist assessed the ease of esophageal instrumentation by using the Numerical Rating Scale (NRS: 0-100), with 0 being difficult and 100 being easy. In addition, expressed his satisfaction with the lidocaine administration technique by using the NRS 0-10 with 0 being dissatisfied and 10 being satisfied; the topics of time to start the procedure; instrumentation technique; gag reflexes during the procedure; presence of hyper secretion; and smooth operation. The patients were delivered to the recovery room for 1-hour observation of vital signs and other complications. Before discharge, the co-researcher interviewed the patients using the questionnaires for their satisfaction with the topical anesthesia techniques by using NRS 0-10, with 0 being dissatisfied and 10 being very satisfied; the topics of sensation during drug administration; taste of medication; sensation during the instrumentation; sensation after drug administration; willingness for drug administration; sore throat; and dysphagia.

The data were expressed as mean and standard deviation. The categorical variables were carried out using the Chi-square test. The interval variables between the two groups such as NRS were compared using the independent t-test. Finally, p-value less than 0.05 with 95% confidence interval was considered statistically significant difference. Written informed consent was obtained from the patient for publication of this study.

Results

Demographic data including sex, age, weight, height, ASA physical status, allergy, history of EGD and/or EGD under anesthetic technique were not significant differences between the two groups (Table 1). One hundred and ten patients were randomized into two groups.

Table 1: Baseline demographic characters of study group.

	Group A (112)	**Group B (108)**	**'P' Value**
Age	49.5 ± 10.67	52.5 ± 8.3	0.103
sex (M:F)	66:46	60:48	0.847
Weight (Kg)	45.5 ± 9.23	42.5 ± 7.83	0.07
Height (Cm)	156 ± 8.6	154 ± 7.3	0.19
ASA Physical Status			0.84
1	48	42	
2	64	66	
Allergy	4	3	0.9
Smoking	3	4	0.71
Previous EGD	10	12	0.637

The endoscopist expressed to the procedural effectiveness: satisfaction score with instrumentation, which showed no significant difference between group A and group B respectively (Table 2).

On patient response to endoscopy, sensation during drug administration remain same however, for other categories, namely sensation during instrumentation, taste of medication, sensation after drug administration, willingness for drug administration, incidence of sore throat and dysphagia, they performed better than group B. Patients still chose either spraying or nebulized lidocaine for EGD (Table 3).

Table 2: Endoscopist response to ease of Endoscopy

		Group A (112)	**Group B (108)**	**'P' Value**
Endoscopist responses		83.6±8.3	81.5±10.6	0.102
	Difficult	10	12	0.65
	Poor	30	20	0.15
	Fair	26	30	0.44
	Excellent	46	46	0.89

Table 3: Patient response to Endoscopy

		Group A (112)	Group B (108)	'P' Value
Patient Response				
	Sensation during drug administration	8 ± 1.8	7.4 ± 2	0.1
	Taste of medication	6 ± 1.23	8 ± 1.5	0.0001
	Sensation during the instrumentation	6 ±1.79	8 ± 1.34	0.0001
	Sensation after drug administration	7 ± 1.4	8 ± 1.7	0.001
	Willingness for drug administration	8 ± 1.3	8 ± 1.5	0.9
	Sore throat	7 ± 1.13	8 ±1.1	0.001
	Dysphagia	7 ± 1.2	8 ±1.4	0.006
Treatment of Cho ice				0.71
	Yes	106	100	
	No	6	8	

Discussion

Goal of the anesthesiologist in upper gastrointestinal endoscopy is to facilitate the work of the endoscopist. Gastrointestinal endoscopy under topical anesthesia without sedation is preferred by some endoscopist rather than sedation as a cost restraint procedure. Spraying lidocaine seemed to be a practical maneuver for the surgeon to deal with the patients during the procedure. This finding is well-accepted by many operators. Korttila *et al* (1991) [16]. Administered spraying lidocaine and ultrasonic nebulization in patients underwent bronchoscopy and found that spraying lidocaine was more efficient than ultrasonic nebulization [16]. Hedenbro *et al* (1992) [5] claimed that after topical anesthesia of the pharynx with spraying lidocaine, endoscopists expressed less discomfort from the intubation and satisfied with the technique [5]. Amornyotin S. *et al* (2009) [17] studied patients undergoing EGD using viscous and spraying lidocaine and found that spraying lidocaine led to better tolerance and ease of intubation as well as high patients' satisfaction and pain scores [17]. In a recent study by Noitasaeng *et al* they had shown that lignocaine spray is better than nebulization in term of endoscopist response [18].

But in contrast to previous study which showed better response of spray than nebulization, there was no difference between endoscopist response to either lignocaine spray or nebulization in present study as they respond to similar fair & excellent endoscopy satisfaction. However, spraying lidocaine carries some adverse effects. It can cause discomfort among patients needing to open their mouths widely while the drug is sprayed over the surrounding areas. Hsin-I Tsai *et al* (2012) [9] studied patients under moderate to deep sedation for diagnostic gastroscopy and found that topical pharyngeal anesthesia with lidocaine yielded an irritating sensation and a bitter taste to patients [9]. While Dhir *et al* (1997) [2] had contrary result and compared lidocaine with placebo in unsedated patients undergoing EGD and claimed that the spraying lidocaine did not ease the procedure and the reason was of the difficulty of spraying lidocaine over the mucosa or the presence of saliva, or because patients swallowed the drug immediately, the pharynx was only partially anesthetized [2]. Frosh *el al* (1998) [19] stated that their patients experienced a bad taste after lidocaine spraying [7]. Compared to spraying nebulized lidocaine was well-accepted, since the technique is familiar (Oxygen administration via face mask). Major previous work on nebulized lidocaine was on bronchoscopy. Williams *et al* (2005) [20] used nebulized lidocaine in unsedated patients for awake fiber-optic intubation and claimed that lidocaine nebulization was acceptable among patients [20]. Keane *et al* (1992) [21] stated that nebulized lidocaine had significant advantages over spraying lidocaine, with better acceptance in patients undergoing fiber-optic bronchoscopy [21]. Therefore, it was a convenient, well-tolerated method of drug delivery for upper airway endoscopy. For the EGD, previously it was thought that spraying lidocaine was dramatically more effective than nebulized lidocaine. However, patients expressed more satisfaction with nebulized lidocaine administration during instrumentation, taste of medication, sensation after drug administration, willingness for drug administration, less incidence of sore throat and dysphagia while endoscopist response was similar to both.

The major limitation of the study is that we were unable to measure the blood lidocaine levels in both groups. Since most nebulized lidocaine is deposited along the upper airway passage, its concentration used in topical anesthesia is still to be assessed and dose of optimal effect for EGD need to be studied.

Conclusion

Nebulized Lidocaine is equally effective to spraying lidocaine in terms of endoscopist response to EGD but is more tolerable to patient in terms of administration, taste of medication, sensation and post procedural sore throat and dysphagia. Study has practical implication in term of patient tolerability while not compromising on endoscopist requirements for smooth endosocopy.

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