

## Effect Of Budesonide Inhalation In The Prevention Of Post-Operative Sore Throat, Hoarseness Of Voice And Cough: A Prospective Randomized Control Study

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### Abstract

**Background:** Postoperative sore throat (POST), hoarseness of voice and cough are common complications in patients receiving general anaesthesia with tracheal intubation. This study was performed to compare the effect of inhaled budesonide suspension, administered using a metered dose inhaler, on the incidence and severity of POST, hoarseness of voice and cough.

**Methods:** The study was a randomized, double blinded one in which 70 patients were randomized into 2 groups undergoing laparoscopic surgeries with tracheal intubation lasting <2hr. Group A received 200µg budesonide inhalation suspension, using a metered dose inhaler, 10 min before intubation, and repeated 6 h after extubation. No such intervention was performed in Group B. The intensity of post operative sore throat, hoarseness of voice and cough was assessed at 1 hr, 6 hr and 24hr.

**Results:** The incidence of POST for patients in group A was lower at 1hr 5(14.3%), 6hr 3(8.6%), 24hr 2(5.7%) when compared to group B at 1hr 15(42.86%), 6hr 12(34%), 24hr 11 (31%). Similarly, the incidence of hoarseness of voice in group A at 1hr 3(8.6%), 6hr 2(5.7%), 24 hr 1(2.8%) was lower when compared to group B at 1hr 14(40%), 6hr 12(34.28%), 24 hr 9 (25.7%). The incidence of cough in group A at 1hr 3(8.6%), 6hr 2(5.7%), 24hr 1(2.8%) was also lower when compared with group B at 1hr 13(37.14%), 6hr 11 (31.4%), 24hr 9(25.7%). Group A showed significant decrease at 1hr, 6hr and 24hr when compared with group B, P<005. The incidence of Postoperative sore throat (POST), hoarseness of voice and cough were significantly lower in budesonide group A than group B.

**Conclusion:** The use of pre-operative 200ug of budesonide nebulization reduces the incidence and severity of post-operative sore throat, hoarseness of voice and cough during the post -operative period.

**Keywords:** Tracheal intubation, budesonide, sore throat, hoarseness, cough

### Introduction

Postoperative sore throat (POST), hoarseness of voice and cough are common complications with incidence ranging from 19.4% - 83%<sup>1</sup> in patients receiving general anaesthesia with endotracheal intubation. The etiology is probably due to mechanical injury during intubation, damage to mucosa due to the pressure from the endotracheal tube cuff and dehydration of the mucosa.

Prophylactic management is recommended to improve the quality of post-anaesthesia care, though the symptoms are usually self-limiting. The pharmacological methods include gargling and nebulization with various agents like ketamine<sup>2-9</sup>, lignocaine, budesonide,<sup>10-14</sup> azulene sulphonate,<sup>15</sup> beclomethasone,<sup>16</sup> magnesium sulphate<sup>17</sup> and dexamethasone<sup>18-22</sup> which have some efficacy in reducing the symptoms. Therefore, inhaling

budesonide suspension might be useful to reduce POST, hoarseness of voice and cough following endotracheal intubation using metered dose inhaler. Delivery of the drug using metered dose inhaler would obviate the need of additional equipment such as nebulizers or atomizers and also avoid the requirements of assistance from nursing staff. Moreover, this mode of drug delivery is considered as simple and less time consuming with high patient acceptability. The primary aim of the present study is to evaluate the effects of inhaled budesonide suspension, administered using a metered dose inhaler, on the incidence and severity of postoperative sore throat, hoarseness of voice and cough in patients undergoing laparoscopic surgery following endotracheal intubation.

### Material And Methods

The study was a randomized, double-blinded one conducted in the department of Anaesthesiology, at a Tertiary care centre, Imphal, Manipur for a period of two years starting from June 2019 to June 2021. After institutional ethics committee approval and written informed consent of patients who fulfilled the inclusion criteria and do not have any exclusion criteria was explained about the purpose of procedure of the study and was enrolled after getting their written consent. Pre-anaesthetic evaluation was done a day or more before the scheduled day of operation to all patients. All patients were pre-medicated with tablets alprazolam 0.25-0.5mg and ranitidine 300 mg orally at night.

On the day of operation, palonosetron 0.75mg IV given to all the patients. Patients were randomly allocated into two groups. Patients belonging to group A received 200ug budesonide inhalation suspension using a metered dose inhaler 10 min before intubation which was repeated at 6hr after extubation. In group B no such intervention has done. Standard monitoring was established including ECG, non-invasive arterial pressure, ETCO<sub>2</sub> and pulse oximetry.

