

Controlled comparison between betamethasone gel and lidocaine jelly applied over tracheal tube to reduce postoperative sore throat, cough, and hoarseness of voice

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Background. Postoperative sore throat, cough, and hoarseness of voice though minor sequelae after general tracheal anaesthesia can be distressing to the patient.

Methods. This prospective, randomized, double blind, controlled study compares the incidence of postoperative sore throat, cough, and hoarseness of voice after general tracheal anaesthesia when applying betamethasone gel (betamethasone group) or lidocaine jelly (lidocaine group) on the tracheal tube. One hundred and fifty ASA class I and II patients undergoing elective surgeries under general orotracheal anaesthesia were randomized into three groups: betamethasone gel, lidocaine jelly, and control groups. In the post-anaesthesia care unit, a blinded anaesthesiologist interviewed all patients on postoperative sore throat, cough, and hoarseness of voice at 1, 6, 12, and 24 h after operation.

Results. In the first 24 h after surgery, the incidence of postoperative sore throat was 40, 100, and 100%; cough was 6, 40, and 28%; and hoarseness of voice was 4.1, 32.9, and 50%, for the betamethasone, lidocaine and control groups, respectively. The incidence of postoperative sore throat, cough, and hoarseness of voice was significantly lower in the betamethasone group compared with the other two groups ($P < 0.05$).

Conclusions. A wide spread application of betamethasone gel on the tracheal tube decreases the incidence and severity of postoperative sore throat, cough, and hoarseness of voice.

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Postoperative sore throat, cough, and hoarseness of voice is common, uncomfortable, distressing sequelae after tracheal intubation.^{1–4} It was postulated that these effects are because of irritation and inflammation of the airway.³ Although local anaesthetic jelly along with its lubricating properties limits the potential damage to the tracheal mucosa by suppressing bucking on the tracheal tube, its role in prevention of postoperative sore throat is inconclusive as it does not possess any intrinsic anti-inflammatory action.^{1 5 6} As steroids are known for their anti-inflammatory action, betamethasone gel applied to tracheal tube might reduce the incidence of postoperative sore throat, cough, and hoarseness of voice.^{3 4} As previous studies were either underpowered or compared only between betamethasone gel and placebo groups,^{3 4} this prospective, randomized, double-blinded, controlled study compares the role of extensive application of

betamethasone gel, lidocaine jelly, or nothing (control group) on the tracheal tube and cuff in reducing the incidence of sore throat, hoarseness of voice, and cough during the first 24 h postoperative period.

Methods

After having obtained Institutional Ethics Committee approval and written, informed consent from all patients, 150 patients of either sex, aged between 18 and 50 yr, belonging to ASA physical status class I or II, undergoing elective surgery (likely to last between 30 and 240 min) under general anaesthesia with orotracheal intubation were included. Patients undergoing surgeries of the oral cavity and pharynx or with anticipated difficult airway, surgical duration of >240 min, more than two attempts at

intubation, use of nasogastric tube or throat packs, patients with upper respiratory tract infection, and patients on steroid therapy were excluded from the study.

Pre-anaesthetic evaluation was done in all patients. Patients were randomized into the following three groups by computer-generated random number table and sealed envelope method:

- Betamethasone group: betamethasone gel 0.05% applied (Betagel™, Micro Labs Limited, Bangalore, India);
- Lidocaine group: lidocaine 2% jelly applied (Xylocaine® 2% jelly, Astra Zeneca Pharma India Limited, Bangalore, India);
- Control group: no jelly applied.

