

## Comparative Study of Intracuff Air versus Dexamethasone in Endotracheal Tube in Preventing Post-Operative Sore Throat

Ranjeet Rana De<sup>1</sup>, Akhileshwar<sup>2</sup>, Nitin Kumar<sup>3</sup>, Akriti Singh<sup>4</sup>, Saurav Shekhar<sup>5</sup>, Rajbahadur Singh<sup>6</sup>

<sup>1</sup>Assistant Professor, Department of Trauma and Emergency, IGIMS, Patna, Bihar, India

<sup>2</sup>Assistant Professor, Department of Trauma and Emergency, IGIMS, Patna, Bihar, India

<sup>3</sup>Assistant Professor, Department of Trauma and Emergency, IGIMS, Patna, Bihar, India

<sup>4</sup>Assistant Professor, Department of Trauma and Emergency, IGIMS, Patna, Bihar, India

<sup>5</sup>Assistant Professor, Department of Trauma and Emergency, IGIMS, Patna, Bihar, India

<sup>6</sup>Assistant Professor, Department of Trauma and Emergency, IGIMS, Patna, Bihar, India

Received: 10-06-2023 / Revised: 15-07-2023 / Accepted: 22-08-2023

Corresponding Author: Dr. Nitin Kumar

Conflict of interest: Nil

### Abstract:

**Aim:** The aim of the present study was to compare the intra cuff air versus dexamethasone in endotracheal tube in preventing post-operative sore throat.

**Methods:** The present study was done in the Department of Trauma and Emergency over a period of one year. The study population included 200 patients of ASA class I and II who underwent general anaesthesia with controlled ventilation with endotracheal intubation posted for elective surgeries of two to three hours duration.

**Results:** The incidence of sore throat at 24 hours postoperative was lower in group D than in group A. 9 patients (9%) in group D had sore throat while 55 patients (55%) in group A had sore throat at 24hours. This was statistically significant ( $p<0.05$ ). There was a statistically significant ( $p<0.05$ ) decrease in VAS score recorded at one, six, twelve and 24hours after surgery both at rest and with swallowing in group D than in group A. 25% and 20% noted hoarseness of voice in group A and group D respectively. 43% and 15% noted cough incidence in group A and group D respectively.

**Conclusion:** It is noteworthy to observe that when endotracheal tube cuff is inflated with dexamethasone, the incidence of post-operative sore throat and cough is reduced but not hoarseness of voice. Further studies are needed in this direction before this becomes standardized and accepted as a routine one.

**Keywords:** Intracuff Air, Dexamethasone, Endotracheal Tube, Post-Operative Sore Throat.

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

### Introduction

Postoperative sore throat is the most common and most distressing complaint of patients after general anaesthesia with cuffed endotracheal tube. About 80% of patients complain of sore throat after anaesthesia and surgery. Common causes include trauma to tonsillar pillars, pharynx and larynx, tracheal mucosal and ciliary damage and ulcerations from excessive cuff pressure. [1] Postoperative sore throat can be prevented by the use of low intracuff pressure, smaller- sized and steroid coated endotracheal tubes, use of inhalational steroids and topical lidocaine. [2]

Dexamethasone is a potent synthetic glucocorticoid having anti-inflammatory and immunosuppressant actions. [3] Oral dexamethasone is 26 times more potent than cortisol and 6 times more potent than prednisolone. [4] Dexamethasone is used for treatment of autoimmune diseases like rheumatoid

arthritis and SLE. [5] It is also used for treatment of bronchial asthma.

An endotracheal tube (ETT) cuff plays an important role in preventing aspiration and air leakage during positive-pressure ventilation in the operating room or the intensive care unit and even during tracheal extubation. [6] A high intracuff ETT pressure may effectively seal the ETT cuff. However, a high intracuff pressure can damage the tracheal mucosa due to reduced perfusion pressure, and can result in post-extubation airway symptoms including sore throat, hoarseness, and dysphagia. [7-9] Therefore, an intracuff pressure of 20-30 cmH<sub>2</sub>O and adjustment of intracuff pressure guided by objective measurement is normally recommended in order to prevent cuff-related complications. [10,11]

The main causes of postoperative respiratory problems are general anaesthesia and surgery, and

increased benefits are likely to be offered by an increasing understanding of the root causes of respiratory complications and improved methods of early care. It is a general anaesthesia standard to use cuffed endotracheal tubing. In the tracheal mucosa, however, tracheal tube cuff pressure can cause a number of problems. General anaesthesia is common and problematic following postoperative sore throat and other airway morbidities following endotracheal tube intubation. [12,13] About 30 percent and 70 percent of patients are stated to have a sore throat following tracheal intubation. The risk of a sore throat varies according to the endotracheal tube's shape, diameter, and cuff pressure used. Providing prophylactic drugs to relieve postoperative throat pain can be helpful if intubation is required. [14]

The aim of the present study was to compare the intracuff air versus dexamethasone in endotracheal tube in preventing post-operative sore throat.

