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SHORT COMMUNICATION

Lidocaine spray 10 min prior to intubation: effects on postoperative sore throat

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Abstract A sore throat is the most frequent adverse side effect of general anesthesia. The purpose of this study was to compare the different types and timing of lidocaine application based on the effectiveness of reducing postoperative sore throat (POST) after endotracheal intubation. In group A, 8% lidocaine was sprayed on laryngopharyngeal structures immediately before intubation, and the distal ends of the endotracheal tubes (ETTs) were lubricated with 2% lidocaine gel. In group B, 8% lidocaine was sprayed, and ETTs were lubricated with normal saline. In groups C and D, no lidocaine was sprayed, and the ETTs were lubricated with normal saline (C, control) or with 2% lidocaine gel (D). In group E, 8% lidocaine was sprayed 10 min prior to endotracheal intubation, and the ETTs were lubricated with normal saline. In 527 patients, 28.2% reported POST at 24 h following extubation. Statistically significant differences in the incidence of POST were found only between group E (16.0%) and each of the other groups (28.4–38.5%), except for group B (26.5%). In conclusion, 8% lidocaine spray significantly reduced the incidence of POST if it was sprayed on laryngopharyngeal structures 10 min prior to endotracheal intubation.

Keywords Lidocaine spray · Sore throat · Intubation

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A sore throat is the most frequent adverse side effect of general anesthesia. Laryngopharyngeal lidocaine spray and endotracheal lidocaine lubricant are widely used, but their effect on this postoperative symptom is controversial. Some studies [1, 2] report that lidocaine lubricant and/or spray were harmful, but another study [3] revealed no differences between the groups anesthetized with versus without lidocaine. This study was performed to compare different types (spray or gel) and timing of lidocaine application based on their effectiveness in reducing postoperative sore throat (POST) after endotracheal intubation. At the same time, to identify risk factors associated with POST, we used multiple logistic regression models.

After obtaining the approval of our Hospital Ethics Committee and patients' informed consent, the study was carried out in 527 patients, American Society of Anesthesiologists (ASA) classes I and II, undergoing general surgery at Koga Hospital 21, Fukuoka, Japan. The patients were not premedicated. Endotracheal intubation was completed smoothly following induction of general anesthesia with fentanyl 100 μg, propofol 1 mg/kg, and vecuronium 0.1 mg/kg. Endotracheal tubes (ETTs) of 7.0–7.5 mm internal diameter for women and 8.0–8.5 mm internal diameter for men were used (Lo-Contour® Murphy; Mallinckrodt, Athlone, Ireland). The cuff balloon of the ETT was inflated manually with minimum pressure to diminish the possibility of leakage.

All patients were randomized to one of five groups. In group A, 8% lidocaine (Xylocaine® pump spray;

AstraZeneca, Osaka, Japan) was sprayed three times on laryngopharyngeal structures immediately before intubation, and the distal ends of the endotracheal tubes (ETTs) were lubricated with 2% lidocaine gel (Xylocaine jelly; AstraZeneca, Osaka, Japan). In group B, 8% lidocaine was sprayed, and the ETTs were lubricated with normal saline. In groups C and D, no lidocaine was sprayed, and the ETTs were lubricated with normal saline (C, control) or with 2% lidocaine gel (D). In group E, 8% lidocaine was sprayed 10 min prior to endotracheal intubation and ETTs lubricated with normal saline.

Patients were interviewed concerning airway symptoms in the hospital ward on the day after surgery (24 h following extubation). The interviewer scored the grade of symptoms as follows: 0 no symptoms; 1 similar to those experienced with a cold; 2 pain or hoarseness. Grades 1 and 2 were considered to be symptom positive. Data concerning the number and incidence of symptoms were expressed as mean ± standard deviation (SD). Statistical analysis of parametric data between the different groups (A–E) and the differences in distribution frequencies between the groups (symptom positive and negative) were evaluated using the Student's *t* test and chi-square analysis. In order to determine the possible effects of risk factors such as age and sex, we used multiple logistic regression models, and the final model was chosen based on Akaike's information criterion (AIC). Statistical analysis was performed with SAS® statistical software, version 9.1 (SAS Institute Inc., Cary, NC, USA). *P* values <0.05 were considered to be statistically significant. The characteristics of patients, study interventions used in each group, and results of anesthesia are shown in Table 1. There were no significant differences between groups in terms of age, sex, height, body weight, gender distribution, duration of anesthesia, rate of epidural anesthesia, and rate of nasogastric tube insertion.

As shown in Table 1, the group with the lowest number and proportion of patients with side effects on the first postoperative day was group E (16.0%), and the group with the highest was group D (38.5%; $P < 0.05$). There were statistically significant differences in the proportions between group E and all other groups ($P < 0.05$) except for group B ($P = 0.1$).

