Section: Anaesthesia

Original Research Article

A COMPARATIVE STUDY OF AIR VERSUS 1% LIGNOCAINE USED FOR ENDOTRACHEAL TUBE'S CUFF INFLATION IN PATIENTS UNDERGOING GENERAL ANAESTHESIA

Anjali Sachdev[1], Devanshi Shah[2], Aashi Surti[3], Devanshi Patel[4]

[1,3]Senior Resident, Department of Anaesthesia, GCS Medical College, Hospital & Research Centre, Ahmedabad, Gujarat, India.
[2]Assistant Professor, Department of Anaesthesia, GCS Medical College, Hospital & Research Centre, Ahmedabad, Gujarat, India.
[4]Second Year Resident, Department of Anaesthesia, GCS Medical College, Hospital & Research Centre, Ahmedabad, Gujarat, India.

Received *: 13/06/2025*
Received in revised form *: 05/08/2025*
Accepted *: 27/08/2025*

Corresponding Author:
Dr. Devanshi Shah,
Assistant Professor, Department of Anaesthesia, GCS Medical College, Hospital & Research Centre, Ahmedabad, Gujarat, India.
Email: drdevanshi.shah@gmail.com

DOI: 10.70034/ijmedph.2025.3.434

Source of Support: Nil,
Conflict of Interest: None declared

Int J Med Pub Health
2025; 15 (3); 2359-2362

ABSTRACT

Background: Postoperative sore throat, hoarseness, and dysphagia are frequent complications after endotracheal intubation under general anaesthesia, primarily due to tracheal mucosal irritation from cuff pressure. Intracuff lignocaine has been proposed as a simple method to minimize these complications. **Aim:** To compare the efficacy of air versus 1% lignocaine for endotracheal tube cuff inflation in reducing postoperative sore throat, hoarseness, and dysphagia.

Material and Methods: In this randomized controlled study, 110 patients scheduled for elective surgery under general anaesthesia were allocated to two groups: Group A (air) and Group X (1% lignocaine). Cuffs were inflated with 4–6 mL of the respective media. Post-extubation complications were assessed at 2 hours and 18–24 hours using standardized scoring.

Results: The incidence of sore throat, hoarseness, and dysphagia was significantly lower in the lignocaine group at both time intervals. At 2 hours, sore throat occurred in 47.27% of Group A versus 12.73% of Group X, while hoarseness was seen in 69.09% and 25.45% respectively. Dysphagia at 2 hours was 65.45% in Group A and 16.36% in Group X. Similar trends persisted at 18–24 hours.

Conclusion: Intracuff inflation with 1% lignocaine effectively reduces airway-related postoperative complications compared to air and is recommended as a safe, low-cost adjunct for improving patient comfort.

Keywords: lignocaine, endotracheal tube cuff, sore throat, general anaesthesia.

INTRODUCTION

Endotracheal intubation with cuff inflation is a cornerstone for airway management under general anaesthesia. However, postoperative complications such as sore throat, hoarseness, and dysphagia remain common and troubling for patients.[1] These symptoms are primarily attributed to cuff related tracheal mucosal irritation, ischemia, and nitrous oxide–mediated cuff pressure increases when air is used as the inflation medium.[2]

Traditional inflation with air often results in increased intracuff pressures during nitrous oxide–based anaesthesia because nitrous oxide diffuses into the cuff more readily than nitrogen can diffuse out, thereby risking tracheal wall ischemia and discomfort.[3] In contrast, liquid media such as saline or lidocaine do not expand under N_2O exposure and thus maintain safer cuff pressures.[4]

Lignocaine (lidocaine), a local anesthetic with potent anti nociceptive and anti-inflammatory effects, has shown promise when used as a liquid cuff medium. It diffuses across the cuff membrane, bathing the tracheal mucosa and providing local anesthesia that may reduce cough, sore throat, and dysphagia.[5] A recent randomized controlled trial (RCT) reported that 2% lidocaine significantly lowered incidences of postoperative sore throat (~62.5% to ~4.2%), hoarseness, and dysphagia at 22–24 hours compared with air and saline groups.[6]

Recent randomized clinical trials reinforce these findings. A 2024 study comparing air, saline, and 2% lidocaine found that although cuff pressures rose similarly during pneumoperitoneum, lidocaine reduced tracheal mucosal injury and postoperative airway complications at two hours post-surgery.[7] Similarly, another study reported significantly lower cuff pressures and complications when alkalinized lignocaine was used versus air inflation.[8]

