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Research Article

Comparison of the Effect of Propofol Plus IV Lidocaine versus Propofol Plus Topical Lidocaine Spray on Decreasing Gag Reflex in Upper GI Endoscopy: A Clinical Trial

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ABSTRACT

Background: Upper GI endoscopy is a diagnostic and therapeutic procedure widely used across the world. Some patients, however, experience a great deal of discomfort during the procedure, which is mainly due to activation of the gag reflex. Therefore, topical pharyngeal or general anesthesia is applied to reduce the gag reflex during endoscopy. This study aimed to compare the effect of IV lidocaine versus topical lidocaine spray in reducing the gag reflex in patients sedated with propofol.

Methods: This randomized clinical trial was conducted in Imam Khomeini Hospital in 2017. One group of patients received propofol at a dose of 0.5-1 mg/kg plus lidocaine spray and the other group received propofol at the same dose plus IV lidocaine at a dose of 1 mg/kg (maximum 100 mg). Patients in both groups also received 50 µg fentanyl. The variables of gag reflex (using the VAS), patient and physician satisfaction, length of endoscopy, vital signs, and adverse effects were compared between the two groups.

Results: Ninety-three patients were evaluated in this study, of whom 42 (45.2%) were men and the rest were women (n=51, 54.8%). ANOVA was used to evaluate the effect of type of anesthesia on the final level of gag reflex and the results showed lack of any significant difference between the two groups (P>0.05). Patient satisfaction was higher in the IV anesthesia group (P= 0.036) and the physician satisfaction was higher in the topical anesthesia group (P= 0.027). Among vital signs, only SBP showed a modest difference between the two groups and was significantly higher in the topical anesthesia group (P=0.04). There was no significant difference in the rate of adverse effects between the two groups (P> 0.05).

Conclusion: Topical anesthesia using lidocaine spray is as effective and safe as IV lidocaine in decreasing the gag reflex in upper GI endoscopy in patients sedated with propofol.

Upper gastrointestinal (GI) endoscopy is a technique for investigating the GI tract and a therapeutic method for some GI diseases. The rate of adverse events following upper GI endoscopy is 1 in every 200 to 10,000 cases and the mortality rate of this technique is 1 in 2000 cases. The most important adverse events following upper GI endoscopy are cardiopulmonary complications, infection, and GI tract perforation and hemorrhage [1-3]. Upper GI endoscopy requires anesthesia and analgesia along the path of the endoscope to prevent the gag reflex and make sure of the patient's comfort during the procedure. Selection of a proper analgesic and anesthetic largely depends on the physician's experience and patient's preference, and an agent and a method with the fewest side effects and highest patient comfort is usually selected which are reflected in several studies [4-7]. Different drugs like propofol, lidocaine, bupivacaine, etc. are available for

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anesthesia that can be used intravenously or topically as spray. Each of these drugs and their administration routes has its advantages and disadvantages. The advantages of local spray include a lower rate of hypoxia and conscious sedation but the patient tolerance is poor as compared to the deep level of anesthesia. Moreover, other problems with lidocaine spray are a bitter taste during the procedure and a sore throat after it due to the additives in the lidocaine spray, which is a major source of complaint by patients. People who usually undergo topical laryngeal anesthesia once resist it for the second time. For this reason, some endoscopy centers use IV lidocaine. However, deep level of anesthesia is not risk-free and sometimes causes serious complications like hypoxia and arrhythmias. General anesthesia, in addition to the need for special equipment, is time-consuming and expensive [8-9].

Since the gag reflex affects the comfort of the patient and endoscopist, we performed this study to evaluate the effect of IV and topical lidocaine in decreasing the gag reflex.