### Materials and Methods

The present study was done in the Department of Trauma and Emergency, IGIMS, Patna, Bihar, India over a period of one year. The study population included 200 patients of ASA class I and II who underwent general anaesthesia with controlled ventilation with endotracheal intubation posted for elective surgeries of two to three hours duration. Patients with history of allergy to dexamethasone, predictors of difficult intubation, smokers, history of asthma or COPD and with pre-existing sore throat or hoarseness of voice were excluded from the study.

After obtaining written informed consent, patients were divided into two groups D and A depending on cuff filling with dexamethasone and intracuff air respectively. The cuff was prefilled with dexamethasone one hour prior to intubation to

allow time for cuff to be saturated following which the cuff was deflated.

General anaesthesia was induced after premedication with intra venous midazolam 0.02mg/kg IV, glycopyrrolate 0.2mg, ondansetron 0.1mg/kg IV and fentanyl 2-2.5mcg/kg and preoxygenation with 100% oxygen for 3minutes. Following Inj. lignocaine 1.5mg/kg IV, induction was done with Inj. Propofol 2mg/kg. After confirming bag and mask ventilation, Inj. atracurium 0.5 mg/kg IV was given. Tracheal intubation was done using Soft Seal® cuffed sterile polyvinyl chloride ETT with standard HVLP (high volume-low pressure) cuff. According to the group allotted the cuff was inflated with dexamethasone 8mg/2ml or intracuff air. Patients were then maintained on N<sub>2</sub>O 50%: oxygen 50% mixture, sevoflurane and atracurium. Intraoperatively ECG, heart rate, NIBP, oxygen saturation and cuff pressure were monitored. Additional analgesia was provided with 1gram intravenous paracetamol.

At end of surgery, suctioning of secretions was done with direct laryngoscopy to avoid trauma to the tissues. Extubating was done after neuromuscular block was antagonized with neostigmine (0.05mg/kg) and glycopyrrolate (0.01mg/kg) with the patient fully awake and obeying commands like hand grip and eye opening.

In the post anaesthesia care unit, patients were assessed and graded for sore throat using VAS scale with score of 0 no pain, 1-3 mild pain, 4-6 moderate pain and 7-10 severe pain. Assessment of sore throat was done both at rest and swallowing. Assessment was done one hour, six, 12 and 24hours post operatively. Presence of hoarseness of voice and cough was assessed on a 2-point scale 0= absent and 1= present. This was assessed 24hours after surgery.

### Results

**Table 1: Incidence of sore throat at 24 hours postoperative**

	Group D	Group A
No. of patients	9 (9%)	55 (55%)

The incidence of sore throat at 24 hours postoperative was lower in group D than in group A. 9 patients (9%) in group D had sore throat while 55 patients (55%) in group A had sore throat at 24hours. This was statistically significant ( $p < 0.05$ ).

**Table 2: Comparison of VAS score at 1,6,12 and 24hours postoperative between two groups**

Time	Group A		Group D	
	VAS rest	VAS effort	VAS rest	VAS effort
1 hour	3.4±1.2	4.3±1.5	1.6±0.4	2.4±0.6
6 hours	3.0±1.3	3.7±1.3	1.2±0.5	1.7±0.3
12 hours	2.7±0.8	3.3±1.2	0.9±0.2	1.5±0.9
24 hours	2.0±0.5	3.2±1.3	0.7±0.3	1.2±0.3

There was a statistically significant ( $p < 0.05$ ) decrease in VAS score recorded at one, six, twelve and 24hours after surgery both at rest and with swallowing in group D than in group A.

**Table 3: Comparison of hoarseness of voice 24 hours after intubation**

	Present	Absent
Group A (n=100)	25 (25%)	75 (75%)
Group D (n=100)	20 (20%)	80 (80%)

25% and 20% noted hoarseness of voice in group A and group D respectively.