All patients received general anesthesia as per standard protocol. They were preoxygenated with 100% oxygen for 3 min. Intubation was accomplished with fentanyl 2ug/kg and propofol 2mg/kg, followed by rocuronium 1mg/kg. Tracheal intubation under direct laryngoscopy has performed 1 min after the rocuronium injection. The trachea was

intubated with a soft seal cuffed sterile polyvinyl chloride tracheal tube with an internal diameter of 7-7.5 mm for women and 8-8.5 mm for men. General anesthesia was maintained with oxygen 33% in nitrous oxide, sevoflurane, and rocuronium 0.1mg/kg repeated whenever required. The tracheal tube cuff was inflated until no air leakage could be heard with a stethoscope. At the completion of surgery, the oropharynx was gently suctioned, and the sevoflurane has turned off. Inspiratory oxygen concentration increased to 100%. The neuromuscular block was reversed with IV neostigmine 50µg/kg and glycopyrrolate 10µg/kg while awaiting the return of spontaneous ventilation. Trachea has been extubated when the patient is fully conscious.

All the patient were interviewed for sore throat, hoarseness of voice and cough by an investigator at 1 hour, 6 hours and 24 hours post-operatively. Side effects, if any, will be noted. Postoperative sore throat (POST), hoarseness of voice and cough were graded on 4 points scale (0-3). The findings and objectives made during the entire study are tabulated whenever possible, statistically analysed and inference is drawn to evaluate POST, hoarseness of voice and cough between the two groups.

Sample size was calculated based on the study conducted by Rajan S et al<sup>10</sup> with a power of 80% and a confidence interval at 95%. Calculated sample size is 28 in each group, considering 10% loss to follow up; we recruited 35 patients in each group. Data collected was checked for completeness and consistency. Data were entered in IBM SPSS Statistics 21 for Windows (IBM Crop. 1995, 2012). Data of patients were analysed according to which they were randomly assigned originally. Descriptive statistics like proportion, mean, and standard deviations were used in variables like gender, age, weight, duration of anesthesia and duration of surgery. Chi-square test, T-test, wase used for comparing the difference in POST, cough and hoarseness of voice between two groups. P value < 0.05 was taken as statistically significant.

### Results And Observation

The study protocol was completed in 70 patients and the demographic parameter and duration of surgery, as shown in table 1, in the two groups were comparable, statistically not significant and will not affect the study outcome.

**Table 1: Patient's characteristics and duration of anaesthesia and surgery among the two groups**

Characteristics	Group A	Group B	P-value
	N=35(mean $\pm$ SD)	N=35(mean $\pm$ SD)	
Age (yr.)	40.14 $\pm$ 9.47	42.06 $\pm$ 8.8	0.784
Gender (M/F)	17/18	16/19	0.811
Weight(kg)	64.77 $\pm$ 7.12	60.46 $\pm$ 8.53	0.685
Duration of anaesthesia	80.29 $\pm$ 26.6	58.77 $\pm$ 11.6	0.154
Duration of surgery	66.54 $\pm$ 24.43	47.06 $\pm$ 11.04	0.7

**Table 2: Incidence of post-operative sore throat at 1,6, & 24-hour post operatively in Group A, Group B (N=70)**

Time	Occurrence	Group A N (%)	Group B N (%)	P value
1hr	No	30(85.7)	20(57.1)	0.008
	Yes	5(14.3)	15(42.9)	
6hr	No	32(91.4)	23(65.7)	0.009
	Yes	3(8.6)	12(34)	
24hr	No	33(94.3)	24(68.6)	0.006
	Yes	2(5.7)	11(31)	

Table 2 shows the proportion of patients complaining of POST. There was significantly a greater number of patients complaining of POST in Group B, followed by Group A at 1 hour, 6 hour, and 24 hours respectively. In group A, incidence of POST was 5(14.3%), 3(8.6%), 2(5.71%) at 1 hour, 6 hour, and 24 hours respectively. In group B, incidence of POST was 15(42.86%), 12(34%), 11(31%) at 1 hour, 6 hour, and 24 hours respectively. Incidence of POST for patients in Group A was lower at all hours post-operatively when compared to Group B.

