

Effectiveness of Intracuff Dexamethasone versus Dexamethasone Gargles in Reducing Postoperative Sore Throat, Cough, and Hoarseness after General Anesthesia with Endotracheal Intubation

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Abstract

Background: Postoperative sore throat (POST), cough, and hoarseness of voice are common complications following endotracheal intubation under general anesthesia. Dexamethasone administered by different routes has been shown to reduce these airway-related complications.

Objective: To compare the effectiveness of intracuff dexamethasone and dexamethasone gargles in reducing postoperative sore throat, cough, and hoarseness of voice.

Materials and Methods: This prospective, randomized, double-blind clinical trial included 48 patients undergoing elective surgery under general anesthesia with oral endotracheal intubation. Patients were randomized into two groups (n=24 each): Group A received preoperative dexamethasone gargles (0.05%), while Group B received intracuff dexamethasone (0.1 mg/kg). Postoperative sore throat, cough, and hoarseness of voice were assessed at 1, 6, 12, and 24 hours after extubation using a four-point grading scale.

Results: Baseline demographic characteristics were comparable between the groups. The incidence of postoperative sore throat was significantly lower in the dexamethasone gargles group than in the intracuff dexamethasone group (25.0% vs. 58.3%; p=0.03). The incidence of postoperative cough was identical in both groups (4.2% vs. 4.2%; p=1.000). Although the overall incidence of hoarseness of voice was comparable (37.5% vs. 45.8%; p=0.77), persistent hoarseness at 6 hours was significantly lower in the gargles group (p=0.0001). All symptoms were mild and resolved within 24 hours.

Conclusion: Preoperative dexamethasone gargles were more effective than intracuff dexamethasone in reducing postoperative sore throat and facilitating earlier recovery from hoarseness, while both interventions showed similar efficacy in preventing postoperative cough.

Keywords: Dexamethasone Gargles; Intracuff Dexamethasone; Postoperative Sore Throat; Endotracheal Intubation; Hoarseness of Voice; Postoperative Cough.

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Introduction

Postoperative sore throat (POST) is one of the most common minor complications following general anesthesia with endotracheal intubation. Although self-limiting in most patients, it is associated with significant postoperative discomfort and dissatisfaction, adversely affecting the overall quality of recovery [1]. The reported incidence of POST ranges from 6% to 90%, while postoperative cough and hoarseness of voice have also been frequently reported following endotracheal intubation [2]. The etiology of POST is multifactorial and is primarily related to

mechanical trauma and inflammation of the pharyngolaryngeal and tracheal mucosa during airway instrumentation. Endotracheal intubation, excessive cuff pressure, repeated airway manipulation, prolonged duration of intubation, and endotracheal tube size are important contributors to postoperative airway morbidity [3,4]. Despite advances in airway devices and anesthetic techniques, postoperative sore throat, cough, and hoarseness continue to be frequently encountered after endotracheal intubation. The incidence and severity of these complications are influenced by

endotracheal tube size, cuff pressure, duration of intubation, and the degree of airway manipulation during laryngoscopy [5]. Although these complications are generally not life-threatening, they significantly affect patient comfort and satisfaction during the postoperative period [6]. Various preventive strategies have been investigated to reduce the incidence of POST. Non-pharmacological measures include the use of smaller-sized endotracheal tubes, high-volume low-pressure cuffs, gentle airway manipulation, maintenance of optimal intracuff pressure, and careful extubation techniques. However, these measures alone do not consistently prevent postoperative airway symptoms [7,8]. Several pharmacological agents have also been evaluated for preventing POST, including betamethasone gel, topical tenoxicam, intravenous dexamethasone, inhaled beclomethasone, magnesium lozenges, and topical corticosteroids. Although many of these interventions have shown beneficial effects, their efficacy varies and some are associated with practical limitations. Therefore, an effective, safe, and easily applicable prophylactic intervention remains desirable [9]. Dexamethasone is a potent synthetic glucocorticoid with well-established anti-inflammatory and immunosuppressive properties. It suppresses the inflammatory response induced by endotracheal intubation, thereby reducing postoperative sore throat, cough, and hoarseness of voice. Dexamethasone has been administered through several routes, including intravenous injection, gargling, topical application, and intracuff instillation, with encouraging clinical outcomes [10]. Dexamethasone gargles provide topical anti-inflammatory action over the oropharyngeal mucosa before airway instrumentation, whereas intracuff instillation allows gradual diffusion of dexamethasone across the endotracheal tube cuff to the tracheal mucosa throughout the period of intubation. Previous studies have demonstrated that both techniques independently reduce the incidence and severity of postoperative pharyngolaryngeal complications [7–9]. However, direct comparative evidence evaluating the relative efficacy of intracuff dexamethasone and dexamethasone gargles remains limited [6,7]. Therefore, the present study was undertaken to compare the effectiveness of intracuff dexamethasone and dexamethasone gargles in reducing postoperative sore throat, cough, and hoarseness of voice following general anesthesia with oral endotracheal intubation.

