Application of Mometasone Spray to Reduce Sore Throat after Tracheal Intubation

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Background: *Many factors in tracheal intubation lead to postoperative sore throat from mucosal injury. Mometasone furoate spray is a moderate potency corticosteroid that prevents influx of inflammatory cells into the mucosa. The present study assessed the efficacy of this drug for reducing postoperative sore throat.*
Material and Method: *A prospective, randomized, double blind, controlled study was completed. Forty-two patients undergoing general surgery with general anesthesia were randomized into two groups, momethasone and NSS group sprayed at the endotracheal tube cuff, vocal cords, epiglottis and pharynx at the time of tracheal intubation. All the patients were evaluated on the incidence and severity of the sore throat at first, sixth, and 24 hour after surgery.*
Results: *The sore throat after tracheal intubation was significantly less severe after momethasone spray was used than after NSS was used at first, sixth and 24 hours after surgery. The incidences of sore throat in the momethasone group were also significantly fewer than in the SS group at sixth and 24 hour post operation (20% vs. 50% and 10% vs. 40%, respectively) but at the first hour that the incidence was not significantly different (40% vs. 75%). Number needed to treat at the first hour was 2.86, sixth hour was 3.33 and 24 hour was 3.33.*
Conclusion: *Application of mometasone spray reduces postoperative sore throat after tracheal intubation.*

Keywords: *Sore throat, Endotracheal intubation, Mometasone spray*

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After tracheal intubation under general anesthesia, a sore throat is one of the most common complications, occurring in 21% up to 90%[1]. The sore throat is very uncomfortable for the patient in addition to the wound pain from the surgery. It seems to be the consequence of local irritation and inflammation of the airway[2-4].

Steroids are known to be an anti-inflammatory agent. Previous studies have mentioned the effect of locally administrated steroid on reducing sore throat after tracheal intubation. Betamethasone gel effectively reduces the incidence of sore throat compared with lidocaine jelly (40%, 100%)[5]. Momethasone furoate spray is a moderate potency corticosteroid available as a nasal spray that is effectively used in allergic rhinitis patients[22-24].

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The present prospective, double-blind and randomized study was performed to determine whether spraying immediately before intubation at the endotracheal tubes and airways with mometasone furoate, decreased the incidence and severity of sore throat after tracheal intubation.

Material and Method

After receiving the approval of the ethics committee of the hospital and written informed consent of every subject had been obtained, 42 ASA physical status I-II patients scheduled for elective surgery in a supine position, aged 18 years or older were recruited into the present study. Surgery of the head & neck or the oral cavity, presence of a Nasogastric tube before surgery, prior steroid use, and symptoms of sore throat, hoarseness, upper respiratory tract infection, pregnancy and lactation and known case of difficult intubation or suspected difficult intubation were excluded.

One day before surgery, the patients were evaluated by anesthesiology residents and were allocated into two groups by random number table;

1. The Mometasone group (n = 21): 0.05% mometasone furoate solution (Nasonex®).

2. The NSS group (n = 21): 0.9% NaCl solution

In order to facilitate blinding, both of the test solutions (Mometasone furoate or NSS) were prepared in white bottles (as in Fig. 1), by an anesthesiology resident who was not involved in the present study. The test solutions were brought to the anesthesiologists who were caring for the patients on the morning of the surgery.

In the operating room, a PVC endotracheal tube (Curity®), of size number 7.5 mm internal diameter for females and 8.5 for males was prepared and the test solution (Mometasone furoate or NSS) was sprayed two times on the external surface of the endotracheal cuff.

After the induction of anesthesia with propofol 1-2 mg/kg and cisatracurium 0.15-0.2 mg/kg, a Macintosh laryngoscope was used for intubation. The test solution was spayed two times each on the vocal cords, epiglottis, pharynx, and cuff of endotracheal tube (as Fig. 2) before intubation. The endotracheal cuff was inflated to an airway pressure 25 cm H_2O leakage. The suction catheter was inserted as an orogastric tube in some patients during surgery and removed at the end of the operation. Anesthesia was maintained with 50% nitrous oxide, 50% oxygen and Desflurane. Fentanyl 1-2 mcg/kg was also used for the maintenance of anesthesia.