**Table 3: Incidence of Hoarseness of voice at 1,6, & 24-hour post operatively in Group A, Group B (N=70)**

Time	Occurrence	Group A N (%)	Group B N (%)	P value
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1hr	No	32(91.4)	21(60)	0.002
	Yes	3(8.6)	14(40)	
6hr	No	33(94.3)	23(65.7)	0.003
	Yes	2(5.7)	12(34.3)	
24hr	No	34(97)	26(74.3)	0.006
	Yes	1(2.9)	9(25.7)	

Table 3 shows the proportion of patients complaining of hoarseness of voice. There was significantly a greater number of patients complaining of hoarseness of voice in Group B, followed by Group A at 1 hour, 6 hour, and 24 hours respectively. In group A, incidence of hoarseness of voice was 3(8.6%), 2(5.7%), 1(2.8%) at 1 hour, 6 hour, and 24 hours respectively. In group B, incidence of hoarseness of voice was 14(40%), 12(34.28%), 9(25.7%) at 1 hour, 6 hour, and 24 hours respectively. Incidence of hoarseness of voice for patients in Group A was significantly lower at all hours post- operatively when compared to Group B.

**Table 4: incidence of cough at 1,6, & 24-hour post operatively in Group A, Group B (N=70)**

Time	Occurrence	Group A N (%)	Group B N (%)	P value
1hr	No	32(91.4)	22(62.9)	0.004
	Yes	3(8.6)	13(37.1)	
6hr	No	33(94.3)	24(68.6)	0.006
	Yes	2(5.7)	11(31.4)	
24hr	No	34(97)	26(74.3)	0.006
	Yes	1(2.9)	9(25.7)	

Table 4 shows the proportion of patients complaining of cough. There was significantly a greater number of patients complaining of cough in Group B, followed by Group A at 1 hour, 6 hour, and 24 hours respectively. In group A, incidence of cough was 3(8.6%), 2(5.7%), 1(2.8%) at 1 hour, 6 hour, and 24 hours respectively. In group B, incidence of cough was 13(37.14%), 11(31.4%), 9(25.7%) at 1 hour, 6 hour, and 24 hours respectively. Overall, the incidence of cough was 16(45.7%), 13(37.14%), 10(28.6%) at 1 hour, 6 hour, and 24 hours respectively.

## Discussion

Post-operative sore throat, hoarseness of voice and cough is a common complication of general anesthesia and contributes to post-operative

morbidity in the patients. The present study is done to evaluate the effectiveness of inhaled budesonide suspension in the prevention of post-operative sore throat, hoarseness of voice and cough after endotracheal intubation. In our study, we used a metered

dose inhaler to deliver the test drug. The advantage of using the inhaled route is that the total dose administered is minimal, at the same time the maximum concentration of the drug is made available at the site of action, thereby reducing the magnitude of side effects. Budesonide is a corticosteroid with potent glucocorticoid and weak mineralocorticoid activities. Its usefulness in prevention of POST had been investigated with promising results when administered before induction of anesthesia.

In the present study, the incidence of POST among 70 patients at 1hr is 17(48.57%), at 6 hr 15(42.86%) at 24hr 13(37%). The incidence of POST for patients in group A was lower at 1hr 5(14.3%), 6hr 3(8.6%), 24hr 2(5.7%) when compared to group B at 1hr 15(42.86%), 6hr 12(34%), 24hr 11 (31%). Similarly, the incidence of hoarseness of voice in group A at 1hr 3(8.6%), 6hr 2(5.7%), 24 hr 1(2.8%) was lower when compared to group B at 1hr 14(40%), 6hr 12(34.28%), 24 hr 9 (25.7%). The incidence of cough in group A at 1hr 3(8.6%), 6hr 2(5.7%), 24hr 1(2.8%) was also lower when compared with group B at 1hr 13(37.14%), 6hr 11 (31.4%), 24hr 9(25.7%). There was a significant reduction in the incidence of POST, hoarseness of voice and cough in group A when compared with group B.

A study done by Rajan S *et al*<sup>10</sup> patients were randomized into two groups, Group A received 200ug budesonide inhalation suspension using a metered dose inhaler 10 minutes before intubation, which was repeated 6hrs after extubation. In group B no such intervention was performed before intubation or after extubation. The Post-operative sore throat, cough and hoarseness of voice were assessed at 2,6,12 and 24 hrs. Compared to group B, the number of patients who had POST was significantly lower in group A at 6hr and 24h ( $P < 0.001$ ). The incidence of POST during this time interval was 3(13%), 0(0%) at 6hr and 24hr when compared to group B 19(83%), 16(70%) at 6hr, and 24hr respectively. Subsequently the incidence of cough was 17%, 4%, at 6hr and 24 hr and hoarseness of voice 22%, 0% at 6hr, and 24hr was significantly lower when compared to group B. These findings were comparable to our study.

