

Investigación

A study on the effectiveness of a gel containing betamethasone 0.05 %, lidocaine 2%, and tetracaine 1% in reducing postoperative sore throat, hoarseness, cough, and coughing on the tube during emergence from anesthesia

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Abstract

Postoperative sore throat is a common complaint and an undesirable outcome. It is often a side effect of general anesthesia, reported by 30% to 70% of patients following tracheal intubation.

Despite advancements in laryngoscopy equipment, postoperative sore throat remains a common issue, requiring additional pharmacological interventions and negatively affecting patient satisfaction. This highlights the continued need for effective strategies to tackle this challenge in clinical practice.

This study is a retrospective cohort analysis involving 101 patients who underwent elective plastic surgery with orotracheal intubation under general anesthesia. The research compares the incidence of postoperative sore throat, hoarseness, and cough, as well as coughing upon emergence from anesthesia, between two types of lubricated endotracheal tubes: one coated with a gel containing 0.05% betamethasone, 2% lidocaine, and 1% tetracaine, and another with 2% lidocaine jelly.

At the 8-hour mark after extubation, the incidence of postoperative sore throat was significantly lower in the experimental group at 17.6%, compared to 58% in the 2% lidocaine jelly

group ($P < 0.001$). Over the 24-hour evaluation, the experimental group consistently showed a lower incidence of postoperative sore throat at all measured time points.

The 2% lidocaine group had an OR 2.0 CI 95% (1.48-2.93), 2.28 CI 95% (1.54-3.3), and 2.4 CI 95% (1.64-3.5) for postoperative sore throat at post-anesthesia care unit, 8 hours and 24 hours after surgery evaluation respectively.

Our research highlights the potential benefits of applying a gel that contains corticosteroids and local anesthetics to the tracheal tube. This application may help reduce postoperative complications associated with tracheal intubation, including sore throat, coughing, irritation from the tube, and hoarseness.

Keywords

Postoperative Sore Throat, General Anesthesia, Endotracheal Intubation, 2% Lidocaine Jelly, 0.05% Betamethasone, Coughing at Emergence.

Introduction

Postoperative sore throat (POST) is a common complaint and an undesirable outcome. Still, it is a common side-effect

of having a general anesthetic, which is reported by between 30% and 70% of patients after tracheal intubation^{1,2}.

After extubation, the highest incidence of POST usually occurs after six hours. This is because the first few hours may be masked by residual analgesic effects or postoperative pain control. Currently, the use of 10% lidocaine spray for oral pharyngeal anesthesia before intubation is no longer recommended, as it appears to increase the incidence of POST³.

POST is thought to result from inflammation caused by laryngoscopy trauma and endotracheal tube (ETT) cuff injury. Medications with analgesic and anti-inflammatory effects may be the best option for preventing POST after ETT intubation during general anesthesia⁴.

Some of the risk factors that can cause sore throat are the size of the ETT, ETT cuff pressure, female sex, duration of anesthesia, positioning during surgery, concurrent use of nasogastric tubes, and aggressive oropharyngeal suctioning⁵.

A variety of non-pharmacological and pharmacological methods have been used to reduce POST with variable results; some of the non-pharmacological methods include using smaller-sized ETTS, monitoring the ETT cuff pressures, and the use of video laryngoscopes, etc.⁵.

Many patients don't seek medical advice for POST. That's why most anesthesiologists may not be aware of the incidence in their practice; it's a minor complication, but attenuating the symptoms is a worthwhile goal⁶.

The potential mechanisms and etiology of sore throat are thought to be irritation, mechanical trauma during laryngoscopy, and inflammation secondary to the insertion of an endotracheal tube. The cuff pressure may also influence the prevalence and severity of POST. Despite advancements in laryngoscopy equipment, POST persists as a prevalent issue, necessitating additional pharmacological interventions and adversely impacting patient satisfaction. This underscores the ongoing need for effective strategies to address this challenge in clinical practice⁷.

