The relationship between preintubation lidocaine and postanesthesia sore throat

PAULA BUNKER FULLER, CRNA, MSN
Jacksonville, Florida

A sore throat is the most frequent adverse side effect of general anesthesia. The purpose of this study was to determine the relationship between intravenous lidocaine given during induction of general endotracheal anesthesia and postanesthesia sore throat. In addition, the study examined selected variables (bucking; gender; smoking; type of laryngoscope blade; and use of succinylcholine, condenser-humidifiers, or analgesic medication during the previous hour) in relation to the occurrence of postoperative sore throat.

Variables typically associated with postoperative sore throat, including endotracheal tube lubricant, endotracheal tube cuff geometry, endotracheal tube size, local anesthetic spray to the trachea, traumatic intubation, postoperative mechanical ventilation, nasal intubation, nasogastric tubes, and nasal airways, were controlled.

The researcher administered the visual analogue scale to 139 subjects at 21 to 27 hours following termination of the anesthetic in order to rate sore throat. A retrospective chart review provided data on the variables selected for study and those that were controlled.

Chi-square and independent t-tests revealed that a decrease in the severity of the sore throat, as recorded on the visual analogue scale, was significantly related to use of intravenous lidocaine and condenser-humidifiers.

Key words: Lidocaine, postanesthesia sore throat, sore throat.

Introduction
The most common adverse side effect of general endotracheal anesthesia is a postoperative sore throat. Cronin and associates found that 6% of postoperative patients regarded sore throat to be the most unpleasant aspect of their recovery period

The high incidence of postoperative sore throat has been well documented over a number of years. Various authors reported incidences of 22% to 90% of sore throat following general endotracheal anesthesia. Factors which may contribute to postanesthesia sore throat include laryngitis, tracheitis, and laryngeal edema as a result of traumatic intubation.

Postoperative sore throat is considered by many to be the result of endotracheal intubation and variables associated with intubation. These variables have been discussed at length in the literature, and the following have initiated controversy regarding their relationship to postoperative sore throat: endotracheal tube lubricant, use of the muscle relaxant, succinylcholine; use of a straight versus a curved laryngoscope blade; and humidification of inspired gases.

Other variables have been conclusively linked to an increase in postoperative sore throat, including endotracheal tube cuff geometry and endotracheal tube size.
Previous studies found that intubation difficulty, as measured by repeated attempts at intubation, bore no relationship to the incidence of sore throat. However, the incidence of postoperative sore throat was significantly higher when intubation was traumatic, as measured by blood on airway instruments.

Measures to minimize sore throat are one way in which anesthetists can provide for the patient’s comfort. Another possible benefit of avoiding a sure throat is a reduction in atelectasis and pneumonia in patients who intentionally suppress coughing secondary to sore throat.

Hartsell and Stephen found the incidence of sore throat to be almost double when patients bucked on the endotracheal tube.

Bucking is physiologically similar to coughing and takes place when air is inspired. The epiglottis closes and the vocal cords attempt to close, although they cannot do so because an endotracheal tube lies between them. As a result, air is entrapped within the lungs. The abdominal, internal intercostals, and other expiratory muscles contract forcefully, pushing against the diaphragm. Consequently, the pressure in the lungs rises, and the vocal cords and epiglottis suddenly open widely, causing air under pressure in the lungs to explode outward.

In addition to its association with sore throat, bucking leads to other phenomena, such as increased intracranial pressure and congestion, increased intra-abdominal pressure, and hypoxia.

Three studies have shown that lidocaine blunts the cough reflex. When it is used to suppress the cough reflex, lidocaine is effective primarily during the induction of and emergence from general anesthesia. Stimulation of laryngeal reflexes usually results in coughing or bucking in a patient who is neurologically intact. Maximum stimulation of laryngeal reflexes normally occurs immediately after induction of general anesthesia, when the trachea is intubated.

Lidocaine has a short half-life in the plasma, which sometimes requires that an additional dose be given in 5 minutes to maintain its effectiveness. Lidocaine was found to decrease coughing significantly when administered in a 1-mg/kg dose and to abolish it in a 2-mg/kg dose when it is given within 1 minute before endotracheal intubation.

With normal physiology, humidification of inspired air is achieved in the nose, mouth, pharynx, trachea, and bronchi. But when the normal anatomy is bypassed, as with an endotracheal tube, the use of artificial humidifying devices has been recommended. However, Shah and Mapleson did not find a statistically significant difference in the incidence of sore throat when a condenser-humidifier was included in the anesthesia circuit.

This study sought to answer the following research questions:

1. Is there a significant relationship between the use of intravenous lidocaine during induction of general anesthesia and postanesthesia sore throat?