Methods

This randomized clinical trial was accredited by the ethical committee of the hospital (Ethical code: IR.TUMS.IKHC.REC.1396.3014) and department of anesthesiology, and conducted on 100 patients randomly assigned to two groups in Imam Khomeini Hospital. Seven patients who met the exclusion criteria were excluded. One group received propofol at a dose of 0.5-1 mg/kg plus lidocaine spray 10% (three puffs). The second group received propofol at the same dose plus IV lidocaine at a dose of 1 mg/kg (100 mg max). Patients in both groups received 50 µg fentanyl, as well. During the procedure, the gag reflex was assessed and compared in terms of severe gag reflex, mild gag reflex, and complete suppression of gag reflex, using a 10-point visual analogue scale (VAS). The endoscopist satisfaction was asked during the procedure and scored from one to five (5= highest satisfaction). For this purpose, one endoscopist performed the procedure in both groups to remove any possible bias related to the skill and level of satisfaction. Endoscopist satisfaction was defined as no retching during endoscopy, easy passage of the endoscope, and no problem during endoscopy. Patient satisfaction indexes included having no bad memories of the procedure, and not recalling or experiencing a feeling of gag during endoscopy. Arrhythmia and other problems were managed by an anesthesiologist in case of occurrence. Before endoscopy, the patients were examined by an anesthesiologist in the anesthesiology clinic and informed consent was also obtained.

The ASA class I and II patients who were candidates for upper GI endoscopy, willing to participate in the study, not sensitive to the drugs used in the study, did not have cardiopulmonary problems on examinations performed by the anesthesiologist, did not use antiarrhythmic drugs, and were low risk according the anesthesiologist's assessments were included in the study. The exclusion criteria were sensitivity to the drugs used in the study, a positive history of cardiopulmonary diseases, heart rate below 70 beats/minute, use of antiarrhythmic agents, and unwillingness to participate in the study. Patients denied permission to receive anesthesia were also excluded from the study.

Results

One hundred patients were included in this study but the final analysis was performed in 93 patients, of whom 42 (45.2%) were men and 51 (54.8%) were women. Seven patients withdrew from the study. Age, systolic blood pressure, diastolic blood pressure, heart rate, and gag reflex were assessed at the beginning of the study (Table 1). Then, the above variables were assessed in patients in topical (n=45) and IV lidocaine group (n=48) (Table 2).

Table 1- Demographic and clinical characteristics of the patients

Variable	Scale	Mean ± SD
Age	Year	48.3±14.1
Systolic Blood Pressure	mmHg	125.5±17.1
Diastolic Blood Pressure	mmHg	73.6±11.7
Hear Rate	Beats/Min	80±11
Gag Reflex	0-10	9.4±1.3

Table 2- Demographic and clinical characteristics of the patients in IV and topical lidocaine groups

Variable	Scale	IV Lidocaine	Topical Lidocaine	P-value
Age	Year	47.1±14.3	49.7±13.9	0.372
Systolic Blood Pressure	mmHg	121.6±14.0	129.7±19.2	0.022
Diastolic Blood Pressure	mmHg	72.9±10.4	74.3±13.1	0.553
Hear Rate	Beats/Min	80.6±11.5	81±11.8	0.842
Gag Reflex	0-10	9.58	9.39	0.352

As noted above, there was no significant difference between the two groups except for systolic blood pressure. Then, the above indexes were assessed in both groups during anesthesia (Table 3).

Table 3- Vital signs and gag reflex in topical and IV lidocaine groups during anesthesia

Variable	Scale	IV Lidocaine	Topical Lidocaine
Systolic Blood Pressure	mmHg	116.60±15.9	124.02±18.3
Diastolic Blood Pressure	mmHg	67.6±10.9	70.0±14.1
Hear Rate	Beats/Min	78.4±14.8	78.2±10.7
Gag Reflex	0-10	1.56±1.1	1.24±0.74

The median of patient satisfaction was 5 (5-5) in the IV lidocaine and 5 (5-5) in the topical lidocaine group. Similarly, the median of endoscopist satisfaction was 5 (5-5) in the IV lidocaine and 5 (5-5) in the topical lidocaine group.