POST includes signs and symptoms such as pharyngitis, pain and discomfort, laryngitis, tracheitis, hoarseness, cough, or dysphagia. The average incidence of sore throat with a tracheal tube is 45.4%, whereas during the placement of the laryngeal mask airway, it is reported to be 5.8% to 34%⁸.

Multiple interventions have been proposed to reduce the incidence and intensity of pain after laryngotracheal intubation. Some of them involve using lidocaine or benzydamine spray on the outside portion of the tube or directly into the pharynx until the lidocaine is instilled inside the endotracheal tube, but none of them have been chosen as the best technique and the most effective⁹.

The control of ETT cuff pressure during surgery is an integral aspect of anesthesia; the prevention of regurgitant aspiration and airway damage is possible by keeping the ETT cuff pressure at 20-30 cmH₂O as the guidelines recommend^{10, 11}. If the cuff pressure on an ETT is more than 30 cmH₂O, local

tracheal mucosa perfusion is greatly reduced, increasing the risk of postoperative airway problems related to tracheal mucosal erosion¹¹.

The study aims to determine the frequency of POST and other related complications in patients who have had elective plastic surgery and were intubated using an orotracheal tube while under general anesthesia with either betamethasone, lidocaine, and tetracaine gel or 2% lidocaine jelly. We hope that the results of our study can help anesthesiologists refine their techniques and strategies and take preventive measures to reduce incidence and severity.

Materials and Methods

This study is a retrospective cohort of 101 patients aged 18-75 who underwent elective plastic surgery with orotracheal intubation under general anesthesia from February 2023 to March 2024. It compares the incidence of POST, hoarseness, cough, and coughing at emergence when lubricating the endotracheal tube with a gel that contains betamethasone 0.05%, lidocaine 2%, and tetracaine 1% or 2% lidocaine jelly.

All patients were American Society of Anesthesiologists (ASA) status I-II.

We excluded patients in whom laryngoscopy was attempted more than once, patients with upper respiratory tract infection up to 1 month before surgery, on steroid use and analgesic therapy before surgery, and patients in whom the anesthesiologist didn't measure the intracuff pressure using a manometer.

Two topical pharmacological agents used by anesthesiologists for preventing POST in our center were compared.

Group 1: Gel containing betamethasone 0.05%, lidocaine 2%, and tetracaine 1% (BLTG) applied over the tracheal tube.

Group 2: 2% Lidocaine jelly (LIDO) applied over the tracheal tube.

According to the anesthesia reports, during anesthesia induction, 3 ml of a gel mixture of betamethasone 0.05%, lidocaine 2%, and tetracaine 1% or 2% lidocaine jelly alone were applied with sterile precautions to the tracheal tube from the distal part of the cuff to 15 cm from the tip. PVC tracheal tubes (size 7.0 to 8.0 mm depending on the patient's size). Anesthesia was induced with Fentanyl 3 mcg/kg, Propofol 1-2 mg/kg. I.V. vecuronium bromide 0.1 mg/kg, tracheal intubation was performed using a video-laryngoscope OnFocus® after 4-5 minutes with TOF 0% and entropy RE/SE: 40-50; only one anesthesiologist intubated all patients and was blinded to postoperative evaluations.

Following intubation, the tracheal tube's cuff was inflated to a pressure between 20-28 cmH₂O. The patient was kept under anesthesia with Sevoflurane 1 MAC in oxygen, FiO₂ 40%, and fentanyl. It's worth noting that the investigator in charge of the postoperative measures was unaware of the patient's group allocation, and the anesthesiologist who applied the gel was also blinded for the allocation.

At the end of the surgery, any remaining neuromuscular block was reversed and oral suction was performed. All patients received the same postoperative analgesia treatment with NSAIDs.

After surgery, the investigator in charge of the postoperative care unit assessed patients for postoperative symptoms, including sore throat, hoarseness of voice, and cough, at 1, 8, and 24 hours and coughing at emersion.