Another anesthesiologist who was not involved in the intraoperative period assessed and recorded the scoring of postoperative sore throat (1: none, 2: minimal, discomfort of throat, 3: moderate, sore when swallowing and 4: severe sore all the time) at the first hour (in PACU), sixth hour and 24 hour (at ward) after surgery.

Data was analyzed by the Mann-Whitney u test for the ordinal scale data, Independent-sample t-test for the continuous scale data and the Chi-square test for the nominal scale data. $P < 0.05$ was considered significant. On the basis of the results of a prior study[6] that showed an incidence of 55% for sore throat, we calculated that 21 patients would be required in each group to detect a reduction in sore throat incidence from 55% to 10% with $\beta = 0.2$, $\alpha = 0.05$ and 20% for drop out.

Results

Forty-two patients were studied but one patient in each group was excluded because they did not use the drugs following the protocol, 20 patients in each group were recruited into the present study

Fig. 1 Test drug

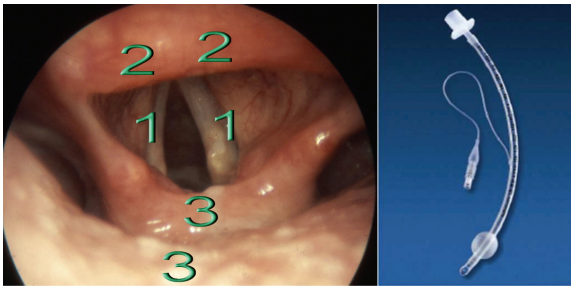

Fig. 2 Position for applying momethasone spray; No.1 on the vocal cord area, No.2 on the epiglottis, No.3 on the pharynx, and on the cuff of ETT

with a comparable gender distribution of 16 females and four males in the Mometasone furoate group and 19 females and one male in the NSS group. There were no differences between groups with regard to demographic data, the intubating performers, intubation attempts, laryngoscopic view, orogastric tube insertion, anesthetic time, intraoperative and postoperative opioids usage (Table 1).

The total incidences of sore throat after tracheal intubation are shown in Table 2. In the first hour postoperative, totally 23 of all 40 patients (57.5%) developed a sore throat, eight patients (40%) in the mometasone group compared with 15 patients (75%) in the NSS group. However, the incidence was not statistically different ($p = 0.054$). By the sixth hour postoperative, four patients (20%) in the mometasone group and 10 patients (50%) in the NSS group still had sore throats. By the 24 hour postoperative, only two patients (10%) in the mometasone group and eight patients (40%) in the NSS group had sore throats. The incidences of sore throat in the sixth and 24 hour were significantly lower in the mometasone group compared with in the NSS group ($p = 0.041$, $p = 0.044$).

Table 1. Patient parameters

	Mometasone group (n = 20)	NSS group (n = 20)	p-value
Age (y)	49.8 ± 8.9	51.7 ± 15.1	0.622
Body weight (kg)	58.7 ± 10.7	57.5 ± 8.9	0.714
Height (cm)	154.9 ± 5.5	154.2 ± 8.8	0.749
Anesthetic time (min)	97.8 ± 63.3	97.8 ± 39.9	1
Intraoperative fentanyl (mcg)	65.6 ± 31.6	54.2 ± 19.0	0.452
Postoperative opioids			
Fentanyl (mcg)	34.3 ± 28.3	38.6 ± 14.4	0.944
Pethidine (mg)	35.0 ± 21.2	22.5 ± 3.6	0.497
Morphine (mg)	7.2 ± 3.6	9.6 ± 7	0.306
Intubating performers			
Student	6 (30)	3 (15)	
Resident	14 (70)	15 (75)	0.127
Staff	0 (0)	2 (10)	
Laryngoscopic view			
Grade I	2 (10)	3 (15)	0.637
Grade II	18 (90)	17 (85)	
Intubation attempts			
1 time	19 (95)	20 (100)	0.317
2 times	1 (5)	0 (0)	
Orogastric tube insertion	7 (35)	14 (70)	0.056

Values are mean ± SD in age, body weight, height, anesthetic time, intraoperative fentanyl, postoperative opioids
Values are number (%) in intubating performer, laryngoscopic view, intubation attempts, orogastric tube insertion

