

# Comparison between water based lubricant and betamethasone gel for lubrication during tracheal intubation through LMA CTrach™ with polyvinyl chloride tube on the incidence of postoperative sore throat and hoarseness of voice

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## Abstract

**Context:** Intubation through LMA CTrach™ involves manipulations with the LMA and tracheal tube. Thus there is a possibility of postoperative sore throat and hoarseness of voice as with any other methods of tracheal intubation.

**Aims:** To compare the incidence of postoperative sore throat and hoarseness of voice with water based lubricant when betamethasone gel is used for lubrication during intubation.

**Settings and Design:** Prospective observational study commenced after approval from hospital ethics committee and was conducted over a period of one year.

**Methods and Material:** Patients fulfilling the inclusion criteria were grouped into 2 groups depending on whether betamethasone gel 0.05% was used as a lubricant (Group Betamethasone) or water soluble lubricant was used for lubrication (Group Water based lubricant) during intubation with LMA CTrach™. Patients were assessed for sore throat and hoarseness of voice after 24 hours of surgery.

**Statistical analysis:** Parametric data were analysed using independent samples t-test. Nonparametric data were analysed using chi-square test or Fisher's exact test. P value less than 0.05 was considered significant.

**Results:** The incidence of postoperative sore throat in Group Betamethasone and Group Water based lubricant was 26.82% and 26.82% respectively. Similarly the incidence of hoarseness of voice was 14.63% and 21.95% respectively.

**Conclusion:** We conclude that betamethasone gel does not reduce the incidence of postoperative sore throat and hoarseness of voice compared to water based lubricant for intubation with PVC tracheal tube through LMA CTrach™.

**Keywords:** LMA CTrach™, Betamethasone gel, postoperative sore throat and hoarseness of voice.

## Introduction

LMA CTrach™ facilitates intubation under vision. Postoperative sore throat and hoarseness of voice can be distressing to the patient <sup>[1-2]</sup>. The manufacturer of LMA CTrach™ suggests the use of a water soluble lubricant for lubrication of the posterior surface of the mask and the tracheal tube <sup>[3]</sup>. It has been found that the incidence of postoperative sore throat and hoarseness of voice is reduced when the tracheal tube is lubricated with betamethasone gel while intubating with conventional laryngoscopy <sup>[4-6]</sup>. Hence we conducted this study to see if the incidence of sore throat and hoarseness of voice is reduced with the use of betamethasone gel for lubrication of LMA CTrach™ and the polyvinyl chloride (PVC) tracheal tube compared to water based lubricant.

## Methods

This prospective observational study commenced after approval from hospital ethics committee and was conducted over a period of one year. The study was registered at Clinical Trials Registry, India (CTRI/2013/06/003744). Patients of either gender aged between 18-65 years, belonging to American Society of Anesthesiologists (ASA) physical status 1 and 2, who were scheduled for surgical procedures under general anaesthesia requiring intubation were included. Patients with mouth opening less than 2.5 cm, history suggestive of gastro-oesophageal reflux disease, morbid obesity, pregnancy, oropharyngeal surgery, use of nasogastric tube or throat pack, pharyngeal or oesophageal pathology, surgeries of duration > 240 minutes were excluded from the study. A written informed consent for participation in the study was obtained from patients enrolled in the study. Patients were grouped into 2 groups at the end of the study depending on whether betamethasone gel 0.05% (Betagel™, Micro Labs Limited, Bangalore, India) was used as a lubricant (Group Betamethasone) or water soluble lubricant (Lubic, Neon Laboratories Limited, Mumbai, India) was used for lubrication (Group Water based lubricant) during intubation with LMA CTrach™. The choice of lubricant was left to the discretion of the consultant anaesthesiologist using the LMA CTrach™.

On the day of the surgery, standard monitors (electrocardiogram, non-invasive arterial pressure, pulse oximetry) were connected to the patient in the operating room, base line values recorded and general anaesthesia was standardized. Intravenous (IV) access was secured and IV fentanyl 2 microgram/kg was given. After preoxygenation with 100% oxygen for 3 minutes anaesthesia was induced with IV propofol taking loss of verbal contact as the endpoint of anaesthetic induction. Ability to mask ventilate was checked and IV vecuronium 0.1 mg/kg was injected to facilitate muscle relaxation. After 3 minutes of assisted ventilation with 2% isoflurane in 100% oxygen tracheal intubation was done using LMA CTrach™.