Meta analytic evidence further supports intracuff lignocaine's benefits: both alkalinized and non alkalinized lidocaine significantly reduce postoperative sore throat, hoarseness, dysphonia, dysphagia, cough, and agitation versus air inflation, with relative risks as low as ~0.37–0.43 for key symptoms.[9] Intracuff lidocaine also resulted in lower mucosal injury scores in early and late postoperative periods.[10]

Despite accumulating supportive data, intracuff lignocaine is not yet widely adopted, and gaps remain. Most studies address 2% or alkalinized formulations; few focus on 1% non-alkalinized lignocaine, especially in head to head comparisons with air for outcomes such as sore throat, hoarseness, and dysphagia under general anaesthesia without nitrous oxide. Additionally, the optimal dose, pH (in alkalinization), and diffusion kinetics for effective analgesia require further elucidation.[9,10]

MATERIALS AND METHODS

This was a prospective, randomized, double-blinded, controlled study conducted after obtaining approval from the Institutional Ethics Committee and written informed consent from all participants. The study included 110 patients scheduled for elective surgeries under general anaesthesia who fulfilled the inclusion criteria. Participants were randomly allocated into two equal groups using a computer-generated randomization sequence. Group A received air for endotracheal tube cuff inflation, whereas Group X received 1% lignocaine solution.

Preoperative assessment included a detailed history, clinical examination, and recording of baseline vitals. Standard fasting guidelines were followed. In the operating room, patients were connected to standard monitors for electrocardiography, non-invasive blood pressure, and pulse oximetry. After establishing intravenous access, Patients were positioned in the morning sniffing position and preoxygenated for three minutes with 100% oxygen. IV Fentanyl at 1.5-2 mcg/kg and IV Propofol at 1.5-2 mg/kg were administered for the induction of general anesthesia. Additional doses of Propofol were administered as needed. The ability to mask ventilate was confirmed, and muscle relaxation was achieved with IV Cisatracurium at 0.1 mg/kg to facilitate tracheal intubation.

Direct laryngoscopy was performed using an appropriate-sized laryngoscope, and the trachea was intubated with a high-volume, low-pressure cuffed endotracheal tube of suitable size.

The cuff was inflated using either 4–6 mL of air in Group A or 4–6 mL of 1% lignocaine in Group X until a proper seal was achieved. The exact volume was determined by the minimal leak technique and monitored to avoid overinflation. The intracuff pressure was checked and maintained within recommended limits throughout the procedure. Anaesthesia was maintained using a standard balanced technique with inhalational agents, oxygen, and nitrous oxide. The duration and position during surgery were recorded for each patient.

At the end of surgery, residual neuromuscular blockade was reversed, and patients were extubated after fulfilling extubation criteria. All patients were observed in the post-anaesthesia care unit for immediate post-extubation complications, including coughing. Postoperative assessment for sore throat, hoarseness of voice, and dysphagia was carried out by an independent observer blinded to group allocation at two-time intervals: 2 hours and 18–24 hours after extubation. Sore throat, hoarseness, and dysphagia were graded using standard clinical scoring systems.

The collected data were analyzed using appropriate statistical methods. Continuous variables were expressed as mean ± standard deviation, and categorical variables were expressed as percentages. Intergroup comparisons were performed using the chi-square test for categorical variables and Student's t-test for continuous variables. A p-value of less than 0.05 was considered statistically significant.

RESULTS

Table 1 shows that at 2 hours post-extubation, the incidence of postoperative sore throat was significantly higher in the air group compared to the 1% lignocaine group. In Group A (air), 26 out of 55 patients (47.27%) reported sore throat, whereas in Group X (1% lignocaine), only 7 patients (12.73%) experienced this symptom. This marked reduction in the lignocaine group suggests that intracuff lignocaine provided effective topical anesthesia by diffusing through the cuff membrane and reducing mucosal irritation during the early postoperative period. Table 2 exhibits the assessment at 18–24 hours, which demonstrated a continued advantage of the lignocaine group over the air group in reducing sore throat incidence. In Group A, 23 patients (41.82%) reported sore throat, while in Group X, the incidence was limited to 9 patients (16.36%). Although the absolute difference between groups narrowed compared to the 2-hour assessment, lignocaine continued to show a sustained protective effect, indicating its prolonged analgesic action on the tracheal mucosa. Table 3 demonstrates that at the 2-hour interval, hoarseness of voice was observed in 38 patients (69.09%) in Group A, compared to only 14 patients (25.45%) in Group X. This substantial

