Effectiveness of dexamethasone in preventing postoperative nausea, vomiting, pain, and enhancing recovery after adult tonsillectomy: a randomized controlled trial

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Abstract

Background: Tonsillectomy in adults is associated with postoperative nausea, vomiting (PONV), pain, and delayed recovery. Dexamethasone may alleviate these complications. **Objective:** To evaluate the effectiveness of a single 8 mg intravenous dose of dexamethasone administered at induction in reducing PONV, postoperative pain, and improving recovery after adult tonsillectomy. **Methods:** This prospective, randomized controlled trial included 109 patients (ASA I - II, aged 16 - 60 years) undergoing elective tonsillectomy under general anesthesia. Participants were randomized to receive dexamethasone 8 mg IV (Group D, n = 55) or 0.9% NaCl (placebo, n = 54) at induction. Outcomes included PONV incidence and severity, pain scores (visual analog scale, VAS) at rest and during swallowing, time to first oral intake, and Quality of Recovery-15 (QoR-15) scores at 24 hours. **Results:** PONV incidence was lower in Group D (9.1%) than in placebo (29.6%) ($p < 0.05$). Median VAS scores at rest and during swallowing were significantly lower in Group D at all time points ($p < 0.05$). Time to first oral water intake (4.9 ± 1.7 h vs. 8.0 ± 3.3 h) and food intake (15.6 ± 0.6 h vs. 19.4 ± 0.6 h) was shorter in Group D ($p < 0.001$). Mean QoR-15 scores were higher in Group D (128.3 ± 7.6) than in placebo (117.5 ± 9.6, $p < 0.001$). **Conclusion:** A single 8 mg IV dose of dexamethasone at induction significantly reduces PONV and pain, accelerates oral intake, and improves QoR-15 scores after adult tonsillectomy.

Keywords: *postoperative nausea and vomiting; adult tonsillectomy; dexamethasone; analgesia; postoperative recovery; QoR-15.*

1. INTRODUCTION

Tonsillectomy is a common surgical procedure in adults, indicated for recurrent or chronic tonsillitis, peritonsillar abscess, suspected malignancy, or obstructive sleep apnea due to pharyngeal airway obstruction [1, 2]. The procedure, typically performed under general anesthesia with endotracheal intubation, is associated with postoperative complications such as pain at rest and during swallowing, nausea, and vomiting [3, 4]. These symptoms can prolong hospitalization, increase readmission risk, and impair quality of recovery [5].

The Quality of Recovery-15 (QoR-15) scale is a validated, patient-reported outcome measure assessing five domains: pain, physical comfort, functional independence, psychological support, and emotional state, with scores ranging from 0 to 150 [6, 7].

Dexamethasone is recommended for PONV prophylaxis in adult tonsillectomy [8]. Its analgesic effects are attributed to anti-inflammatory activity, reduced tissue edema, decreased nociceptor sensitivity, and attenuation of pharyngeal muscle irritation [9, 10, 11]. Meta-analyses have confirmed its role in reducing complications after adult tonsillectomy [12, 13]. The optimal dose remains debated; however, 8 mg IV has demonstrated efficacy in both PONV prevention and pain reduction [8, 14].

In Vietnam, no published study has comprehensively evaluated dexamethasone's effects on PONV, pain, and postoperative recovery quality using the QoR-15 scale after adult tonsillectomy. This study aimed to compare PONV incidence, pain severity, time to oral intake, and QoR-15 scores between patients receiving 8 mg dexamethasone IV at induction and controls.

2. SUBJECTS AND METHODS

2.1. Study design and participants

This prospective, randomized, controlled trial was conducted from April 2024 to May 2025 at the Department of Anesthesiology - Intensive Care & Emergency Medicine, Hue University of Medicine and Pharmacy Hospital.

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Inclusion criteria: adults aged 16 - 60 years, ASA physical status I - II, scheduled for elective tonsillectomy, and provided informed consent. Exclusion criteria: neurological or psychiatric disorders, significant comorbidities, peptic ulcer disease, immunosuppression, chronic pain, regular opioid use, or opioid/heroin dependence.