LMA CTrach™ of appropriate size based on patient's body weight was kept ready. Pre-tests on LMA CTrach™ were performed prior to each use before induction of anaesthesia and the cuff was completely deflated according to the manufacturer's recommendations. Depending on the choice of the consultant anaesthesiologist, the posterior surface of LMA CTrach™ and the PVC tracheal tube (Portex Profile tracheal tube) were lubricated with betamethasone gel or water based lubricant. The PVC tracheal tube used for intubation (size 7, 8 and 8.5 mm internal diameter through LMA CTrach™ size 3, 4 and 5 respectively) was lubricated from its tip till the junction of its proximal one third and distal two thirds, smearing a thin layer of the lubricant all along. This lubricated tracheal tube was passed several times through the Airway tube before insertion of the Airway to distribute lubricant and ensure smooth passage of the tracheal tube. Lubrication was done maintaining sterile precautions. LMA CTrach™ was inserted using one handed rotational technique with head and neck in neutral position. After insertion, it was inflated with air as per the recommended maximum volume for the particular size of LMA CTrach™. The breathing circuit was connected to the LMA CTrach™ and adequacy of ventilation was assessed by

the movement of chest during ventilation, presence of square wave capnogram during ventilation and absence of significant air leak at airway pressure of 20 cm H<sub>2</sub>O. If ventilation was not satisfactory then the recommended manoeuvres were tried to obtain effective ventilation [3]. These manoeuvres were recorded. If the ventilation was inadequate despite these manoeuvres, then one more attempt at insertion with same size LMA CTrach™ or a different sized LMA CTrach™ (if the operator feels that size discrepancy was the cause for inadequate ventilation) was tried. If that also failed, intubation through LMA CTrach™ was abandoned and tracheal intubation was done using direct laryngoscopy. After confirming adequacy of ventilation, viewer was attached and switched on. Glottic view obtained was recorded and optimized with manoeuvres recommended to get a grade 1 view. Such manoeuvres if performed were recorded. Glottic view was graded as follows [7]

**Grade 1:** Full view of arytenoids and glottis.

**Grade 2:** Arytenoids and glottic opening are partly visible; the structure of cords is difficult to see.

**Grade 3:** View includes dark areas indicating an open space.

- a) View of arytenoids, glottis or epiglottis is blurred because of excess light, poor focus, secretions or lubricant.
- b) Insufficient depth of insertion into larynx (e.g. only the tip of the epiglottis visible).

**Grade 4:** No part of the larynx can be identified.

- a) White-out or red-out indicates epiglottis or other tissues are blocking the view or obstruction by secretions or lubricant.
- b) Black-out indicates insufficient light to view tissue, insufficient depth of insertion into larynx or both.

Tracheal intubation was done using prelubricated PVC tracheal tube. If manoeuvres to obtain the best laryngeal view failed to improve the view, another attempt at reinsertion of LMA CTrach™ was done (cleaning the optics of LMA CTrach™). If this also failed to improve the laryngeal view then intubation was tried with the best possible view obtained. If such intubation through LMA CTrach™ failed then intubation through LMA CTrach™ was abandoned and direct laryngoscopy was performed for tracheal intubation. If any manoeuvres were performed during tracheal intubation through the airway tube, they were recorded. If intubation failed with LMA CTrach™ then intubation through LMA CTrach™ was abandoned and direct laryngoscopy was performed for tracheal intubation.