**Table 4: Comparison of cough incidence 24 hours after intubation**

	Present	Absent
Group A (N=100)	43 (43%)	57 (57%)
Group D (N=100)	15 (15%)	85 (85%)

43% and 15% noted cough incidence in group A and group D respectively.

## Discussion

Cuffed Oral Endotracheal Tubes (CoETT) being standard for general anaesthesia, associated complications can be pretty common. Tracheal tube cuff pressure can cause complications in the tracheal mucosa ranging from loss of mucosal cilia, ulceration, haemorrhage and tracheal stenosis to tracheoesophageal fistula. [15] Coughing occurring during the period of emergence from general anaesthesia can lead to potential complications like hypertension, tachycardia, dysrhythmia, increased intraocular pressure, increased intracranial pressure, wound dehiscence and bronchospasm. This can be detrimental to patients leading to deleterious consequences.

The incidence of sore throat at 24 hours postoperative was lower in group D than in group A. 9 patients (9%) in group D had sore throat while 55 patients (55%) in group A had sore throat at 24 hours. This was statistically significant ( $p < 0.05$ ). There was a statistically significant ( $p < 0.05$ ) decrease in VAS score recorded at one, six, twelve and 24 hours after surgery both at rest and with swallowing in group D than in group A. 25% and 20% noted hoarseness of voice in group A and group D respectively. 43% and 15% noted cough incidence in group A and group D respectively. Ever since the adoption of endotracheal intubation into anaesthesia practice, concerns regarding postoperative sore throat (POST) began, which continues till date. Although it is a self-limiting condition, it may delay discharge after day care surgeries. The incidence of POST can be as high as 45.4% following intubation and the common predictors are airway management, female sex, younger patients, gynecological surgeries, and succinylcholine. [16]

Park et al. showed that prophylactic use of 0.2 mg/kg of dexamethasone significantly decreased the incidence and severity of sore throat and hoarseness 1 and 24 hours after tracheal extubation of a double-lumen endobronchial tube. [17] Similarly, Sumathi et al. used another type of corticosteroids, such as betamethasone gel, to reduce postextubation reactions. They showed that widespread application of betamethasone gel on the tracheal tube decreased the incidence and severity

of postoperative sore throat, cough, and hoarseness of voice. [18]

Studies have been done using intravenous dexamethasone to reduce postoperative sore throat. A study by Bagchi D et al [19], intravenous injection of 0.2mg/kg dexamethasone reduced the incidence of post-operative sore throat from 44% to 14%. In present study showed that dexamethasone in cuff can decrease the incidence of post-operative sore throat to 9%. A study by Thomas S et al, concluded that intravenously administered dexamethasone before intubation reduces postoperative sore throat. [20] Similar results were obtained by Haider HS et al, in their trial. [21] The key effect of the using of liquid to inflate cuff is that it keeps endotracheal cuff pressure low throughout surgery by preventing further cuff inflation by nitrous oxide diffusion. Dexamethasone not only prevents nitrous oxide diffusion but by being a potent corticosteroid reduces levels of mediators of inflammation such as prostaglandins and leukotrienes and thus decreases oedema and inflammation. [22] Dexamethasone diffuses through the endotracheal tube cuff, acting on the tracheal mucosa in contact with it, thus reducing the inflammatory process occurring in the tracheal mucosa.

## Conclusion

It is noteworthy to observe that when endotracheal tube cuff is inflated with dexamethasone, the incidence of post-operative sore throat and cough is reduced but not hoarseness of voice. Further studies are needed in this direction before this becomes standardized and accepted as a routine one.

## References

1. Seegobin RD, Van Hasselt GL. Endotracheal cuff pressure and tracheal mucosal blood flow: endoscopic study of effects of four large volume cuffs. *Br Med J Clin Res Ed.* 1984; 288: 965-68.
2. Stenqvist O, Nilsson K. Postoperative sore throat related to tracheal tube cuff design. *Canadian Anaesthetists' Soc J.* 1982;29(4):384-6.
3. Stoelting RK. *Pharmacology and Physiology in Anesthetic Practice.* 3rd ed. Lippincott-Raven; 1999:167-8.