All patients were premedicated with oral diazepam 10 mg and ranitidine 150 mg 2 h before surgery. At induction of anaesthesia, betamethasone gel, lidocaine jelly, or nothing was applied on the external surface of tracheal tube. The PVC tracheal tube (Portex® Profile tracheal tube) was lubricated from the distal end of the cuff to a distance of 15 cm from the tip using 2.5 ml of betamethasone gel or lidocaine jelly, spread uniformly with sterile precautions. Single use PVC tracheal tubes (Portex® Profile tracheal tube), having low-pressure–high-volume cuffs, of size 8.0 mm and 7.0 mm internal diameter were used for male and female patients, respectively. After connecting to standard monitors, adequate i.v. access, and preoxygenation, anaesthesia was induced with i.v. meperidine 0.75 mg kg⁻¹ and thiopental sodium 5 mg kg⁻¹. I.V. vecuronium bromide 0.1 mg kg⁻¹ facilitated tracheal intubation after 3 min following induction and assisted ventilation. All intubations were performed by an anaesthesiology resident with at least 2 yr of experience, who was blinded to group allocation. Immediately after intubation, the tracheal tube cuff was inflated with just enough room air to prevent an audible leak. Anaesthesia was maintained with nitrous oxide 66%, halothane 0.5–1% in oxygen, and i.v. bolus of vecuronium bromide was repeated intermittently to maintain one to two twitches on train-of-four stimulation of ulnar nerve. Intracuff pressure was not monitored. Humidifiers or heat and moisture exchangers were not used in any of the groups. The name of the jelly or gel used was not recorded on the anaesthesia chart, but was recorded separately in order to ensure that the anaesthetist in charge of the post-anaesthesia care unit remained blinded to the group allocation of the patients.

At the end of the surgery, oxygen 100% was administered and residual neuromuscular block was antagonized with atropine 0.02 mg kg⁻¹ and neostigmine 0.05 mg kg⁻¹. Oral suctioning was done just before extubation only. The trachea was extubated after deflating the cuff when the TOF ratio was at least 70% and patient fully awake. All patients received oxygen by a facemask after operation. Assessment of patients for postoperative sore throat, cough, and hoarseness of voice at 1, 6, 12, 24 h after surgery was carried out by the anaesthetist in charge of the

Table 1 Scoring system for sore throat, cough and hoarseness¹⁶

Score	
Sore throat	
0	No sore throat at any time since the operation
1	Minimal sore throat
2	Moderate sore throat
3	Severe sore throat
Cough	
0	No cough at any time since the operation
1	Minimal cough or scratchy throat
2	Moderate cough
3	Severe cough
Hoarseness	
0	No evidence of hoarseness at any time since the operation
1	No evidence of hoarseness at the time of interview
2	Hoarseness at the time of interview noted by patient only
3	Hoarseness that is easily noted at the time of interview

post-anaesthesia care unit, blinded to the group allocation, using the questionnaire (Table 1).

Data were analysed by ANOVA (Fisher's *F*-test) and *post hoc* Tukey's *T*-test wherever appropriate. Categorical data were analysed by χ^2 test. $P < 0.05$ was considered significant. On the basis of the results of a prior study that showed an incidence of 55.8% for sore throat, 46.5% for hoarseness, and 37.2% for cough after lubrication with placebo gel, we calculated that 50 patients would be required in each group to detect a difference of 25% in the incidence with power of 80% and $\alpha = 0.05$.³

Results

No patients were excluded from analysis. Patient characteristics and duration of surgery were comparable between the groups (Table 2). The incidence of sore throat, cough, and hoarseness of voice was significantly lower in the betamethasone group compared with lidocaine, and control group ($P < 0.05$) except at the first postoperative hour when the incidence of cough was comparable between the betamethasone and the lidocaine groups ($P = 0.519$) (Figs 1, 2 and 3). Incidence of sore throat was significantly less in the lidocaine group compared with the control group ($P = 0.000$) (Fig. 1). However, except during the first postoperative hour, the incidence of cough and hoarseness of voice was comparable between the lidocaine and the control groups (Figs 2 and 3). None of the patients

Table 2 Patient characteristics. Data are mean (SD)

Variables	Group		
	Betamethasone (n=50)	Lidocaine (n=50)	Control (n=50)
Age (yr)	32 (10)	33 (9)	32 (10)
Weight (kg)	54 (7)	56 (11)	53 (8)
Duration of surgery (min)	87 (34)	91 (44)	95 (38)
Sex distribution (male/ female) (absolute numbers)	27/23	28/22	27/23

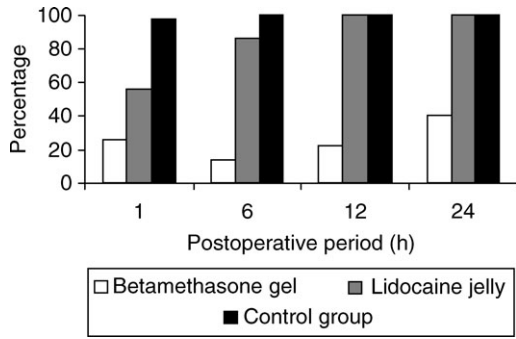


Fig 1 Percentage incidence of sore throat.