Sample size calculation: using the formula for comparing two independent proportions:

In which:

$$n = \frac{\left(Z_{(1-\alpha/2)}\cdot\sqrt{2\overline{P}\cdot(1-\overline{P})}+Z_{(1-\beta)}\cdot\sqrt{p_1\cdot(1-p_1)+p_2\cdot(1-p_2)}\right)^2}{(p_1-p_2)^2}$$

n: the minimum required sample size for each group.

α: significance level, the risk of type I errors.

$Z_{(1-\alpha/2)}$: standard normal deviate ($Z_{(1-\alpha/2)}$=1.96 due to choosing α = 0.05).

β: probability of type II error. $Z_{(1-\beta)}$ =1.645 due to choosing β = 0.05.

p_1 the incidence of PONV in adult tonsillectomy without any intervention was reported to be 48% (p_1 = 0.48), according to the study by Thimmasettaiah NB [16]. In our study, we hypothesized that administration of 8 mg intravenous dexamethasone at induction would reduce the incidence of PONV by 60%, yielding an estimated incidence of 19.2% in the intervention group (p_2 = 0.192). Consequently, $\overline{P}$ = (p_1 + p_2)/2 = 0.336.

Based on the aforementioned formula, the minimum required sample size for each study group was 47 patients. To minimize the risk of sample loss during the study period, we enrolled a total of 110 patients. During follow-up and data collection, one patient was lost to follow-up. Consequently, the final analysis included 109 patients, with 55 patients in Group D and 54 patients in placebo.

The institutional ethics committee approved the protocol (Approval No H2024/091).

2.2. Randomization and interventions

Patients were randomized (random.org) to Group D (dexamethasone 8 mg IV at induction) or placebo (0.9% NaCl). Anesthesia induction: fentanyl 3 µg/kg, propofol 2.5 mg/kg, rocuronium 0.6 mg/kg; maintenance with sevoflurane (1 - 1.2 MAC). All patients received IV paracetamol 1 g every 8 h. Rescue analgesia: IV morphine 3 mg if VAS ≥ 4. Rescue antiemetics: IV ondansetrone 4 mg if if patient had grade 4 according to the Klockgether-Radke scale, then IV metoclopramide 10 mg if needed. Patients who failed two doses of rescue antiemetics received 20 mg of IV propofol.

2.3. Outcomes

Primary outcome: incidence and severity of PONV within 24 h.

Secondary outcomes: VAS pain scores at rest and during swallowing, time to first oral water and food intake, and QoR-15 score at 24 h.

2.4. Statistical analysis

Continuous variables: mean ± SD or median (IQR), analyzed with t-test or Mann - Whitney U test. Categorical variables: number (%), analyzed with χ^2 or Fisher's exact test. Significance level: $p < 0.05$.

3. RESULTS

3.1. Characteristics of studied participants

Table 1. Characteristics of participants

Characteristics	Group D (n = 55)	Placebo (n = 54)	p
Age (year)	31.0 ± 10.1	31.3 ± 7.3	> 0.05
BMI (kg/m²)	22.0 ± 3.4	22.5 ± 3.0	> 0.05
ASA I/II	49/6	53/1	> 0.05
Apfel score 0/1/2/3/4	4/15/20/16/0	4/17/11/22/0	> 0.05

There were no statistically significant differences between the two groups regarding age, weight, height, BMI, gender, ASA classification and Apfel score.

3.2. Nausea and vomiting

3.2.1. Incidence of nausea and vomiting

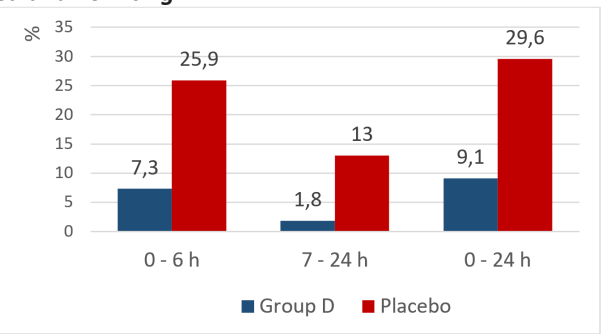

Figure 1. Incidence of postoperative nausea/vomiting

A total of 21 patients developed PONV in the first 24 hours, comprising 5 patients in Group D and 16 patients in placebo. The difference in incidence was statistically significant during both the 0 - 6 hour and 0 - 24 hour periods ($p < 0.05$).