The non-parametric Mann-Whitney U test was used to compare the endoscopist satisfaction with IV or topical lidocaine in terms of decreased gag reflex during upper GI endoscopy. The results showed significantly higher satisfaction with topical anesthesia (P=0.027). Similarly, the Mann-Whitney U test was also applied to compare patient satisfaction with IV or topical lidocaine in terms of decreased gag reflex during upper GI endoscopy. The results showed significantly higher satisfaction with IV anesthesia (P=0.036).

The ANCOVA method was used to compare the effect of propofol plus IV lidocaine versus propofol plus lidocaine spray on decreasing the gag reflex during upper GI endoscopy according to age and sex. The initial level of the gag reflex and one of the variables of sex and age were used as covariates, the effect of type of anesthesia on the final level of the gag reflex was assessed (Table 4). The results showed that the type of anesthesia had no effect on the gag reflex.

Table 4- Comparison of gag reflex between IV and topical lidocaine groups using ANCOVA

Group	Mean Gag Reflex	95% Confidence Interval	P-value
IV Lidocaine	1.55	(-0.093) -(0.699)	0.132*
Topical Lidocaine	1.25		
IV Lidocaine	1.56	(-0.080) -(0.707)	0.375†
Topical Lidocaine	1.25		

* age and initial gag reflex as covariates

† Sex and initial gag level as covariates

Independent t-test was applied to compare blood pressure and heart rate between IV and topical lidocaine groups in upper GI endoscopy. The results only showed a significantly higher systolic blood pressure in the topical lidocaine group (P=0.04) (Table 5).

Table 5- Comparison of blood pressure and heart rate between IV and topical lidocaine groups

Variable	Scale	IV Lidocaine	Topical Lidocaine	P-value
Systolic Blood Pressure	mmHg	116.60±15.9	124.02±18.3	0.04
Diastolic Blood Pressure	mmHg	67.65±10.9	70.0±14.1	0.369
Hear Rate	Beats/Min	78.48±14.8	78.20±10.7	0.918

Complications of anesthesia like hypotension and apnea were seen in 8 patients (16.67%) in the IV lidocaine group and 8 patients (17.77%) in the topical lidocaine group. Chi-square was applied to compare the incidence of complications between the two groups which showed no significant difference (P=0.887).

Independent t-test was used to compare the length of the endoscopic procedure between IV and topical lidocaine groups, and the results showed a significantly longer duration in the IV lidocaine group (P=0.008) (Table 6).

We also investigated the difference in each variable in the beginning and at the end of the study in both groups. For this purpose, a new variable was defined through subtraction of the primary value of each variable from its final value. Independent t-test was used for analysis.

The following table (Table7) shows the descriptive data of the new parameters.

Table 6- Comparison of length of endoscopy between IV and topical lidocaine groups

Group	Minute (mean±SD)
IV lidocaine	7.9±2.5
Topical lidocaine	6.47±2.6

Table 7- Descriptive data table

Type of anesthesia		Mean	Standard deviation	Standard error
Difference in DBP	IV	-5.2708	9.51089	1.37278
	local	.3778	8.99062	1.34024
Difference in SBP	IV	-5.0625	15.50347	2.23773
	local	-5.7556	11.45179	1.70713
Difference in HR	IV	-2.1250	10.48327	1.51313
	local	-2.8889	8.62139	1.28520
Difference in gag reflex score	IV	-8.0208	1.60438	0.23157
	local	-8.1556	1.46094	0.21778

Independent t-test was applied to investigate the difference in the next stage. The results are presented in the following table (Table 8). P-values were non-significant in all cases.

Table 8- Results of independent t-test on new parameters.

	Results of independent t-test					
	T statistic	Two-tailed P value	Difference in means	Standard error	95% CI of difference in means	
					Lower	Upper
Difference in DBP	-0.465	0.643	-0.89306	1.92205	0.71098	2.92487
Difference in SBP	0.244	0.808	0.69306	2.84167	0.95158	6.33769
Difference in HR	0.382	0.703	0.76389	1.99781	-3.20452	4.73229
Difference in gag reflex score	0.423	0.674	0.13472	0.31886	-0.49866	0.76810

Discussion

The results of the study showed no significant difference in the gag reflex between IV lidocaine plus propofol versus topical lidocaine plus propofol. However, patient and endoscopist satisfaction was higher in the IV lidocaine and topical lidocaine group, respectively.