The intensity of POST was carried out as follows: 0) No sore throat at any time since the operation, 1) Mild sore throat; less than a sore throat from a cold, 2) Moderate sore throat; just like a sore throat from a cold, 3) Severe sore throat; worse than the sore throat from a cold. Sore throat intensity was higher in the 2% lidocaine group compared with the BLTG group ($P < 0.001$) (Fig 2).

The data collected in the study were consistent with a normal distribution. Continuous variables were expressed as means with standard deviation, while percentages were used for categorical variables. Data were statistically tested with the Student's t-test or Chi-square when appropriate. P values of less than 0.05 were considered statistically significant. We calculated Odds Ratio (OR) using contingency tables and built a logistic regression model. The statistical analyses and calculations were conducted using SPSS Statistics version 21.0 (IBM, New York, USA).

The results of a prior study showed an incidence of 5% for sore throat after lubrication with betamethasone gel and 27.8% with 2% lidocaine. We calculated that 50 patients would be required in each group to detect a difference of 25% in the incidence with a power of 80% and $\alpha = 0.05$.

Table 1. Baseline data: comparison between BTLGel, 2% Lidocaine and Overall

	Overall	Group 1: BTLGel	Group 2: LIDO 2%	P Value
Age, years	42±13	43±12.8	41.6±13.3	0.59
Sex, female/male	91/10	46/5	45/5	0.97
Comorbid conditions				0.43
Diabetes	2 (2%)	0 (0%)	2 (4%)	
Hypertension	11 (10.9%)	7 (13.7%)	4 (8%)	
Hypothyroidism	2 (2%)	1 (2%)	1 (2%)	
Asthma	1 (1%)	1 (2%)	0 (0%)	
ASA classification I/II	81/20	41/10	40/10	0.96
Type of surgery				0.59
Breast Lift	26 (38.5%)	11(21.6%)	15(30%)	
Rhinoplasty	14 (50.8%)	6 (11.8%)	8 (16%)	
Rhytidectomy	29 (9.2%)	17 (33.3%)	12(24%)	
Liposuction	32 (1.5%)	17(33.3%)	15(30%)	
Intubation time,min	340.2±109.3	358.1±113.6	322±102.6	.097
Total dose of Fentanyl, mcg	299.2±65.9	299.5±61.3	299±71	0.96

Results

One hundred and one patients met the inclusion criteria and were enrolled. Table 1 shows the characteristics of the study groups. The incidence of POST at the 8-hour time interval after extubating was significantly lower in the BLTG group, with only 17.6% compared to a much higher incidence of 58% in the 2% lidocaine group ($P < 0.001$). These were the highest incidences for both groups during the 24-hour evaluation period; Group 1 had a lower incidence of POST compared with the 2% lidocaine group at each time point (Fig 1).

The 2% lidocaine group had an OR 2.0 CI 95% (1.48-2.93), 2.28 CI 95% (1.54-3.3), and 2.4 CI 95% (1.64-3.5) for POST at PACU, 8 hours and 24 hours after surgery evaluation respectively.

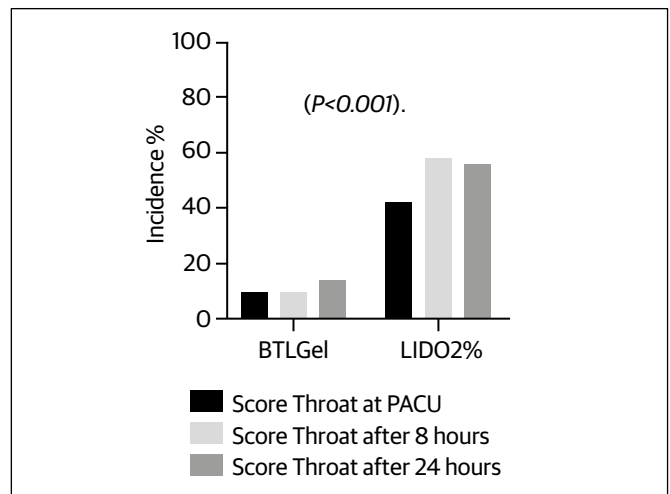


Figure 1. Incidence of postoperative Score Throat.