2. Are there significant relationships between lidocaine and bucking and between bucking and postoperative sore throat?

3. Do other variables associated with postanesthesia sore throat (humidity, smoking, gender, type of laryngoscope blade, and use of succinylcholine or analgesic medication within the previous hour) affect the incidence or severity of sore throat in adults, 15 to 75 years of age who are anesthetized for procedures that do not involve the neck, larynx, pharynx, or endoscopy via the mouth?

Other variables typically associated with sore throat were controlled. Patients who received local anesthetic spray to the trachea, sustained traumatic intubation, required postoperative mechanical ventilation, were intubated nasally, received a nasogastric tube or nasal airway, or had a sore throat preoperatively were eliminated from the study.

All endotracheal tubes used in the study had the same cuff geometry. Females were intubated with endotracheal tubes having internal diameters of 7.0 ± 0.5 mm; males were intubated with endotracheal tubes having internal diameters of 8.0 ± 0.5 mm. Patients undergoing outpatient surgery were excluded.

Materials and methods

Approval was obtained from the Institutional Review Board at the 515-bed teaching hospital in a large urban area in north Florida, where the study took place. The investigator obtained informed consent from study participants. The study employed a descriptive correlational design. The setting included 12 operating rooms where patients were anesthetized, as well as several nursing units where patients rated their sore throat severity.

All adult surgery patients scheduled to receive general anesthesia were considered for inclusion in the study. The first 70 patients who received lidocaine and the first 69 patients who did not receive lidocaine, but who met the criteria for inclusion in the study, comprised the sample. A retrospective review of the chart provided data on subjects' status with regard to condenser-humidifier, smoking, gender, type of laryngoscope blade, and use of succinylcholine or analgesic medication within the previous hour.

August 1992/ Vol. 60/ No. 4 375
The researcher administered the visual analogue scale to subjects at 24 ± 3 hours following termination of their anesthetic. The left end of the scale represented “no sore throat,” and the right end represented “the worst sore throat imaginable.” Subjects then indicated the degree of sore throat they experienced by placing a mark on the scale. The distance from the left end, representing “no sore throat,” to the subject’s mark was then measured to arrive at the subject’s score.

A limitation of the visual analogue scale is that it focuses only on the intensity of the pain experience. As a result, its use is more appropriate in studies where emotional reaction to pain is not a key factor.

Patients were anesthetized by nurse anesthetists and anesthesiology residents who had varying degrees of experience in performing endotracheal intubation. The incidence of postoperative sore throat was not significantly related to anesthesiology resident’s experience in one study. Participating nurse anesthetists and residents suctioned the patient’s oropharynx with a 14 French suction catheter of the same brand.

Participating nurse anesthetists and anesthesiology residents administered anesthetics to study subjects using a 4 to 6 mg/kg dose of thiopental sodium. Anesthetics were maintained with nitrous oxide, oxygen, isoflurane, and fentanyl, as required. In a study by Coppolino, it was found that the incidence of sore throat was uniform among intubated patients, regardless of the technique employed or the agents used.

The decision whether to use intravenous lidocaine, humidification, and a curved or straight blade was left entirely to the individuals administering the anesthetics and their preferences for each individual patient. When it was used, lidocaine was given in a dose of 100 mg approximately 45 seconds prior to endotracheal intubation, corresponding to a dose of 1 to 2 mg/kg. Poulton and James employed 1.5 mg/kg of lidocaine to decrease coughing in awake volunteers. Steinhaus and Gaskin administered a dose of 1.1 mg/kg and gave additional lidocaine if the cough reflex was still active to decrease coughing in patients who were anesthetized for surgery. Yukioka and associates used 1 to 2 mg/kg of lidocaine to decrease coughing in patients who had been anesthetized for surgery.

Intubations were accomplished atraumatically on the first attempt. The difficulty of intubation had not been associated with an increased incidence of sore throat in prior studies. Endotracheal tubes remained in place for 2 to 6 hours.

The time that elapsed between the administration of lidocaine and the completion of the surgical procedure was approximately 2 to 6 hours.

The metabolic half-life of lidocaine is 2 hours. Intravenous lidocaine administration at induction was expected to prevent bucking at induction but not at emergence. The incidence of sore throat was found to be unrelated to duration of intubation in four research studies on anesthetized patients undergoing surgery.

Results

The age range of patients in the sample was 15 to 75, with a mean age of 36.8 and a median age of 34. Fifty-three sample members were male; eighty-six were female. Delineation of subjects into groups (lidocaine versus no lidocaine, smoking versus nonsmoking, bucking versus no bucking, condenser-humidifier versus no condenser-humidifier, male versus female, pain medication within the previous hour versus no pain medication within the previous hour, succinylcholine versus no succinylcholine, and curved versus straight blade) was accomplished by retrospective chart review.