Following intubation, LMA CTrach™ Viewer was removed, the tracheal tube cuff was inflated and ventilation was confirmed by chest movements and capnogram. The cuff of the LMA CTrach™ was then deflated. Stabilizing the tracheal tube with the stabilizing rod, the LMA CTrach™ was removed. After adjusting the tube position (with cuff deflated) to ensure bilateral equal movements of the chest, the tracheal tube cuff was reinflated and the tube secured with adhesive plasters. Whenever possible, lungs were ventilated through LMA CTrach™ with 2% isoflurane in 100% oxygen. Anaesthesia was deepened during the process of intubation by boluses of IV propofol. After intubation tracheal tube cuff pressure was continually monitored and maintained at 30 cm H<sub>2</sub>O. Anaesthesia was maintained with isoflurane in 66% nitrous oxide and oxygen aiming a MAC of 1.3. IV vecuronium bromide was repeated intermittently to maintain one to two twitches on train of four stimulation. Analgesia was standardized with boluses of IV fentanyl used intraoperatively and boluses of IV nalbuphine used postoperatively. Heat and moisture exchangers (HME) were used in all the patients. The name of the lubricant was not recorded in the anaesthesia record to ensure blinding and was recorded separately.

At the end of the surgery 100% oxygen was administered and neuromuscular blockade was reversed with IV glycopyrrolate 0.01 mg/kg and neostigmine 0.05 mg/kg. Trachea was extubated when the TOF ratio was at least 90% and patient was awake. A gentle oropharyngeal suctioning was done prior to extubation. Oxygen was supplemented in the postoperative period. Patients were assessed for sore throat and hoarseness of voice after 24 hours of surgery. The anaesthetist evaluating sore throat and hoarseness of

voice was blinded to the study group. The severity of these was also assessed using the following scoring system [8].

### **Scoring system for sore throat and hoarseness**

#### **Sore throat**

No sore throat at any time since the operation.

1. Minimal sore throat.
2. Moderate sore throat.
3. Severe sore throat.

#### **Hoarseness**

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.

Patients complaining of severe sore throat and/or severe hoarseness of voice had a provision for treatment with intramuscular diclofenac 75 mg and subsequent follow up.

This was a prospective observational study spanning over a period of one year and not a randomized controlled trial. Hence there was no scope for sample size estimation in the beginning of the study. Statistical analysis was done using SPSS version 16 for Windows in consultation with the Medical statistics department of the University. Parametric data (Age, weight, timings) were analysed using independent samples t-test. Nonparametric data were analysed using chi-square test or Fisher's exact test. P value less than 0.05 was considered significant.

### **Results**

During the one year study period 100 patients participated in the study. Among them 18 were excluded from analysis due to protocol violation (use of nasogastric tube, throat pack, non-steroidal anti-inflammatory drugs and systemic corticosteroids). Betamethasone gel was used in 41 patients (Group Betamethasone) and water soluble lubricant was used in 41 patients (Group water based lubricant). Patient characteristics are given in Table 1. Out of 41 patients in each group 11 patients in group betamethasone (26.82%) and 11 patients in group water based lubricant (26.82%) had sore throat in the postoperative period (Table 2). This was comparable ( $P=1.00$ ). The severity of sore throat was also comparable between the two groups (Table 3). The incidence of postoperative hoarseness of voice was 14.63% in group betamethasone and 21.95% in group water based lubricant ( $P=0.569$ ) (Table 4). The severity of hoarseness of voice was also comparable between the two groups (Table 5). No patient in either group required rescue medication for treatment of sore throat or hoarseness of voice. Sore throat and hoarseness of voice resolved by 24 hours after the initial assessment in all the patients. Since intubation with LMA CTrach™ involves use of airway tube and subsequently intubation through this conduit, the manoeuvres used to obtain adequate ventilation, adequate glottic view and successful passage of tube into the glottis can also influence the incidence of postoperative sore throat and hoarseness of voice. The number of manoeuvres used for successful intubation and the number of attempts for successful intubation were compared between the two groups and found to be comparable.

**Table 1:** Patient characteristics

	Group Betamethasone	Group Water based Lubricant
Age in years	43.93 (13.35)	40.90 (11.92)
Gender (Male/Female)	27/14	26/15
Weight in Kg	64.17 (11.82)	58.92 (12.43)

Data are mean (standard deviation) for age and weight, absolute numbers for gender distribution.