Sharma S *et al*<sup>22</sup> observed 190 patients posted for laparoscopic cholecystectomy. The patients were divided into three groups. Patients in group N were

nebulized with 8 mg dexamethasone prior to surgery, patients in group I received intravenous dexamethasone (8mg) while patients in group C were intubated with endotracheal tube which was pre-treated (cuff soaked in dexamethasone 8 mg). The severity of POST and hoarseness of voice was determined after 24 hrs. Incidence of POST decreased in all patients with maximum decrease in group N (18%), while 30.8% in group I and 30.4% in group C. Incidence of hoarseness significantly decreased in group N (15.6%) as compared to group I (40.3%) as well as group C (39.1%). The study concluded that nebulization is most effective method in decreasing POST as well as hoarseness compared to topical and intravenous method. These findings were comparable to our study.

Ashwini H *et al*<sup>17</sup> observed 90 patient and divided into two groups of 45 patients each. Group D received dexamethasone 8mg with 3ml of normal saline nebulization while Group M received magnesium sulphate with 3 ml of normal saline for nebulization 30 min before the induction of an aesthesia. POST, cough and hoarseness of voice were assessed at 0,4,8,12 and 24hrs. Compared to group M, the number of patients in group D who had POST were significantly low at rest at 0 hr ( $p = 0.0262$ ), 4hr ( $p = 0.00022$ ), 8hr ( $p = 0.00039$ ) and 12hr ( $p = 0.000657$ ). Only one patient in each group had POST at 24 hrs which was statistically not significant ( $p = 1.00$ ). However, in our present study the incidence of POST was significantly reduced in budesonide group at 24hr [ 5.7% ( $p = 0.006$ )] than in control group.

In a study conducted by Rajkumar G *et al*<sup>2</sup> used prophylactic ketamine gargle compared with normal saline in 45 patients each. The incidence of POST at 0hr, 2hr, 4hr and 24hr was 24%, 27%, 22% and 18% in NS group compared to 13%, 13%, 18% and 18% in K group. This study found the significant reduction in incidence of POST in Ketamine group compared with normal saline and concluded that gargling with ketamine decreases the incidence and severity of POST in patient undergoing general anesthesia.

Inhaled or aerosolized corticosteroids are commonly used in asthma treatment and are widely used in POST prophylaxis due to their ability to reduce inflammation, edema, fluid transudation, and pain severity. Our results suggest that nebulized corticosteroids are the best solution for almost all

outcomes. In addition to preventing POST, cough and hoarseness, prophylactic administration of corticosteroids has been reported to reduce the incidence of postoperative laryngeal edema and reintubation<sup>23</sup>

The limitation of our study was that the tracheal cuff pressure was not monitored during the surgery as increased pressure cuff is a contributing factor for POST. Moreover, delivery of the drug to the site of action was solely dependent on patient effort and hence might not have been uniform and accurate in all patients. Therefore, preoperative nebulization with budesonide is useful and effective for attenuation of the incidence and severity of post operative sore throat, hoarseness of voice and cough in patients undergoing elective surgery under general anesthesia using endotracheal tube.

### Conclusion

It can be concluded from the study that the use of pre-operative 200ug of budesonide nebulization reduces the incidence and severity of post-operative sore throat, hoarseness of voice and cough during the post-operative period.