Materials and Methods

This prospective, randomized, double-blind clinical trial was conducted in the Department of Anaesthesiology, Mahadevappa Rampure Medical College (MRMC), Kalaburagi, after obtaining approval from the Institutional Ethics Committee.

The study was carried out over a period of 18 months. Eligible patients aged 18–70 years, belonging to ASA physical status I–III and scheduled for elective surgery under general anesthesia with oral endotracheal intubation, were enrolled after obtaining written informed consent.

Randomization and Blinding

Patients were randomly assigned using the sealed envelope method into:

- Group A (n = 24): Dexamethasone gargles
- Group B (n = 24): Intracuff dexamethasone

The study was double-blinded. The anesthesiologist preparing the study drug was not involved in patient assessment, and both the investigator and participants remained blinded to group allocation.

Inclusion Criteria

- Age 18–70 years
- Both sexes
- ASA grade I–III
- Elective surgery under general anesthesia requiring oral endotracheal intubation

Exclusion Criteria: Patients with upper respiratory tract infection or sore throat, those receiving steroid therapy, anticipated difficult intubation, requirement of Ryle's tube insertion, surgeries in the prone position, surgery duration >3 hours, or requiring more than one intubation attempt were excluded.

Study Procedure: After pre-anesthetic evaluation and overnight fasting, patients were randomized into two groups. Group A received 0.05% dexamethasone gargles (5 mg in 10 mL normal saline) for 30 seconds, 15 minutes before induction, while Group B gargled with 10 mL normal saline. General anesthesia was induced using standard institutional protocol, and oral endotracheal intubation was performed with a cuffed Portex tube. In Group A, the cuff was inflated with normal saline, whereas in Group B it was inflated with 0.1 mg/kg dexamethasone diluted with normal saline, maintaining cuff pressure at 25 cmH₂O using a cuff pressure manometer. Anesthesia was maintained with oxygen-air mixture, isoflurane, and neuromuscular relaxants as per protocol. At the end of surgery, patients were extubated after adequate reversal of neuromuscular blockade.

Outcome Assessment: Patients were assessed for postoperative sore throat, cough, and hoarseness of voice at 1, 6, 12, and 24 hours after extubation.

Statistical Analysis: Data were analyzed using IBM SPSS Statistics version 26.0. Continuous variables were expressed as mean $\pm$ SD and compared using the independent Student's t-test, while categorical variables were analyzed using the

Chi-square test or Fisher's exact test. A p-value <0.05 was considered statistically significant.

Results

A total of 48 patients were enrolled and randomized equally into Group A (dexamethasone gargles) and Group B (intracuff dexamethasone), with 24 patients in each group. All patients completed the study and were included in the final analysis. The baseline demographic and perioperative characteristics were comparable between the two groups (Table 1). The mean age was 39.8 ± 15.16 years in Group A and 40.12 ± 14.26 years in Group B ($p=0.940$). The mean duration of surgery was 145.0 ± 35.01 minutes and 132.5 ± 39.48 minutes, respectively ($p=0.251$). Gender distribution was identical in both groups, with 10 (41.7%) males and 14 (58.3%) females ($p=1.000$). The time-wise incidence of postoperative airway complications is presented in (Table 2). At 1 hour, postoperative sore throat occurred in 6 (25.0%) patients in Group A compared with 14 (58.3%) in Group B. At 6 hours, sore throat persisted in 1 (4.2%) patient in Group A and 7 (29.2%) patients in Group B, while only 3 (12.5%) patients in Group B had symptoms at 12 hours. No patient in either group experienced sore throat at 24