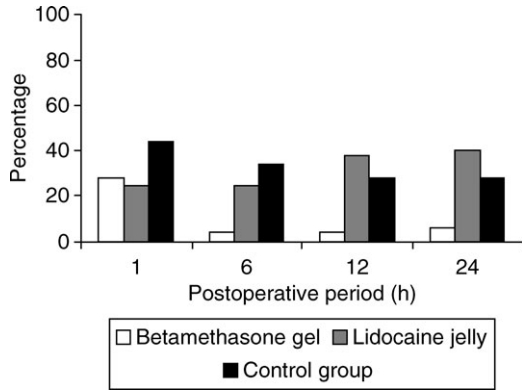


Fig 2 Percentage incidence of cough.

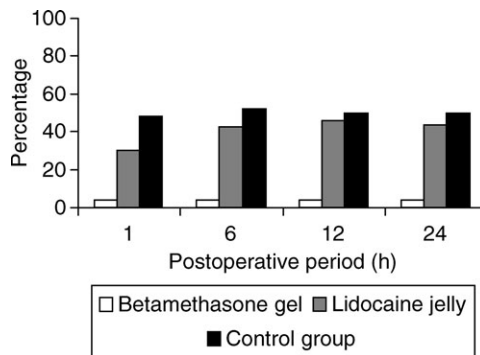


Fig 3 Percentage incidence of hoarseness of voice.

suffered from severe cough or severe hoarseness of voice (Grade 3). In none of the patients in the betamethasone group, 4 patients in the lidocaine group, and 18 patients in the control group, severe sore throat (Grade 3) was recorded. The incidence of severe sore throat was significantly less in the betamethasone and lidocaine groups compared with control group ($P < 0.05$).

Discussion

We found that the incidence of postoperative sore throat, cough, and hoarseness of voice was significantly less when betamethasone gel was widely applied over the tracheal tube compared with lidocaine jelly or nothing applied over the tube. Lidocaine jelly reduced the

incidence of postoperative sore throat but not cough or hoarseness of voice compared with the control group.

The incidence of postoperative sore throat, cough, and hoarseness of voice is distressingly high [6.6–90%].^{1 2} Many factors including the diameter of the tracheal tube, cuff design and pressure, intubation procedure, movement of the tracheal tube during the surgery, bucking/coughing on the tube, and excessive pharyngeal suctioning during extubation have been described to influence the incidence of these.^{2 5–14}

Recognizing the potential role of inflammation in these postoperative airway sequelae, the use of inhaled and topical steroids was described.^{3 4 7 8} Although Stride concluded that 1% hydrocortisone water soluble cream was ineffective in reducing the incidence of postoperative sore throat, it was realized that they had applied topical hydrocortisone only from the distal tip to 5 cm above the cuff.⁸ The beneficial effect of steroid gel application was observed in subsequent studies because of wide spread application of steroid gel to all portions of the tube that came in contact with the posterior pharyngeal wall, vocal cords, and trachea and not just confined to the tip and cuff of the tracheal tube.^{3 4} Our study confirms the findings of studies by Ayoub and colleagues³ and Selvaraj and Dhanpal⁴ proving that widespread application of betamethasone gel significantly reduces the incidence of postoperative sore throat, cough, and hoarseness of voice. However, Ayoub and colleagues³ compared only the betamethasone gel group vs the control group. We included a lidocaine jelly group in addition to the control group, because lidocaine jelly is still widely used in clinical practice to lubricate tracheal tube. While aerosolized lidocaine has been associated with a higher incidence of postoperative sore throat, cough, and hoarseness of voice, the role of lidocaine jelly is not clear.^{15 17} Contrary to our findings, Selvaraj and Dhanpal⁴ found the incidence of postoperative cough and hoarseness to be higher in the lidocaine jelly group than in the control group. However, they had not standardized the extubation protocol in the groups studied, which could have affected the incidence of postoperative sore throat, cough, and hoarseness.