To evaluate the association between POST and the type and/or timing of lidocaine application, we used multiple logistic regression models. We considered age, sex, region of surgery, anesthesia duration, nasogastric tube use, size of ETT, morphine use, fentanyl use, and epidural anesthesia use as the various risk factors and chose the final model based on AIC. Table 2 shows the variables that

Table 1 Characteristics of patients, interventions used (spray and/or gel), data on anesthesia, and symptom-positive rate in study groups

Group (*n*)	Spray/gel	Sex (M/F)	Age (years)	Height (cm)	Weight (kg)	Symp. (%)	Anesthesia (min)	Epi. (*n*)	N/G (*n*)
A (118)	Xy+/+	68/50	62.5 ± 14.9	158.8 ± 10.2	58.8 ± 11.6	32.2	218.2 ± 98.7	41	47
B (102)	Xy+/−	60/42	64.5 ± 15.8	158.6 ± 11.3	59.1 ± 12.6	26.5	222.0 ± 117.8	24	36
C (109)	−/−	69/40	66.1 ± 16.0	160.1 ± 9.5	59.6 ± 10.7	28.4	247.5 ± 123.9	36	48
D (117)	−/+	60/57	65.3 ± 15.0	170.3 ± 11.3	57.3 ± 12.8	38.5	232.0 ± 118.0	34	40
E (81)	Xy10+/−	46/35	64.0 ± 14.0	159.6 ± 9.8	58.4 ± 11.5	16.0[a]	250.2 ± 112.4	29	23

Xy10+: Xylocaine spray used 10 min prior to intubation. Age, height, weight data, and duration of anesthesia are presented as means ± standard deviation. There were no significant differences in patient characteristics between groups

Xy+ Xylocaine spray used immediately before intubation, *Symp.* symptom positive, *Epi.* epidural anesthesia, *N/G* nasogastric tube

[a] Group E showed a significantly lower rate of symptom-positive (score 1 or 2) than the other groups ($P < 0.05$), except for group B

Table 2 Multiple logistic regression–Akaike's information criterion (AIC) elimination: potential predictors of sore throat and risk reduction

Variable/comparison	Odds ratio	95% confidence interval	*P* value
Age (years), ≤70 vs. >70	2.73	1.76–4.25	<0.001*
Size of ETT (mm), 7.0–7.5 vs. 8.0–8.5	1.65	1.09–2.49	0.019*
Epidural anesthesia, without vs. with	2.11	1.26–3.53	0.005*
Nasogastric tube, with vs. without	2.89	1.61–5.18	<0.0004*
Surgery region, neck vs. others	0.51	0.21–1.25	0.139
Group A vs. group C	0.86	0.47–1.58	0.622
Group B vs. group C	0.70	0.37–1.33	0.279
Group D vs. group C	1.29	0.71–2.32	0.403
Group E vs. group C	0.41	0.19–0.87	0.020*

Size of ETT was related to the patient's sex: 7.0–7.5 mm (female), 8.0–8.5 mm (male)

* *P* values reaching the level of statistical significance

remained in the final model. The smaller size of ETT (7.0–7.5 mm) was associated with a probability of sore throat than the larger size of ETT (8.0–8.5 mm), with the odds ratio (OR) being 1.65. As would be expected, the size of ETT used was related to the patient's sex. Patients 70 years or younger had a higher chance of experiencing sore throat than those older than 70 years (OR 2.73). Patients who underwent epidural anesthesia (in addition to the general anesthesia) had a significantly smaller risk of developing sore throat compared with patients who did not have the epidural anesthesia (OR 2.11). The presence of a nasogastric tube was also a strong predictor of postoperative airway symptoms (OR 2.89). The region of surgery was not a predictor of these symptoms (OR 0.51). As to lidocaine use, group E only had a significantly smaller risk of POST compared with the control group (OR 0.41, $P = 0.020$). Only the use of lidocaine spray tended to diminish the risk of POST.