hours. Postoperative cough remained infrequent in both groups, whereas hoarseness of voice was more common in Group B, particularly at 6 hours. Overall, the incidence of postoperative sore throat was significantly lower in the dexamethasone gargles group than in the intracuff dexamethasone group (25.0% vs. 58.3%; $p=0.030$). The incidence of postoperative cough was identical in both groups (4.2% vs. 4.2%; $p=1.000$), while hoarseness of voice occurred in 37.5% and 45.8% of patients, respectively, without a significant difference ($p=0.770$) (Table 3, Figure 1). The severity of postoperative airway symptoms is shown in (Table 4, Figure 2). All symptoms were mild, with no patient developing moderate or severe sore throat, cough, or hoarseness. Mild sore throat was significantly less frequent in Group A ($p=0.030$), whereas the severity of cough and hoarseness was comparable between the groups. The persistence of postoperative airway symptoms is summarized in (Table 5, Figure 3). Sore throat was significantly lower in Group A at 1 hour ($p=0.030$) and 6 hours ($p=0.040$). Persistent hoarseness at 6 hours was also significantly lower in Group A (4.2% vs. 58.3%; $p=0.0001$). No significant differences were observed for cough at any time point, and all airway symptoms resolved completely by 24 hours.

Table 1: Perioperative Characteristics of the Study Groups

Variable	Group A (n=24)	Group B (n=24)	p-value
Age (years), Mean $\pm$ SD	39.8 ± 15.16	40.12 ± 14.26	0.940
Duration of surgery (min), Mean $\pm$ SD	145.0 ± 35.01	132.5 ± 39.48	0.251
Male, n (%)	10 (41.7)	10 (41.7)	1.000
Female, n (%)	14 (58.3)	14 (58.3)	

Table 2: Time-wise Incidence of Postoperative Airway Complications

Time after Extubation	Sore Throat Group A	Sore Throat Group B	Cough Group A	Cough Group B	Hoarseness Group A	Hoarseness Group B
1 hour	6 (25.0)	14 (58.3)	1 (4.2)	1 (4.2)	9 (37.5)	11 (45.8)
6 hours	1 (4.2)	7 (29.2)	0	1 (4.2)	1 (4.2)	14 (58.3)
12 hours	0	3 (12.5)	0	0	0	2 (8.3)
24 hours	0	0	0	0	0	0

Table 3: Comparison of Airway Complications between Study Groups

Variable	Group A n (%)	Group B n (%)	p-value
Sore throat	6 (25.0)	14 (58.3)	0.030
Cough	1 (4.2)	1 (4.2)	1.000
Hoarseness of voice	9 (37.5)	11 (45.8)	0.770