Table 2. Incidence of sore throat after tracheal intubation

Postoperative (h)	Mometasone group	NSS group	p-value
1st	8/20 (40%)	15/20 (75%)	0.054
6th	4/20 (20%)	10/20 (50%)	0.041*
24th	2/20 (10%)	8/20 (40%)	0.044*

Values are number of patient (%)
* $p < 0.05$ significant

Table 3. Severity of sore throat after tracheal intubation

Postoperative (h)	Mometasone group	NSS group	p-value
1st	1 (1, 3)	2 (1, 3)	0.02*
6th	1 (1, 2)	1.5 (1, 3)	0.043*
24th	1 (1, 2)	1 (1, 3)	0.026*

Values are median (min, max), *$p < 0.05$ significant, Severity; 1 = none, 2 = mild, 3 = moderate, 4 = severe

In Table 3, the scores for the severity of sore throat after tracheal intubation are significantly lower in the mometasone group throughout the first, sixth, and 24 hour of postoperative periods ($p = 0.02$, 0.043 and 0.026). None of the patients in the present study suffered from a severe sore throat.

In the first hour, there was only one patient in the mometasone group and four patients in the NSS group who experienced moderate sore throat and all of these patients had the same moderate score of sore throat by the sixth hour (Fig. 3). By the 24 hour, two patients in the NSS group still had moderate sore throat (Fig. 3). Number needed to treat (NNT) at first hour was 2.86, at sixth hour was 3.33 and at 24 hour was 3.33.

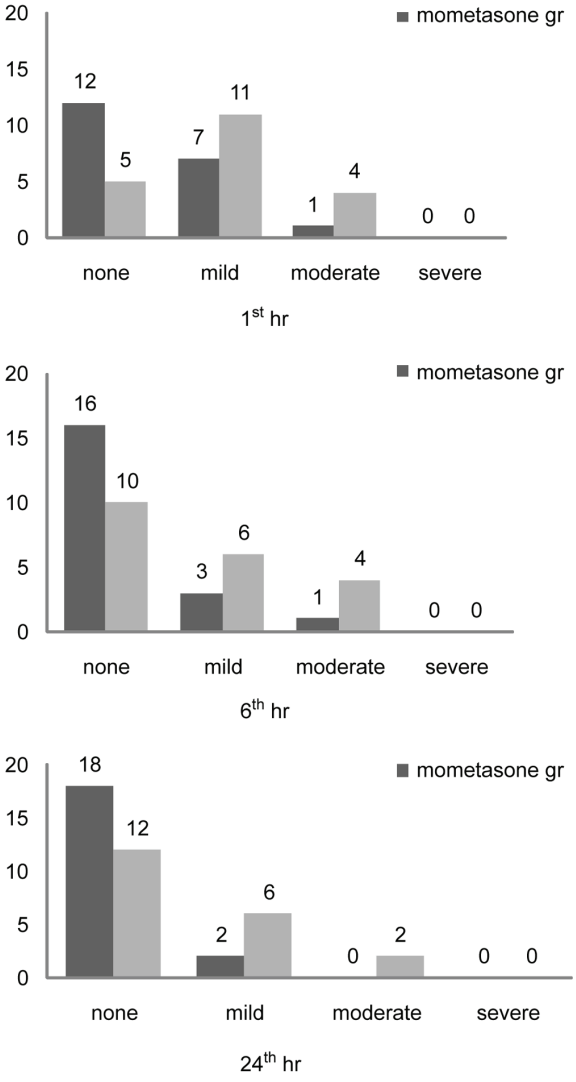

Fig. 3 Present number of patients that complained of sore throat after tracheal intubation at 1st hr (X-axis: number of patients, Y-axis: severity of sore throat)

Discussion

The mechanism of sore throat after tracheal intubation is not fully understood. Possible contributing factors are local pharyngeal, laryngeal and tracheal irritation. The association between sore throat and the area of contact between the endotracheal cuff and trachea has been clearly demonstrated[7-13]. Previous studies have shown laryngeal changes and the affect on voice-frequency histograms after tracheal intubations[14,15].