**Table 2:** Incidence of sore throat

	Sore throat		P value*
	Yes	No	
Group Betamethasone (number of patients)	11	30	1.00
Group Water based lubricant (number of patients)	11	30	

**Table 3:** Severity of sore throat

	Grade of sore throat				P value*
	0	1	2	3	
Group Betamethasone (number of patients)	30	9	2	0	0.384
Group Water based lubricant (number of patients)	30	10	0	1	

**Table 4:** Incidence of hoarseness of voice

	Hoarseness of voice		P value*
	Yes	No	
Group Betamethasone (number of patients)	6	35	0.569
Group Water based lubricant (number of patients)	9	32	

**Table 5:** Severity of hoarseness of voice

	Grade of Hoarseness of voice				P value*
	0	1	2	3	
Group Betamethasone (number of patients)	35	4	1	1	0.481
Group Water based lubricant (number of patients)	32	8	1	0	

## Discussion

We found that betamethasone gel was not effective in reducing the incidence or severity of postoperative sore throat and hoarseness of voice when used as a lubricant for intubation through LMA CTrach™ using PVC tracheal tube. Betamethasone gel has been evaluated as a lubricant for tracheal tube during conventional direct laryngoscopy and for supraglottic devices. We have not come across studies in literature where betamethasone gel has been evaluated with LMA CTrach™.

Incidence of postoperative sore throat and hoarseness of voice following tracheal intubation has been observed to be 6.6-90% [1, 2]. Many factors are found to influence the incidence of postoperative sore throat and hoarseness of voice. They include different modes of securing the airway (oropharyngeal airway, LMA, tracheal tube), diameter of the tube, cuff design and pressures, use of different lubricants, number of attempts of airway device insertion, prolonged intubation, movement of tracheal tube during surgery, bucking/coughing on the tube, excessive pharyngeal suctioning during extubation and use of nasogastric tube or throat pack [4-6, 8-20].

The lubricant used to lubricate the airway device can influence postoperative sore throat and hoarseness of voice. To reduce the incidence of postoperative sore throat and hoarseness of voice, various lubricants

have been tried.

McHardy and Chung had stated that lubricants containing local anesthetics may be dangerous and do not seem to be helpful<sup>[10]</sup>. Study by Klemola *et al.* had shown less side effects in control group rather than in lignocaine jelly and spray group<sup>[18]</sup>. But, intracuff lidocaine and IV lidocaine at the end of the surgery decreased the incidence of postoperative sore throat and hoarseness of voice as per Soltani *et al.* study<sup>[19]</sup>.

Topical application of steroid over the surface of airway devices like laryngeal mask airway and tracheal tube serves the dual purpose of lubricating the device and exerting the anti-inflammatory action on the mucosa coming in contact with the device. Previous studies evaluating the role of topical application of betamethasone gel over a wide surface of tracheal tube have shown a significantly decreased incidence of postoperative sore throat and hoarseness of voice<sup>[4-6, 8-9]</sup>. The utility of betamethasone gel to decrease the postoperative sore throat and hoarseness of voice has been demonstrated for Proseal laryngeal mask airway also<sup>[20]</sup>. In the above mentioned studies intubation was done following direct laryngoscopy. Intubation using LMA CTrach™ involves use of the laryngeal mask airway and subsequent intubation through this conduit under vision. Due to increased instrumentation of the airway and the use of manoeuvres (like up and down manoeuvre, Chandy's manoeuvre etc.) to obtain adequate ventilation or adequate glottic view or proper alignment of the glottis for tracheal passage of the tube the incidence of postoperative sore throat and hoarseness of voice may be increased. Thus we wanted to assess the incidence of postoperative sore throat and hoarseness of voice with LMA CTrach™ when the recommended water based lubricant is used and see if the incidence changes when betamethasone gel is used as a lubricant. Contrary to the evidence seen for tracheal intubation by direct laryngoscopy betamethasone gel as a lubricant did not significantly reduce the incidence of postoperative sore throat and hoarseness of voice with LMA CTrach™.

The anaesthetic technique was standardized in this study and the multiple factors which could influence postoperative sore throat and hoarseness of voice were controlled. Nasogastric tube, throat pack, oropharyngeal airway were not used. Analgesic protocol was standardized. Only surgeries of duration less than 4 hours were included. Gentle and minimal suctioning of oropharynx was done at the time of extubation. Cuff pressure was continually monitored and kept constant.