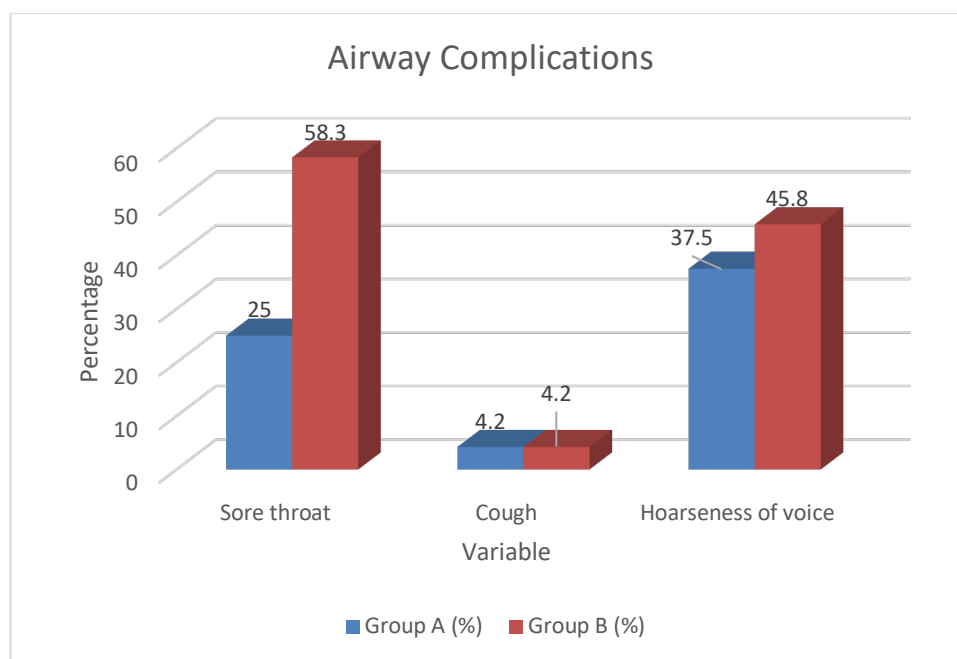


Figure 1: Comparison of Airway Complications between Study Groups

Table 4: Distribution of Symptom Severity during the First 24 Hours

Symptom	None n (%)	Mild n (%)	Moderate n (%)	Severe n (%)	p-value
Group A					
Sore throat	18 (75.0)	6 (25.0)	0	0	
Cough	23 (95.8)	1 (4.2)	0	0	
Hoarseness	15 (62.5)	9 (37.5)	0	0	
Group B					
Sore throat	10 (41.7)	14 (58.3)	0	0	0.030
Cough	23 (95.8)	1 (4.2)	0	0	1.000
Hoarseness	13 (54.2)	11 (45.8)	0	0	0.770