In most of the previous studies, the beneficial effects of steroids in reduction of sore throat after tracheal intubation have been shown. Stride PC L[16] compared 1% hydrocortisone cream with KY jelly applied from the distal tip to 5 cm above the cuff, and found that 1% hydrocortisone cream caused more sore throat (90% in hydrocortisone: 10% in KY jelly). Chakib M[17] compared water-soluble jelly plus chlorhexidine gluconate with water-soluble jelly plus chlorhexidine gluconate plus 0.05% betamethasone group and found that the addition of betamethasone reduced sore throat. Hakim M EL[6] compared 50 mcg beclomethasol metered dose aerosol with 10% lidocaine spray 10 mg and found that beclomethasol reduced sore throat (55% in lidocaine: 10% in beclomethasone). Sumathi PA[5] compared 0.05% betamethasone gel, 2% lidocaine gel and placebo and that betamethasone gel reduced the sore throat (40%: 100%: 100%, respectively).

According to previous clinical trial data, the authors found that low potency corticosteroid (1% hydrocortisone cream[16]) cannot reduce sore throat after tracheal intubation but high potency corticosteroid in various preparations (0.05% beta-methasone cream or jelly and beclometasone aerosol) can reduce post-intubation sore throat. Betamethasone is more potent than mometasone furoate but its preparations are not designed for using in airway mucosa.

In the present study, mometasone furoate spray, which is a moderate potency corticosteroid, sprayed through the most common areas of injury after intubation including the trachea that endotracheal cuff attachment, vocal cords, epiglottis and pharynx at posterior over cricoid plate had a beneficial effect on reducing sore throat after tracheal intubation. In the early period after tracheal intubation, at first hour postoperative, the incidence of sore throat was not significantly different between the two groups but there was a significant difference in the severity of sore throat symptoms, which was lower in the

mometasone group. By the sixth and 24 hour postoperative, both the incidences and the severity of sore throat were significantly lower in the mometasone group compared with the NSS group. It seems that the incidence and severity of sore throat in the mometasone group also subsided much more quickly in a period of time (Table 3, Fig. 2). Mometasone furoate spray was reported at onset to improve the symptoms of perennial allergic rhinitis by the fourth hour and seasonal allergic rhinitis by the seventh hour after use[25]. Therefore, the onset of anti-inflammation of the traumatized airway after tracheal intubation would show at six and 24 hours later. The effectiveness of mometasone spray before tracheal intubation can reduce the incidence of sore throat, which NNT (number needed to treat) were 2.86, 3.33, and 3.33 at the first, sixth and 24 hour respectively.

Systemic side effects of corticosteroids depend on the potency, absorption and dosage. The authors planned to apply mometasone to all portions that had a potential role in inflammation including the vocal cords, epiglottis, hypopharynx and endotracheal tube cuff that was in contact with the tracheal mucosa. The systemic side effects of this drug are less than 1%. The dose of mometasone eight puffs used in the present study was equivalent to 400 mcg of mometasone furoate, which is within the safe clinical range[24]. Another advantage of mometasone furoate spray is that the actual preparation can be promptly used in the mucosa of the airway.

The present study was designed to standardize these possible confounding factors that affect sore throat, which previous studies have discussed such as inflate endotracheal tube cuff pressure at the same airway pressure leakage[9] and N2O: O2 ratio[18], which is affected by N2O diffusion into the cuff of endotracheal tube, the diameter of the endotracheal tube[10], the same design of endotracheal tube cuff[7-9,11] and the intubation technique with non-depolarizing muscle relaxant[19] instead of succinylcholine[20].

The limitation of the present study was the sample size that included more women than men in both groups but the ratio of males to females in each group was not statistically different. However, Harding CJ[21] demonstrated no significant difference of sore throat incidences between male and female. The present study was performed in general surgery in only the supine position so the results may not be referable in other populations. Mometasone furoate is a white-opaque formula solution, so this character may not actually blind the intubating performers, however, the intubating performers and the assessors of postoperative sore throat were not the same people and the assessors were actually blind between the two groups. Because the data was collected in the medical school, the intubating performers could have been medical students, rotating residents, anesthesiology residents, or anesthesiology staff. However, the authors also checked by statistically calculating after separating in the groups of the intubating performers and found no significant difference in either the incidence or the severity of sore throat among each groups of the intubating performers. The incidence of coughing and bucking on the tracheal tube at the time of extubation was not recorded in any of the group. Although the protocol of extubation was the same standard in all patients, but coughing and bucking at the time of extubation should have been recorded and evaluated as to the effect with the sore throat. Because perioperative and postoperative opioids administrations were not fixed, the sore throat may have been lower in those who received much more opioids. However, the type of surgery in both groups was similar, and the dosage or type of opioids was not statistically different so that the severity of sore throat score after surgeries in both groups should not have been affected by the opioids.