### References

1. Park SY, Kim SH, Lee SJ, Chae WS, Jin HC, Lee JS, et al. Application of triamcinolone acetonide paste to the endotracheal tube reduces postoperative sore throat: A Randomized controlled trial. *Can J Anaesth*. 2011;58(5):436–42.
2. Rajkumar G, Eshwori L, Konyak P Y, et al. Prophylactic ketamine gargle to reduce post-operative sore throat following endotracheal intubation. *J Med Soc*. 2012;26(3):175-9.
3. Ahuja V, Mitra S, Sarna R. Prophylactic ketamine gargle to reduce post-operative sore throat following endotracheal intubation. *Indian J Anaesth*. 2015;59(1):37-42.
4. Kang HY, Seo D, Choi J, Park S, Kang W. Preventive effect of ketamine gargling for postoperative sore throat after endotracheal intubation. *Anaesth Pain Med*. 2015;10(1):257-60.
5. Reddy M, Fiaz S. Dose dependent effectiveness of ketamine nebulization in preventing post-operative sore throat due to tracheal intubation. *Sri Lankan J Anaesthesiol*. 2018;26(1):22-7.
6. Chan L, Lee M L, Loo Y L. Postoperative sore throat and ketamine gargle. *Br J Anaesth*. 2010;105(1):97-9.
7. Jain S, Bendwal HP, Gohiya S, Alwani N, Pancholi S, Romday R. Comparison of nebulized ketamine and ketamine with clonidine in postoperative sore throat. *Int Surg J*. 2017;4(5):1579-83.
8. Rudra A, Ray S, Chatterjee S, Ahmed A, Ghosh S. Gargling with Ketamine attenuates the postoperative sore throat. *Indian J Anaesth*. 2009;53(1):40-3.
9. Canbay O, Celebi N, Sahin A, Celiker V, Ozgen S, Aypar U. Ketamine gargle for attenuating postoperative sore throat. *Br J Anaesth*. 2008;100:490-3.
10. Rajan S, Tosh P, Paul J, Kumar L. Effect of inhaled budesonide suspension, administered using a metered dose inhaler, on post-operative sore throat, hoarseness of voice and cough. *Ind J Anaesth*. 2018;62(1):66-71.
11. Chen YQ, Wang JD, Xiao J. Prophylactic Effectiveness of Budesonide inhalation in Reducing Postoperative Throat Complaints. *J Anesth Clin Res*. 2012;3(1):7-10
12. Singh AN, Hirday K, Niraj K, Harshvardhan, Harshitha G. Use of Preoperative Inhaled Budesonide to Reduce Postoperative Sorethroat Incidence after Endotracheal Intubation. *Int J Contem Med Res*. 2019;6(4):1-4.
13. Abbasi S, Moradi S, Talakoub R, Kashefi P, Koushki AM. Effect of nebulized budesonide in preventing postextubation complications in critically patients: A prospective, randomized, double-blind, placebo-controlled study. *Adv Biomed Res*. 2014;3(1):182-4.
14. Paul S, Gangwar R, Pratap KM Comparative Evaluation of efficacy of Nebulised Budesonide Dexamethasone in Reducing Post-operative Sore Throat in patients undergoing Elective Lumbar Spine Surgery in Prone Position. *J Clin Anaesth*. 2019;3(1):111.

15. Ogata J, Minami K, Horishita T, Shiraishi M, Okamoto T, Terada T et al. Gargling with sodium azulene sulfonate reduces the postoperative sore throat after intubation of the trachea. *Int Anesth Res Soc.* 2005;101(1):290-3.
16. Elhakim M. Beclomethasone prevents postoperative sore throat. *Acta Anaesthesiol Scand.* 1993;37(3):250-2.
17. Ashwini H, Kumari KS, Lavanya R. Comparative study of dexamethasone nebulization with magnesium sulphate nebulization in preventing post-operative sore throat following endotracheal intubation. *Ind J clin Anaesth.* 2018;5(3):341-7.
18. Thomas S and Beevi S. Dexamethasone reduces the severity of postoperative sore throat. *Can J Anaesth.* 2007;54(11):897–901.
19. Sun L, Guo. Dexamethasone for preventing post-operative sore throat: a meta-analysis of randomized controlled trials. *Ir J Med Sci.* 2014;183(4):593-600.
20. Salama AK, El-badawy AM. Does nebulized dexamethasone decrease the incidence of postextubation sore throat? A randomized controlled study. *Ain-Shams J Anaesthesiol.* 2016;9(1):104-7.
21. Zhoa X, Cao X, Li Q. Dexamethasone for prevention of postoperative sore throat: a systemic review and meta-analysis. *J Clin Anesth.* 2015;27(1):45-50.
22. Sharma S, Bhardwaj, V., Sharma, S., & Rana, S. Dexamethasone to decrease post-anesthesia sore throat (POST) and hoarseness-which is the most effective route: intravenous, topical, or nebulization? A prospective randomized trial. *Ain-Shams J Anesth.* 2021;13(1):2-5.
23. Zhang W, Zhao G, Li L, Zhao P. Prophylactic Administration of Corticosteroids for Preventing Postoperative Complications Related to Tracheal Intubation: A Systematic Review and Meta-Analysis of 18 Randomized Controlled Trials. *Clin Drug Investig.* 2016;36(4):255–65.
24. Liu J, Zhang X, Gong W, Li S, Wang F, Fu S et al. Correlation between controlled tube cuff pressure and post-procedural complications: a multicenter study. *Int Anesth Res Soc.* 2010;111(5):1133-7.