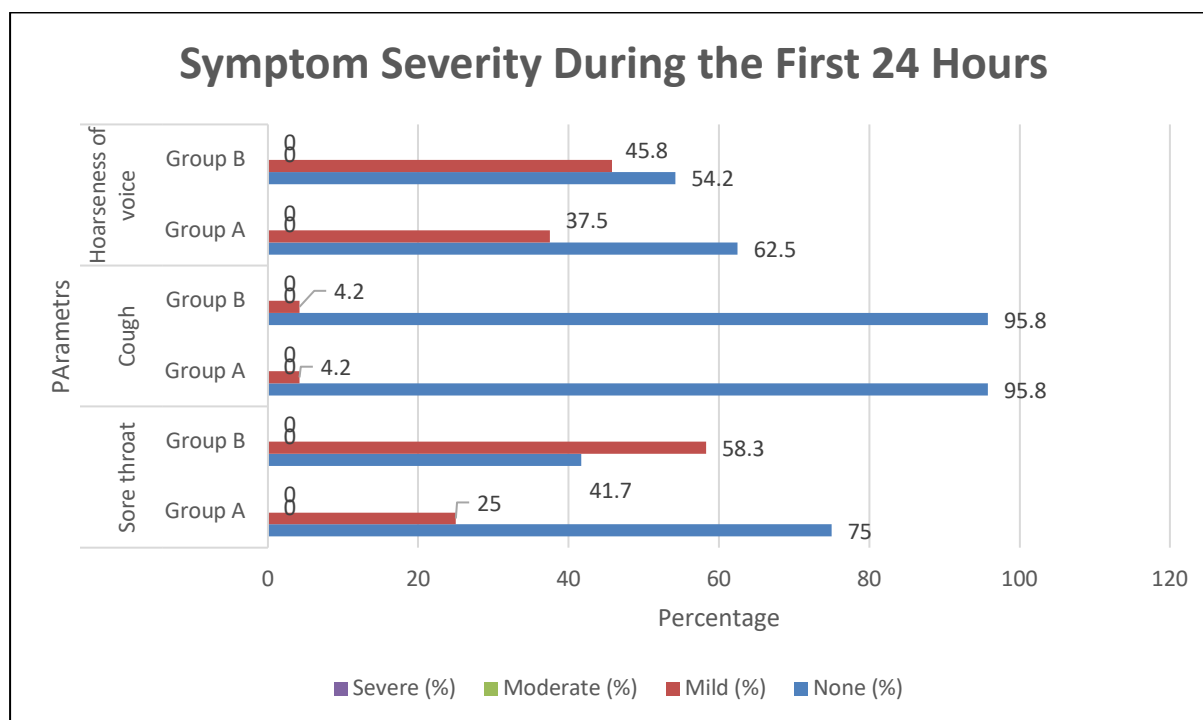
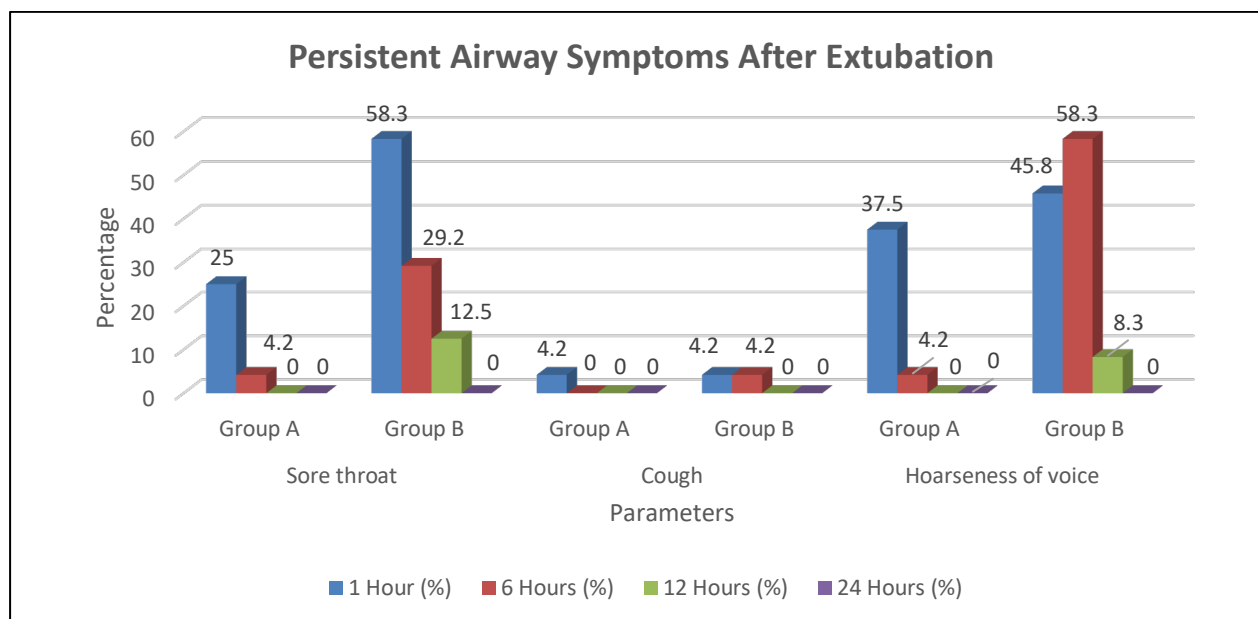


Figure 2: Distribution of Symptom Severity during the First 24 Hours

Table 5: Comparative Analysis of Persistent Airway Symptoms after Extubation

Outcome	Group	1 Hour n (%)	6 Hours n (%)	12 Hours n (%)	24 Hours n (%)
Sore throat	Group A	6 (25.0)	1 (4.2)	0 (0.0)	0 (0.0)
	Group B	14 (58.3)	7 (29.2)	3 (12.5)	0 (0.0)
	p-value	0.030	0.040	0.234	1.000
Cough	Group A	1 (4.2)	0 (0.0)	0 (0.0)	0 (0.0)
	Group B	1 (4.2)	1 (4.2)	0 (0.0)	0 (0.0)
	p-value	1.000	1.000	1.000	1.000
Hoarseness of voice	Group A	9 (37.5)	1 (4.2)	0 (0.0)	0 (0.0)
	Group B	11 (45.8)	14 (58.3)	2 (8.3)	0 (0.0)
	p-value	0.770	0.0001	0.480	1.000

**Figure 3: Comparative Analysis of Persistent Airway Symptoms after Extubation**

Discussion

Postoperative sore throat (POST), cough, and hoarseness of voice are common airway-related complications following general anesthesia with endotracheal intubation. Although generally self-limiting, these symptoms adversely affect patient comfort and satisfaction.