The dose of betamethasone gel used in our study was equivalent to 4 mg of prednisone and that of lidocaine jelly was 50 mg, which is in the safe clinical range for both drugs. Although flaring up of local subtle infection is a possibility with topical steroid application, there are no reports of adverse effects secondary to betamethasone gel application over the tracheal tube. The limitation in our study was that no cuff pressure monitoring was done intra-operatively. However, as it was standardized for all the groups and the duration of the surgery was short, it is unlikely to have influenced the results. The incidence of coughing or bucking on the tracheal tube at the time of extubation was not recorded in any of the groups. Although the extubation protocol was the same in all the groups, the correlation between coughing or bucking at the

time of extubation and the incidence of sore throat, cough, or hoarseness could not be evaluated in this study. The benefit of betamethasone gel or lidocaine jelly application during prolonged intubation needs to be evaluated. Systemic corticosteroids have recently been shown to prevent post-extubation upper airway obstruction after longer term intubation in the intensive care unit.¹⁸

We conclude that betamethasone gel applied widely over tracheal tube effectively mitigates postoperative sore throat, cough, and hoarseness of voice compared with lidocaine jelly application.

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References

- 1 Christensen AM, Willemoes-Larson H, Lundby L, Jakobsen KB. Postoperative throat complaints after tracheal intubation. *Br J Anaesth* 1994; **73**: 786–7
- 2 Mandoe H, Nikolajsen L, Lintrup U, Jepson D, Molgaard J. Sore throat after endotracheal intubation. *Anesth Analg* 1992; **74**: 897–900
- 3 Ayoub MC, Ghobashy A, McGrimley L, Koch ME, Qadir S, Silverman DG. Wide spread application of topical steroids to decrease sore throat, hoarseness and cough after tracheal intubation. *Anesth Analg* 1998; **87**: 714–6
- 4 Selvaraj T, Dhanpal R. Evaluation of the application of topical steroids on the endotracheal tube in decreasing postoperative sore throat. *J Anaesthesiol Clin Pharmacol* 2002; **18**: 167–70
- 5 McHardy FE, Chung F. Postoperative sore throat: cause, prevention and treatment. *Anaesthesia* 1999; **54**: 444–53
- 6 Klemola UM, Saarnivaara L, Yrjola H. Post-operative sore throat: effect of lignocaine jelly and spray with endotracheal intubation. *Eur J Anaesthesiol* 1988; **5**: 391–9
- 7 El-Hakim M. Beclomethasone prevents postoperative sore throat. *Acta Anaesthesiol Scand* 1993; **37**: 250–2
- 8 Stride PC. Postoperative sore throat: topical hydrocortisone. *Anaesthesia* 1990; **45**: 968–71
- 9 Loeser EA, Bennett GM, Orr DL, Stanley TH. Reduction of post-operative sore throat with new endotracheal cuffs. *Anesthesiology* 1980; **52**: 257–9
- 10 Higgins PP, Chung F, Mezei G. Postoperative sore throat after ambulatory surgery. *Br J Anaesth* 2002; **88**: 582–4
- 11 Maruyama K, Sakai H, Miyazawa H, *et al.* Sore throat and hoarseness after total intravenous anaesthesia. *Br J Anaesth* 2004; **92**: 541–3
- 12 Jensen PJ, Hommelgaard P, Sondergaard P, Eriksen S. Sore throat after operation: influence of tracheal intubation, intracuff pressure and type of cuff. *Br J Anaesth* 1982; **54**: 453–7
- 13 Stenqvist O, Nilsson K. Postoperative sore throat related to tracheal tube cuff design. *Can Anaesth Soc J* 1982; **29**: 384–6
- 14 Soltani HA, Aghadavoudi O. The effect of different lidocaine application methods on postoperative cough and sore throat. *J Clin Anaesth* 2002; **14**: 15–8
- 15 Herlevsen P, Bredahl C, Hindsholm K, Kruhoffer PK. Prophylactic laryngo-tracheal aerosolized lidocaine against postoperative sore throat. *Acta Anaesthesiol Scand* 1992; **36**: 505–7
- 16 Harding CJ, McVey FK. Interview method affects incidence of postoperative sore throat. *Anaesthesia* 1987; **42**: 1104–7
- 17 Maruyama K, Sakai H, Miyazawa H, *et al.* Sore throat and hoarseness after total intravenous anaesthesia. *Br J Anaesth* 2004; **92**: 541–3
- 18 Epstein SK. Corticosteroids to prevent postextubation upper airway obstruction: the evidence mounts. *Crit Care* 2007; **11**: 156