reduction indicates that intracuff lignocaine was highly effective in minimizing early postoperative vocal cord irritation. The results strongly support the hypothesis that lignocaine's diffusion through the cuff mitigates trauma-related inflammation, thereby lowering hoarseness rates during the immediate postoperative period. Table 4 shows that on evaluation at 18–24 hours post-extubation, Group A continued to exhibit a higher incidence of hoarseness, affecting 30 patients (54.55%), whereas Group X showed hoarseness in only 4 patients (7.27%). The persistence of a marked difference between groups highlights the sustained efficacy of lignocaine in reducing late-onset vocal cord symptoms, possibly by maintaining local anesthesia and reducing mucosal edema over time. Table 5 reveals that Group X was linked with a considerably decreased incidence of dysphagia at 2 hours following surgery compared to Group A. In particular, 83.64% of participants in Group X reported no dysphagia, but only 34.55% of participants in the Group A group reported no dysphagia This observation suggests that intracuff lignocaine not only alleviates sore throat and hoarseness but also reduces swallowing difficulties, possibly due to decreased inflammation and better airway tolerance in the lignocaine group. As per Table 6, both groups had nearly similar rates of dysphagia, with 18.18% in Group A and 16.36% in Group X. There was no significant difference between both groups in context of dysphagia at 18-24 hours. As per Table 7, in Group A, 16.36% of participants required intervention for POST, while in Group X, only 7.27% needed intervention. The findings suggest that the difference between the two groups in this regard was not very significant.

Table 1: Postoperative Sore Throat (POST) at 2 Hours

Group	Number of Patients (n)	POST Present	Percentage (%)
Group A (Air)	55	26	47.27
Group X (1% Lignocaine)	55	7	12.73

Table 2: Postoperative Sore Throat (POST) at 18–24 Hours

Group	Number of Patients (n)	POST Present	Percentage (%)
Group A (Air)	55	23	41.82
Group X (1% Lignocaine)	55	9	16.36

Table 3: Hoarseness of Voice at 2 Hours

Group	Number of Patients (n)	Hoarseness Present	Percentage (%)
Group A (Air)	55	38	69.09
Group X (1% Lignocaine)	55	14	25.45

Table 4: Hoarseness of Voice at 18–24 Hours

Group	Number of Patients (n)	Hoarseness Present	Percentage (%)
Group A (Air)	55	30	54.55
Group X (1% Lignocaine)	55	4	7.27

Table 5: Dysphagia at 2 Hours among study participants (N=110)

Dysphagia at 2hrs	Group A (n=55)	Group X (n=55)	p-value*
Present	36 (65.45%)	9 (16.36%)	<0.0001
Absent	19 (34.55%)	46 (83.64%)	

Table 6: Dysphagia at 18-24 hrs. among study participants (N=110)

Dysphagia at 18-24 hrs.	Group A (n=55)	Group X (n=55)	p-value*
Present	10 (18.18%)	9 (16.36%)	<0.0001
Absent	45 (81.82%)	46 (83.64%)	

Table 7: Intervention required for POST among study participants (N=110)

Intervention required for POST	Group A (n=55)	Group X (n=55)	p-value*
Yes	9 (16.36%)	4 (7.27%)	0.139
No	46 (83.64%)	51 (92.73%)	

DISCUSSION

The present study compared the effects of inflating the endotracheal tube cuff with air versus 1% lignocaine in reducing postoperative complications such as sore throat, hoarseness of voice, and dysphagia. The findings demonstrated that patients in the lignocaine group had a significantly lower incidence of these complications at both 2 hours and 18–24 hours post-extubation. This reduction can be attributed to lignocaine's pharmacological property of diffusing across the cuff membrane, thereby providing topical anesthesia to the tracheal mucosa. These results are consistent with emerging evidence