Mechanical trauma during laryngoscopy, endotracheal intubation, and cuff-induced mucosal ischemia are considered the principal mechanisms responsible for these complications.[11] Dexamethasone, owing to its potent anti-inflammatory action, has been investigated through various routes of administration for the prevention of postoperative airway morbidity.[12]

The present randomized double-blind study compared the effectiveness of dexamethasone gargles and intracuff dexamethasone in reducing postoperative sore throat, cough, and hoarseness of voice. Baseline demographic characteristics, including age, gender distribution, and duration of surgery, were comparable between the groups, indicating successful randomization. In the present study, the incidence of postoperative sore throat

was significantly lower in the dexamethasone gargles group than in the intracuff dexamethasone group (25.0% vs. 58.3%; $p=0.03$). Furthermore, symptoms resolved earlier in the gargles group, with no patient reporting sore throat beyond 12 hours. Lee et al. [13] compared dexamethasone gargles with dexamethasone-soaked endotracheal tubes and reported a 33% incidence of postoperative sore throat in the gargles group. The lower incidence observed in our study may be attributed to the longer gargling duration (30 seconds versus 5 seconds).

Similarly, Ki et al. [14] reported a 34.4% incidence of POST following dexamethasone gargles, which was higher than the 25.0% observed in our study, possibly because their study included patients undergoing laparoscopic procedures requiring nasogastric tube insertion. Rajan et al. [12] demonstrated that intracuff dexamethasone significantly reduced postoperative sore throat, with an incidence of 10%, which was lower than the 58.3% observed in our intracuff group. The longer duration of surgery and inclusion of different surgical procedures in our study may explain this difference. Likewise, Sugathan et al.

[15] reported only 8% incidence of POST with intracuff dexamethasone, probably because the endotracheal tube cuff was prefilled with dexamethasone before intubation, enhancing drug diffusion across the cuff. The incidence of postoperative cough was low and comparable between both groups (4.2% vs. 4.2%; $p=1.000$), with all cases being mild.

These findings are in agreement with Ki et al. [14], who reported cough incidences ranging from 0% to 6.3% after dexamethasone administration through different routes. Desai et al. [16] also observed minimal postoperative cough following intracuff dexamethasone. Rafiei et al. [17] demonstrated that intracuff dexamethasone reduced cough severity, although their reported incidence (65.5%) was considerably higher than that observed in our study, probably because cough was assessed immediately after extubation. Similarly, Mansouritehrani et al. [18] reported a postoperative cough incidence of 9.4%, which was slightly higher than the 4.2% observed in the present study.

Although the overall incidence of postoperative hoarseness of voice was comparable between the two groups (37.5% vs. 45.8%; $p=0.770$), persistent hoarseness at 6 hours was significantly lower in the dexamethasone gargles group (4.2% vs. 58.3%; $p=0.0001$), indicating earlier symptom resolution. Ki et al. [14] reported a higher incidence of postoperative hoarseness (62.5%) following dexamethasone gargles, which may be explained by differences in the study population and the inclusion of laparoscopic procedures requiring nasogastric tube insertion. Sugathan et al. [15] observed an incidence of 18% with intracuff dexamethasone, which is comparable with our findings.

In contrast, Rajan et al. [12] reported no postoperative hoarseness following intracuff dexamethasone, possibly reflecting differences in surgical duration, airway management, and patient characteristics.

Conclusion

Preoperative dexamethasone gargles were more effective than intracuff dexamethasone in reducing the incidence of postoperative sore throat following endotracheal intubation under general anesthesia.

Both interventions showed comparable efficacy in preventing postoperative cough and the overall incidence of hoarseness of voice, although dexamethasone gargles facilitated earlier resolution of hoarseness.

Preoperative dexamethasone gargling is a simple, safe, and effective strategy for minimizing postoperative airway-related complications.

Limitations

The study was conducted at a single tertiary care center with a relatively small sample size, which may limit the generalizability of the findings. Long-term postoperative outcomes and patient satisfaction beyond 24 hours were not evaluated.

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