4. Ayoub CM, Ghobashy A, Koch ME, McGrimley L, Pascale V, Qadir S, et al. Widespread application of topical steroids to decrease sore throat, hoarseness, and cough after tracheal intubation. *Anesth Anal.* 1998;87(3):714-6.
5. Wang JJ, Ho ST, Lee SC, Liu YC, Liu YH, Liao YC. The prophylactic effect of dexamethasone on postoperative nausea and vomiting in women undergoing thyroidectomy: a comparison of droperidol with saline. *Anesth Anal.* 1999;89(1):200-3.
6. Priebe HJ. Could "safe practice" be compromising safe practice? Should anesthetists have to deflate the cuff of the endotracheal tube before extubation? *Minerva Anesthesiol.* 2016 Feb;82(2):236-9.
7. Combes X, Schauvliege F, Peyrouset O, Motamed C, Kirov K, Dhonneur G, Duvaldestin P. Intracuff pressure and tracheal morbidity: influence of filling with saline during nitrous oxide anesthesia. *Anesthesiology.* 2001 Nov;95(5):1120-4.
8. Dobrin P, Canfield T. Cuffed endotracheal tubes: mucosal pressures and tracheal wall blood flow. *Am J Surg.* 1977 May;133(5):562-8.
9. Seegobin RD, van Hasselt GL. Endotracheal cuff pressure and tracheal mucosal blood flow: endoscopic study of effects of four large volume cuffs. *Br Med J (Clin Res Ed).* 1984 Mar 31;288(6422):965-8.
10. American Thoracic Society; Infectious Diseases Society of America. Guidelines for the management of adults with hospital-acquired, ventilator-associated, and healthcare-associated pneumonia. *Am J Respir Crit Care Med.* 2005 Feb 15;171(4):388-416.
11. Hockey CA, van Zundert AA, Paratz JD. Does objective measurement of tracheal tube cuff pressures minimise adverse effects and maintain accurate cuff pressures? A systematic review and meta-analysis. *Anaesth Intensive Care.* 2016 Sep;44(5):560-70.
12. Ferreyra G, Long Y, Ranieri VM. Respiratory complications after major surgery. *Current opinion in critical care.* 2009 Aug 1;15(4):342-8.
13. Lam F, Lin YC, Tsai HC, Chen TL, Tam KW, Chen CY. Effect of intracuff lidocaine on postoperative sore throat and the emergence phenomenon: a systematic review and meta-analysis of randomized controlled trials. *PLoS One.* 2015 Aug 19;10(8):e0136184.
14. Tanaka Y, Nakayama T, Nishimori M, Tsujimura Y, Kawaguchi M, Sato Y. Lidocaine for preventing postoperative sore throat. *Cochrane database of systematic reviews.* 2015(7).
15. Malhotra S, Singh M, Malhotra N. Tracheal morbidity following tracheal intubation: comparison of air, saline and lignocaine used for inflating cuff. *J Anaesth Clin Pharmacol* 2007; 23(2):163-167.
16. Higgins PP, Chung F, Mezei G. Postoperative sore throat after ambulatory surgery. *British journal of anaesthesia.* 2002 Apr 1;88(4):582-4.
17. Park SH, Han SH, Do SH, Kim JW, Rhee KY, Kim JH. Prophylactic dexamethasone decreases the incidence of sore throat and hoarseness after tracheal extubation with a double-lumen endobronchial tube. *Anesth Analg* 2008; 107(6): 1814-8.
18. Sumathi PA, Shenoy T, Ambareesha M, Krishna HM. Controlled comparison between betamethasone gel and lidocaine jelly applied over tracheal tube to reduce postoperative sore throat, cough, and hoarseness of voice. *Br J Anaesth* 2008; 100(2): 215-8.
19. Bagchi D, Mandal MC, Das S, Sahoo T, Basu SR, Sarkar S. Efficacy of intravenous dexamethasone to reduce incidence of postoperative sore throat: A prospective randomized controlled trial. *J Anaesthesiol Clinic Pharmacol.* 2012;28(4):477.
20. Thomas S, Beevi S. Dexamethasone reduces the severity of postoperative sore throat. *Canadian J Anesth.* 2007;54(11):897-901.
21. Haider HS, Al-Ali BT. Role of dexamethasone in reducing the severity of postoperative sore throat. *Iraqi Post Graduate Med J.* 2013;12 (3): 454-7.
22. Pizov R. Intracuff pressure and tracheal morbidity: influence of filling cuff with saline during nitrous oxide anesthesia. *Surv Anesthesiol.* 2002;46(4):222.