The incidence of postoperative sore throat following intubation by direct laryngoscopy has been found to be 45 to 65% when water based lubricant was used<sup>[13, 15]</sup>. We found the incidence to be 26.82% with LMA CTrach™ when water based lubricant was used. While the reported incidence of postoperative sore throat after intubation by direct laryngoscopy is 14 to 33% when betamethasone gel was used<sup>[4-6, 8]</sup>. We found an incidence of 26.82% when used with LMA CTrach™. Similarly, the incidence of hoarseness of voice after intubation by direct laryngoscopy is 67.5% when water based lubricant was used and 5-30% when betamethasone was used<sup>[4-6, 8]</sup>. We found that the incidence of postoperative hoarseness of voice to be 21.95% and 14.63% when water based lubricant and betamethasone gel were used respectively. The increased need for airway instrumentation with LMA CTrach™ compared to direct laryngoscopy probably explains the higher incidence of postoperative sore throat and hoarseness of voice in our study. Also PVC tracheal tube was used for intubation instead of the recommended silicon tracheal tube to be used with LMA CTrach™ for its cost effectiveness.

There were few limitations in this study. This was a non-randomized observational study done over a period of one year. Randomized controlled study design recruiting a larger sample size would have been ideal. We could not follow this study design because betamethasone gel is selectively used by few anaesthesiologists in the department which compelled us to follow the observational design. The exact amount of lubricant used was not standardized. We only specified that the lubricant has to be uniformly smeared in a single layer over the dorsal aspect of the cuff of laryngeal mask and over the tracheal tube from its tip to junction of proximal one third and distal two thirds. To control the multiple factors influencing sore throat and hoarseness of voice the protocol was strictly standardized which resulted in large number of exclusions following recruitment due to protocol violations. The episodes of coughing and straining on the tracheal tube at the time of extubation could not be monitored and standardized. We

conclude that betamethasone gel does not reduce the incidence of postoperative sore throat and hoarseness of voice compared to water based lubricant for intubation with PVC tracheal tube through LMA CTrach™.

## 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;74:897-9005.
3. LMA CTrach™. Instruction Manual. Singapore: The Laryngeal Mask Company Limited, 2006.
4. 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;87:714-67.
5. 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.
6. Kazemi A, Amini A. The effect of betamethasone gel in reducing sore throat, cough and hoarseness after laryngo-tracheal intubation. *Middle East J Anaesthesiol.* 2007;19:197-204.
7. Timmermann A, Russo S, Graf BM. Evaluation of the CTrach-an intubating LMA with integrated fibreoptic system. *Br J Anaesth.* 2006 Apr;96:516-21.
8. 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. *Brit J Anaesth.* 2008;100:215-8.
9. Allen G. Using betamethasone gel to reduce intubation discomfort. *AORN J.* 2008;87:833-39.
10. McHardy FE, Chung F. Postoperative sore throat: cause, prevention and treatment. *Anaesthesia.* 1999;54:444-53.
11. Scuderi PE. Postoperative sore throat: more answers than questions. *Editorial Anesth. Analg.* 2010;111:831-2.
12. Loeser EA, Bennett GM, Orr DL, Stanley TH. Reduction of postoperative sore throat with new endotracheal cuffs. *Anesthesiology.* 1980;52:257-917.
13. Higgins PP, Chung F, Mezei G. Postoperative sore throat after ambulatory surgery. *Br J Anaesth* 2002;88:582-4.
14. Maruyama K, Sakai H, Miyazawa H, *et al.* Sore throat and hoarseness after total intravenous anaesthesia. *Br J Anaesth.* 2004;92:541-3.
15. 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.
16. Stenqvist O, Nilsson K. Postoperative sore throat related to tracheal tube cuff design. *Can Anaesth Soc. J.* 1982;29:384-6.
17. Harding CJ, McVey FK. Interview method affects incidence of postoperative sore throat. *Anaesthesia.* 1987;42:1104-7.
18. 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.
19. Soltani HA, Aghadavoudi O. The effect of different lidocaine application methods on postoperative cough and sore throat. *J Clin Anaesth.* 2002;14:15-8.
20. Kiran S, Goel M, Singhal P, Gupta N, Bhardwaj M. Postoperative sore throat with 0.05% betamethasone gel and 2% lignocaine jelly used as a lubricant for ProSeal LMA (PLMA) insertion. *E.g. J Anaesth.* 2012;28:139-142.