Our logistic regression model for POST at PACU, 8 hours and 24 hours in 2% lidocaine group, shows the odds ratio (Exp (B)) of 10.2% CI 95% (3.03-34.47) $P < 0.001$, 8.29 CI 95% (2.88-23.79) $P < 0.001$ and 8.00 CI 95% (3.02-21.1) $P < 0.001$ respectively.

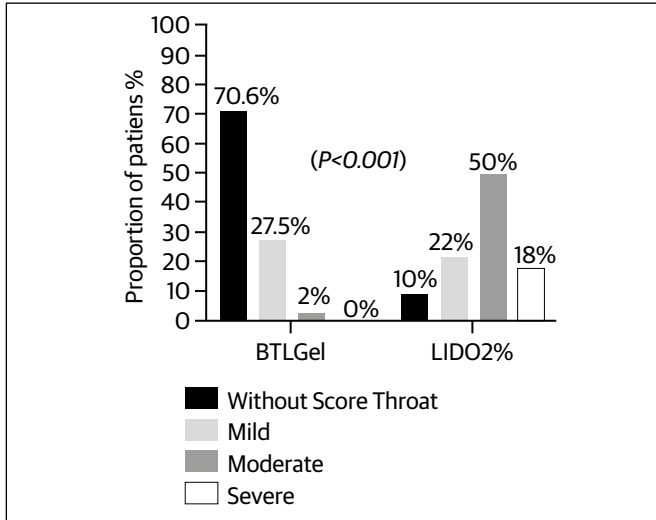


Figure 2. Score Throat Severity.

The incidence of hoarseness of voice and cough was lower in the BTLG group compared to the 2% lidocaine group ($P < 0.05$) (Fig 3 and Fig 4).

The incidence of coughing at extubation was significantly lower in the BTLG group, OR 0.20 CI 95% (0.069-0.58) ($P < 0.001$) (Fig 4).

We did not find any evidence of adverse events related to either of the anesthetic gels that we used.

Discussion

This research showed that using a gel that includes beta-methasone, lidocaine, and tetracaine on a tracheal tube could potentially lower the occurrence and intensity of POST, hoarseness of voice, cough, and coughing on the tube at extubation compared to using only 2% lidocaine jelly. BTLG Group reports an odds ratio for POST at 8 hours of 0.35 (95% CI 0.19-0.64) ($p < 0.001$). The OR for hoarseness of voice for the BTLG group was 0.11 CI 95% (0.029-0.42) ($p < 0.001$).

These results are associated with the findings of P. A. Sumathi et al. (2008). The betamethasone group showed a significantly lower incidence of sore throat, cough, and hoarseness of voice compared to the lidocaine group ($p < 0.05$). As they also mention, consideration of several factors linked to the process of inflammation is crucial, including the diameter of the tracheal tube, cuff design, and pressure,

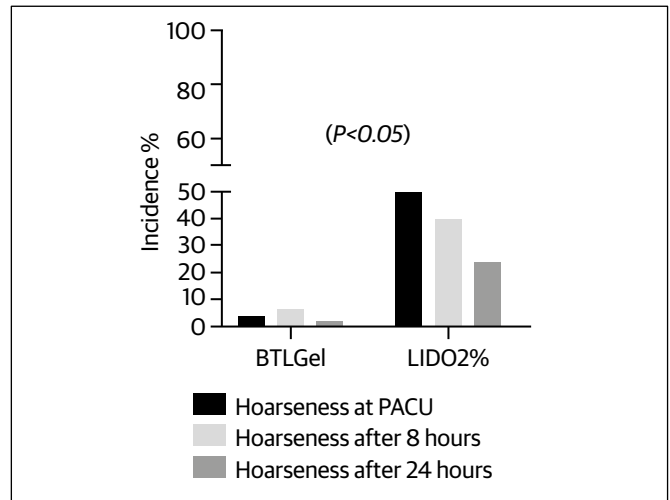


Figure 3. Incidence of Hoarseness of voice.