Conclusion

0.05% Mometasone furoate spraying on the endotracheal tube cuff and the airway mucosa immediately before tracheal intubation was effective in reducing postoperative sore throat with NNT 2.86, 3.33, and 3.33 at the first, sixth and 24 hour respectively.

Potential conflicts of interest

None.

References

1. Loeser EA, Stanley TH, Jordan W, Machin R. Postoperative sore throat: influence of tracheal tube lubrication versus cuff design. Can Anaesth Soc J 1980; 27: 156-8.
2. Christensen AM, Willemoes-Larsen H, Lundby L, Jakobsen KB. Postoperative throat complaints after tracheal intubation. Br J Anaesth 1994; 73: 786-7.
3. Keane WM, Denneny JC, Rowe LD, Atkins JP Jr. Complications of intubation. Ann Otol Rhinol Laryngol 1982; 91: 584-7.
4. McHardy FE, Chung F. Postoperative sore throat: cause, prevention and treatment. Anaesthesia 1999; 54: 444-53.

5. 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: 215-8.
6. el Hakim M. Beclomethasone prevents post-operative sore throat. Acta Anaesthesiol Scand 1993; 37: 250-2.
7. Loeser EA, Kaminsky A, Diaz A, Stanley TH, Pace NL. The influence of endotracheal tube cuff design and cuff lubrication on postoperative sore throat. Anesthesiology 1983; 58: 376-9.
8. Loeser EA, Bennett GM, Orr DL, Stanley TH. Reduction of postoperative sore throat with new endotracheal tube cuffs. Anesthesiology 1980; 52: 257-9.
9. 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.
10. Stout DM, Bishop MJ, Dwersteg JF, Cullen BF. Correlation of endotracheal tube size with sore throat and hoarseness following general anesthesia. Anesthesiology 1987; 67: 419-21.
11. Loeser EA, Orr DL, Bennett GM, Stanley TH. Endotracheal tube cuff design and postoperative sore throat. Anesthesiology 1976; 45: 684-7.
12. Peppard SB, Dickens JH. Laryngeal injury following short-term intubation. Ann Otol Rhinol Laryngol 1983; 92: 327-30.
13. Hilding AC. Laryngotracheal damage during intratracheal anesthesia. Demonstration by staining the unfixed specimen with methylene blue. Ann Otol Rhinol Laryngol 1971; 80: 565-81.
14. Priebe HJ, Henke W, Hedley-Whyte J. Effects of tracheal intubation on laryngeal acoustic waveforms. Anesth Analg 1988; 67: 219-27.
15. Lesser T, Williams G. Laryngographic investigation of postoperative hoarseness. Clin Otolaryngol Allied Sci 1988; 13: 37-42.
16. Stride PC. Postoperative sore throat: topical hydrocortisone. Anaesthesia 1990; 45: 968-71.
17. 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 Analg 1998; 87: 714-6.
18. Stanley TH. Nitrous oxide and pressures and volumes of high- and low-pressure endotracheal-tube cuffs in intubated patients. Anesthesiology 1975; 42: 637-40.
19. Combes X, Andriamifidy L, Dufresne E, Suen P, Sauvat S, Scherrer E, et al. Comparison of two induction regimens using or not using muscle relaxant: impact on postoperative upper airway discomfort. Br J Anaesth 2007; 99: 276-81.
20. Joorgensen LN, Weber M, Pedersen A, Munster M. No increased incidence of postoperative sore throat after administration of suxamethonium in endotracheal anaesthesia. Acta Anaesthesiol Scand 1987; 31: 768-70.
21. Harding CJ, McVey FK. Interview method affects incidence of postoperative sore throat. Anaesthesia 1987; 42: 1104-7.
22. Electronic Medicines Compendium. Nasonex 50 micrograms/actuation nasal spray, suspension [database on the Internet]. 2011 [cited 2011 May 19]. Available from: http://www.medicines.org.uk/EMC/browsedocuments.aspx
23. Schering Coperation. NasonexRM (Mometasone furoate monohydrate) nasal spray 50 mcg: product formation [database on the Internet]. Revised: January 2011 [cited 2011 May 19]. Available from: http://www.spfiles.com/pinasonex.pdf
24. Baldwin CM, Scott LJ. Mometasone furoate: a review of its intranasal use in allergic rhinitis. Drugs 2008; 68: 1723-39.
25. Bende M, Carrillo T, Vona I, Castel-Branco MG, Arheden L. A randomized comparison of the effects of budesonide and mometasone furoate aqueous nasal sprays on nasal peak flow rate and symptoms in perennial allergic rhinitis. Ann Allergy Asthma Immunol 2002; 88: 617-23.