After tracheal intubation, the incidence of POST varies from 14.4% to 50% [4].The main causes of POST are thought to involve traumatic laryngoscopy or contact with the tracheal tube cuff, which may result in edema or erosion of the pharyngeal or tracheal mucosa [5–8]. Previous studies of the effects of ETT lubricants and lidocaine spray on the incidence of POST have generated inconsistent results [6–12]. Loeser et al. [6] and Jones et al. [7] reported that both lignocaine jelly and ointment increased the incidence of sore throat compared with water-soluble jelly or no lubrication. However, Basaranoglu et al. [8] found that there was no relationship between lidocaine jelly and POST. Concerning the methods of lidocaine application, Soltani and Aghadavoudi [9], Altintas et al. [10], and Navarro and Baughman [11] reported that using lidocaine in the ETT cuff or intravenous administration of lidocaine at the end of surgery decreased the frequency of postoperative cough and sore throat. Clearly, there are conflicting reports about the effects of using lidocaine jelly as an ETT lubricant and other methods of lidocaine application. In our study, lidocaine spray alone showed a tendency to decrease POST, and lidocaine jelly increased the incidence of sore throat, consistent with the results of Loeser et al. [6] and Klemola et al. [12]. Fujita et al. [13] reported that methylparaben specifically activated the transient receptor potential (TRP) AT channels and can cause pain sensations, especially when applied to the mouth or skin. Methylparaben, an ingredient in lidocaine jelly, may the main cause of POST. Rieger et al. [14] reported that there were no significant differences in the incidence and severity of POST without dysphonia between patients anesthetized with the use of a laryngeal mask airway (LMA) without local anesthetics versus those who underwent endotracheal intubation. In addition to the results of those reports, our results of multiple logistic regression analysis suggest that one of the leading causes of POST involves the surface of mucous membranes in the oral cavity. When we use Xylocaine viscous as a local anesthetic for gastroscopy, patients were asked to roll it in the oral cavity for about 5 min because prolonged contact (4–10 min) of solution provides adequate mucosal anesthesia.[1] Caracas et al. [15] reported a systematic review regarding anti-inflammatory effects of local anesthetics. When lidocaine was used as early or pretreatment, the anti-inflammatory effects in addition to the anesthetic effects of lidocaine may be more pronounced. Therefore, we hypothesized that POST may have its roots in insufficient anesthesia of an oral surface. Our result may suggest that the use of sufficient anesthesia on the oral surface reduced the symptoms originating from the oral cavity by about 16% compared with controls [3], whereas symptoms originating from the trachea persisted and contributed to the 16% incidence of sore throat. As to lidocaine use, lidocaine spray, even if sprayed immediately before intubation, only showed a tendency to diminish the risk of POST, but as we show in the result of the multiple logistic regression models, group E was the only group with a significantly smaller risk of POST compared with the control group ($P = 0.020$). These results suggest that when lidocaine was used early (4–10 min prior to intubation), it provided adequate mucosal anesthesia and anti-inflammatory effects. If we add the number of cases, we may have a significant differences in the rate of POST between groups B and E.

In conclusion, 8% lidocaine spray reduced the rate of postoperative airway symptoms significantly when sprayed on laryngopharyngeal structures 10 min prior to endotracheal intubation.

References

1. Christensen AM, Willemoes-Larsen H, Lundby L, Jakobsen KB. Postoperative throat complications after tracheal intubation. Br J Anaesth. 1994;73:786–7.
2. Harding CJ, McVey FK. Interview method affects incidence of postoperative sore throat. Anaesthesia. 1987;42:1104–7.
3. Joshi GP, Inagaki Y, White PF, Taylor-Kennedy L, Wat LI, Gevirtz C, McCraney J, McCulloch DA. Use of the laryngeal mask airway as an alternative to the tracheal tube during ambulatory anesthesia. Anesth Analg. 1997;85:573–7.
4. McHardy FE, Chung F. Postoperative sore throat: cause, prevention and treatment. Anaesthesia. 1999;54:444–53.
5. Thomas DV. Hoarseness and sore throat after tracheal intubation. Small tubes prevent. Anaesthesia. 1993;48:355–6.

[1] Masuda M, Yokota M, Takada H, Uematsu T. Xylocaine viscous as a local anesthetic for gastroscopy. Shokakibyo No Rinsho. 1963;5:526–8. (in Japanese).

6. Loeser EA, Stanley TH, Jordan W, Machin R. Postoperative sore throat: influence of endotracheal tube lubrication versus cuff design. Can Anaesth Soc J. 1980;27:156–8.
7. Jones MW, Catling S, Evans E, Green DH, Green JR. Hoarseness after tracheal intubation. Anaesthesia. 1992;47:213–6.
8. Basaranoglu G, Erden V, Delatioglu H. Postoperative sore throat; effect of lidocaine jelly and pomade on endotracheal intubation. J Clin Anesth. 2004;16:79–80.
9. Soltani HA, Aghadavoudi O. The effect of different lidocaine application methods on postoperative cough and sore throat. J Clin Anesth. 2002;14:15–8.
10. Altinaş F, Bozkurt P, Kaya G, Akkan G. Lidocaine 10% in the endotracheal tube cuff: blood concentrations, haemodynamic and clinical effects. Eur J Anaesthesiol. 2000;17:436–42.
11. Navarro RM, Baughman VL. Lidocaine in the endotracheal tube cuff reduces postoperative sore throat. J Clin Anesth. 1997;9: 394–7.
12. Klemola UM, Saarnivaara L, Yrjölä H. Post-operative sore throat: effect of lignocaine jelly and spray with endotracheal intubation. Eur J Anaesthesiol. 1988;5:391–9.
13. Fujita F, Moriyama T, Higashi T, Shima A, Tominaga M. Methyl *p*-hydroxybenzoate causes pain sensation through activation of TRPA1 channels. Br J Pharmacol. 2007;151:153–60.
14. Rieger A, Brunne B, Hass I, Brummer G, Spies C, Striebel HW, Eyrich K. Laryngo-pharyngeal complaints following laryngeal mask airway and endotracheal intubation. J Clin Anesth. 1997;9: 42–7.
15. Caracas HCPM, Maciel JVB, Martins PMRS, Souza MMG, Maia LC. The use of lidocaine as an anti-inflammatory substance: a systematic review. J Dentistry. 2009;37:93–7.