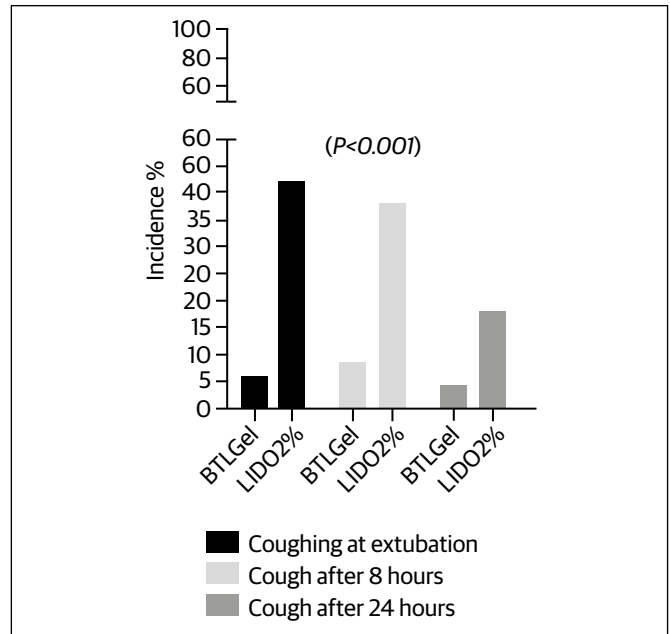


Figure 4. Incidence of Cough.

intubation procedure, movement of the tracheal tube during surgery, coughing on the tube, and excessive pharyngeal suctioning during extubation. These factors have been noted to have an impact on the incidence¹².

Focusing on prevention instead of treatment is crucial for enhancing the quality of care and patient satisfaction in addressing this anesthesia-related issue. The development of POST is believed to be caused by inflammation caused by injury from the tracheal tube's cuff to the mucosa of the pharynx and trachea. That's why, unlike most studies conducted on POST, we were very careful to include patients where the anesthesiologist maintained tracheal tube's cuff pressures between 20 and 28 cmH₂O¹³.

Based on a Cochrane systematic review, we specifically chose to compare 2% topical lidocaine jelly, because it has consistently demonstrated a significant reduction in the risk and severity of POST RR 0.64, 95% CI (0.48 to 0.85)¹⁴.

In our center, the anesthesiology department uses the combination of local anesthetics (lidocaine and tetracaine) with the corticosteroid betamethasone. This is based on evidence from a systematic review and meta-analysis by A. Kuriyama in 2018, which showed that corticosteroids applied to tracheal tubes were associated with a reduced incidence of POST with a relative risk of 0.39 and a CI 95% (0.32-0.46)¹⁵.

In contrast to our findings, it was observed that there was no reduction in postoperative hoarseness of voice when comparing corticosteroids to analgesic agents applied to tracheal tubes. However, a reduction in the incidence of postoperative cough was found with a relative risk of 0.33 CI 95% (0.17-0.65)¹⁵.

The presence of a sore throat following anesthesia can lead to patient dissatisfaction and hamper their recovery and return to normal function despite anesthesiologists categorizing this as a minor complication¹⁶.

Our study has several strengths and demonstrates an association between the use of a gel containing local anesthetics and corticosteroids with less incidence of multiple postoperative outcomes (cough, POST, hoarseness of voice, and coughing on the tube at emersion) compared to 2% lidocaine jelly applied to the tracheal tube. Also measured the cuff pressure during surgery in all the patients.

We have limitations; controlling patients' conditions and the amount of analgesic administration during the first postoperative hours is difficult due to varying levels of pain experienced in different surgeries.

Conclusion

Our research demonstrates the potential benefits of using a gel containing corticosteroids and local anesthetics applied to the tracheal tube to reduce postoperative complications related to tracheal intubation, such as sore throat, cough, coughing on the tube, and hoarseness of voice.

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