การใช้ mometasone furoate spray พ่นทางเดินหายใจส่วนบนขณะใส่ท่อช่วยหายใจเพื่อลดอาการเจ็บคอหลังผ่าตัด

อรุณชัย นรเศรษฐกมล, อัญชลี เตชะนิเวศน์, จักรพงษ์ เสาธงทอง, ณัฏฐิกา ยุระเกตุ, ปราชญานันท์ ขาวสนิท

วัตถุประสงค์: *เพื่อศึกษาความสัมพันธ์ของยา mometasone furoate spray พ่นช่วยลดอาการเจ็บคอหลังใส่ท่อช่วยหายใจ*

วัสดุและวิธีการ: *การศึกษาแบบไปข้างหน้าในผู้ป่วย ASA class I-II ซึ่งมารับการผ่าตัดแบบไม่ฉุกเฉินในท่านอนหงาย ผู้ป่วยทั้งหมด 42 คน จะได้รับการสุ่มเป็น 2 กลุ่ม โดยผู้ป่วย, วิสัญญีแพทย์ผู้ให้การระงับความรู้สึก และผู้ที่สอบถามหลังผ่าตัดไม่ทราบว่าถูกสุ่มอยู่ในกลุ่มใด กลุ่มที่ 1 ได้รับ mometasone spray พ่น และกลุ่มที่ 2 ได้รับน้ำเกลือบริสุทธิ์พ่น บริเวณที่พ่นได้แก่ ท่อช่วยหายใจ และทางเดินหายใจส่วนบน โดยพ่นขณะใส่ท่อช่วยหายใจ และเมื่อเสร็จสิ้นผ่าตัด ผู้ป่วยจะได้รับการสอบถามถึงอาการเจ็บคอหลังการใส่ท่อช่วยหายใจ โดยให้ประเมินเป็นตัวเลขตามความรุนแรงคือ 0 = ไม่เจ็บ, 1 = เจ็บไม่มาก, 2 = เจ็บปานกลาง, 3 = เจ็บมาก โดยการสอบถามจะเริ่มหลังจากเสร็จสิ้นการผ่าตัดที่ 1 ชั่วโมง บริเวณห้องพักฟื้น และต่อมาที่ 6, 24 ชั่วโมง บริเวณหอผู้ป่วย*

ผลการศึกษา: *ความรุนแรงของการเจ็บคอในกลุ่มพ่น mometasone spray น้อยกว่าในกลุ่มพ่นน้ำเกลืออย่างมีนัยสำคัญ ทั้งที่ 1 ชั่วโมง, 6 ชั่วโมง และ 24 ชั่วโมงหลังผ่าตัด สำหรับอุบัติการณ์การเจ็บคอในกลุ่มพ่น mometasone spray พบน้อยกว่าในกลุ่มพ่นน้ำเกลืออย่างมีนัยสำคัญทั้งที่ 6 ชั่วโมง และ 24 ชั่วโมงหลังผ่าตัด (20% ต่อ 50% และ 10% ต่อ 40%, ตามลำดับ) แต่ที่ 1 ชั่วโมงหลังผ่าตัดอุบัติการณ์การเจ็บคอในทั้งสองกลุ่มไม่แตกต่างอย่างมีนัยสำคัญ (40% ต่อ 75%)*

สรุป: *การใช้ mometasone spray พ่นบริเวณทางเดินหายใจส่วนบนขณะใส่ท่อช่วยหายใจ สามารถลดอาการเจ็บคอการใส่ท่อช่วยหายใจหลังผ่าตัดได้*