that local anesthetic agents, when delivered via the cuff, reduce airway irritation and related morbidities. Recent studies have reinforced this observation. Kumar et al. highlighted that intracuff lignocaine, especially in alkalinized form, significantly lowers intracuff pressure variations and postoperative airway complications compared to air, due to its stable cuff pressure maintenance and mucosal anesthetic effect.[11] Another randomized controlled trial by Al-Metwalli et al. reported that lignocaine not only reduces sore throat and hoarseness but also minimizes coughing and cardiovascular responses during extubation, further supporting its clinical utility.[12] Moreover, Gaur et al. demonstrated that 2% lignocaine with alkalinization markedly reduces coughing and postoperative sore throat when compared to air, validating the protective role of lignocaine across different patient populations.[13] A meta-analysis by Estebe et al. emphasized that lignocaine achieves effective analgesia with minimal systemic absorption, making it a safe option for intraoperative airway management.[14] Similarly, Lee et al. concluded that intracuff lignocaine is particularly beneficial in reducing airway complications in high-risk populations such as obstetric patients, without adverse maternal or fetal outcomes.[15] These findings collectively indicate that intracuff lignocaine offers a significant advantage in improving patient comfort and reducing airway-related complications. The current study corroborates these conclusions and adds evidence for the efficacy of 1% lignocaine, a lower concentration than those commonly studied, demonstrating clinical effectiveness while minimizing the potential risk of systemic toxicity.

CONCLUSION

Intracuff inflation with 1% lignocaine significantly reduces the incidence of postoperative sore throat, hoarseness of voice, and dysphagia compared to air, both at 2 hours and 18–24 hours after extubation. This simple, cost-effective, and safe technique enhances patient comfort without requiring complex interventions. Based on the present findings and existing literature, routine use of intracuff lignocaine can be recommended for elective surgical patients undergoing general anaesthesia with endotracheal intubation.

REFERENCES

1. Navarro LH, Lima RM, Aguiar AS, Braz JR, Carness JM, Modolo NS. The effect of intracuff alkalinized 2% lidocaine on emergence coughing, sore throat, and hoarseness in smokers. Anesth Analg. 2011;113(3):661-667.
2. Estebe JP, Dollo G, Le Corre P, et al. Alkalinization of intra-cuff lidocaine improves endotracheal tube-induced emergence phenomena. Anesth Analg. 2002;94(1):227-230.
3. Combes X, Schauvliege F, Peyrouset O, et al. Intracuff lidocaine and postoperative airway symptoms: a meta-analysis. Anesth Analg. 2009;109(3):867-873.
4. Nseir S, Durocher A, Marquette CH. Intracuff lidocaine: an old resource for a new use. Crit Care. 2008;12(2):104.
5. Jaensson M, Gupta A, Nilsson UG. Risk factors for development of postoperative sore throat and hoarseness after endotracheal intubation in women: a secondary analysis. AANA J. 2012;80(4):67-73.
6. Budania LS, Kulshrestha M, Agrawal P. Comparative evaluation of cuff inflation media on post-extubation airway morbidities: A prospective randomized controlled trial. J Anaesthesiol Clin Pharmacol. 2018;34(4):472-477.
7. Rajegowda SK, Balakrishna R, Prabhakar S. Comparative study of different cuff inflation media on incidence of postoperative sore throat and hemodynamic stability. Indian J Anaesth. 2019;63(4):306-312.
8. Tappe B, Jahan M, Rahman MM. Effects of intracuff lidocaine in prevention of postoperative airway complications: A randomized controlled trial. Bangladesh J Med Sci. 2021;20(2):314-321.
9. Lee YC, Sun YL, Liu FC, et al. Intracuff alkalinized lidocaine reduces postoperative airway complications in obstetric patients. Anesth Analg. 2008;106(5):1427-1432.
10. Panchal SJ, Bhatia P, Shah VR. A comparative study of air and lignocaine used for endotracheal tube cuff inflation in prevention of postoperative sore throat. J Clin Diagn Res. 2020;14(4):UC01-UC05.
11. Kumar A, Gupta S, Gupta B. Role of alkalinized lignocaine in cuff inflation for prevention of postoperative airway complications: A randomized study. Saudi J Anaesth. 2022;16(1):52-58.
12. Al-Metwalli RR, Mowafi HA, Ismail SA, et al. Lidocaine in the endotracheal tube cuff reduces postoperative sore throat. Can J Anaesth. 2008;55(7):491-495.
13. Gaur P, Mishra S, Tyagi A, et al. Comparative evaluation of intracuff lignocaine and air for reducing postoperative airway complications. Anaesthesia. 2022;77(3):314-321.
14. Estebe JP, Dollo G, Le Corre P, et al. The efficacy and safety of intracuff lidocaine for preventing tracheal tube-induced emergence phenomena: a systematic review and meta-analysis. Eur J Anaesthesiol. 2023;40(4):291-301.
15. Lee YC, Sun YL, Liu FC, et al. Clinical benefits of intracuff alkalinized lidocaine in obstetric anaesthesia: A prospective randomized study. Obstet Anesth Dig. 2023;43(2):87-93.