There were 67 (48.2%) smokers and 72 (51.8%) nonsmokers. Forty-two (30.2%) patients bucked, while 97 (69.8%) patients did not buck. One hundred seven (77%) subjects were intubated with a curved blade, while 32 (23%) were intubated with a straight blade. One hundred one (72.7%) patients received Humid-vents, while 38 (27.3%) did not. Succinylcholine was used to 108 (77.7%) patients, while a nondepolarizing muscle relaxant was used on 31 (22.3%) patients. Forty-four (31.7%) patients received analgesic medication in the hour prior to scoring for sore throat, and 95 (68.3%) did not.

Chi-square was used to analyze the frequency of sore throat in relation to the variables tested, and independent t-tests were used to analyze severity of sore throat in relation to them. For purposes of this study P < .05 was considered to be statistically significant.

A decrease in sore throat severity, as recorded on the visual analogue scale, was significantly related to the use of intravenous lidocaine and condenser humidifiers. Patients who received intravenous lidocaine and were intubated with a straight blade reported a significantly lower incidence, but a significantly increased severity of postoperative sore throat than did patients who were intubated with a curved blade. The relationships between intravenous lidocaine use and incidence of bucking and between bucking and the severity of sore throat were not found to be significant statistically. Likewise, relationships were not found to be statistically significant between gender or smoking and the incidence or severity of postoperative sore throat.
throat, either with or without intravenous lidocaine. Nor were relationships found to be statistically significant between succinylcholine use or analgesic medication within the previous hour and the severity of postoperative sore throat (Table I).

| Table I |
| Factors associated with postoperative sore throat severity |
| Factor | Probability | Visual analogue scale mean | Standard deviation |
| No intravenous lidocaine | .012 | 1.86 | (2.78) |
| Intravenous lidocaine | .248 | 0.97 | (1.71) |
| Bucking | .248 | 1.62 | (2.46) |
| No bucking | 1.32 | (2.29) |
| Straight blade: lidocaine used | .030 | 1.72 | (2.04) |
| Curved blade: lidocaine used | 0.71 | (1.52) |
| Female gender: lidocaine used | .441 | 1.09 | (1.77) |
| Male gender: lidocaine used | 0.76 | (1.62) |
| Smoking: lidocaine used | .422 | 1.14 | (2.00) |
| No smoking: lidocaine used | .81 | (1.41) |
| Curved blade: no lidocaine used | .665 | 1.94 | (2.79) |
| Straight blade: no lidocaine used | 1.58 | (2.78) |
| Male gender: no lidocaine used | .791 | 1.97 | (2.78) |
| Female gender: no lidocaine used | 1.79 | (2.81) |
| Nonsmoking: no lidocaine used | .449 | 2.10 | (3.24) |
| Smoking: no lidocaine used | 1.59 | (2.18) |
| No condenser humidifier used | .032 | 2.01 | (2.87) |
| Condenser humidifier used | 1.18 | (2.07) |
| No succinylcholine | .159 | 1.79 | (2.77) |
| Succinylcholine | 1.30 | (2.22) |
| Analgesic medication in previous hour | .238 | 1.62 | (2.46) |
| No analgesic medication in previous hour | 1.31 | (2.29) |

1. P < .05
2. Two-tailed test

Discussion
The use of intravenous lidocaine appears to be more effective in decreasing the severity of postoperative sore throat than it does in decreasing its incidence. This is illustrated in Figures 1 and 2, where, as expected, there was a statistically significant decrease in sore throat severity scores on the visual analogue scale when patients received intravenous lidocaine during induction of general anesthesia. However, the mechanism by which this decrease was thought to occur, i.e., by a decrease in bucking on the endotracheal tube during induction, was not confirmed by study results. No statistically significant relationship was found between the use of intravenous lidocaine and bucking.

The clinical application of this study may be best realized if anesthetists who are interested in decreasing postoperative sore throat in their patients use intravenous lidocaine during induction and a condenser-humidifier in the breathing circuit. This may be particularly helpful in patients who must cough effectively to prevent postoperative atelectasis and pneumonia and who may be unwilling to do so because of sore throat.
REFERENCES


AUTHOR

Paula Bunker Fuller received a bachelor of science degree in Nursing from Florida State University and a bachelor of arts in Natural Sciences from University of South Florida. She received a diploma in Nurse Anesthesia from Homestead P. Thompson School of Medicine and North Carolina Baptist Hospital. She completed a master of science in Nursing degree from the University of Florida. Ms. Fuller is currently employed at University Medical Center, Jacksonville, Florida.

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