Previous studies have evaluated the benefits of adding topical anesthesia to sedation to reduce the gag reflex. We compared the effects of adding IV and topical (spray) lidocaine to sedation with propofol.

Heuss et al. conducted a randomized clinical trial to assess the effectiveness of lidocaine spray in patients undergoing upper GI endoscopy who were anesthetized with IV propofol. No gag reflex was seen in 82% of the patients in the lidocaine group and 71% of the patients in the placebo group. The results of this study showed that lidocaine spray could reduce the gag reflex in patients sedated with IV propofol. However, it had no effect on the patient and endoscopist satisfaction [6]. In another study, Leitch et al. compared tolerance to upper GI endoscopy between two groups of patients receiving lidocaine spray and placebo. Patients in both groups were sedated with diazepam. The results showed that lidocaine spray increased patient tolerance and facilitated upper GI endoscopy for the endoscopist [10]. Similarly, another study by Ristikankare et al. in patients sedated with midazolam showed that lidocaine spray facilitated endoscopy but had no effect on patient tolerance [11]. Moreover, the results of a meta-analysis on five clinical trials showed that topical anesthesia before upper GI

endoscopy facilitated the procedure and improved patient tolerance [12].

Kim et al. investigated the effect of IV lidocaine as a bolus before sedation with fentanyl and propofol in 66 patients suffering from gastric neoplasm and scheduled for endoscopic submucosal dissection. The results showed that IV lidocaine reduced the need for fentanyl and decreased patient movement during endoscopy. Moreover, it significantly decreased epigastric and throat pain after the procedure [13].

In our study, we found no significant difference in the gag reflex between topical (spray) and IV lidocaine in patients sedated with propofol. If we accept the results of previous studies indicating that topical lidocaine decreases the gag reflex, our findings may suggest that IV lidocaine is as effective as its topical form.

There are controversial reports of the effect of topical anesthesia on patient and endoscopist satisfaction. Although several studies have reported no positive effects following the use of topical anesthesia [14-16], some other studies have recommended topical anesthesia to improve patient satisfaction [6]. In our study, patient satisfaction was higher in the IV lidocaine group and endoscopist satisfaction was higher in the topical lidocaine group. The reason for higher patient satisfaction in the IV lidocaine group may be a deeper level of anesthesia in these patients.

The rate of adverse events and safety are the most important factors when selecting a proper sedative agent for endoscopy. In this regard, cardiovascular complications are of great importance. Previous studies have shown that propofol is associated with fewer side effects in upper GI endoscopy [17]. Anaphylactic reaction and methemoglobinemia are rare but fatal adverse effects of lidocaine that require prompt intervention [18-20]. There was no significant difference in the rate of adverse reactions between the two groups but systolic blood pressure was lower in the IV lidocaine group as compared to the topical lidocaine group, which could be due to deeper level of anesthesia in these patients or the blocking effect of lidocaine on cardiac conduction system. There was also no significant difference in the heart rate and diastolic blood pressure between the two groups. Overall, it could be concluded that the safety profile of anesthesia with IV and topical lidocaine is acceptable.

Conclusion

The results of this study showed that IV lidocaine is as effective and safe as topical anesthesia with lidocaine spray in reducing the gag reflex during upper GI endoscopy in patients sedated with IV propofol. Patient satisfaction was higher in the IV lidocaine group and endoscopist satisfaction was higher in the topical lidocaine group, but there was no significant difference in vital signs and adverse reactions between the two groups. Further studies with larger sample sizes and the evaluation of other factors like the depth of anesthesia and levels of arterial blood gases are required to confirm our findings.

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