3.2.2. Severity of nausea and vomiting according to the Klockgether-Radke scale

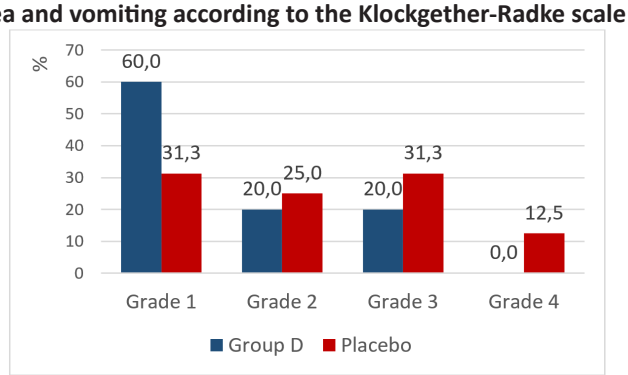

Figure 2. Severity of nausea/vomiting

12.5% of patients in placebo experienced grade 4 PONV, requiring rescue with ondansetrone. There was no statistically significant difference in the severity of PONV between the two study groups ($p > 0.05$).

3.3. Pain at rest

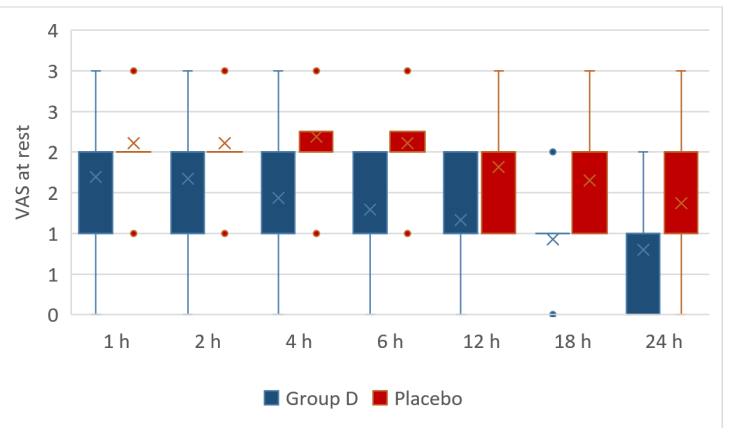

Figure 3. VAS at rest

Pain at rest scores were consistently lower in Group D compared to placebo at all assessment time points. A marked reduction in median VAS scores was observed from the 4th postoperative hour onward in group D. The differences between the two groups were statistically significant at all time points during the first postoperative day ($p < 0.05$).

In both groups, no patients required rescue morphine.

3.4. Pain during swallowing

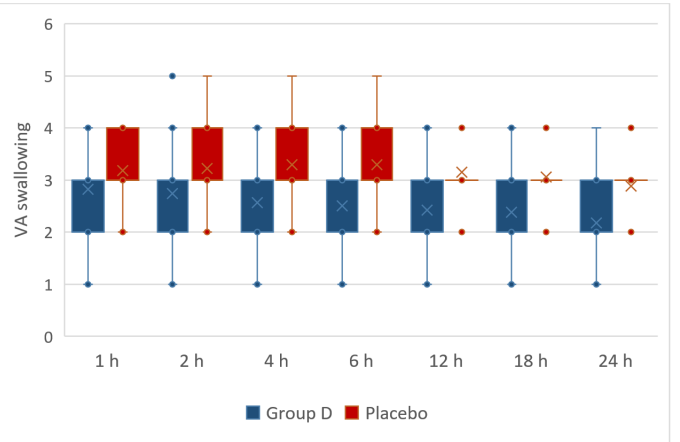

Figure 4. VAS during swallowing

Median VAS scores during swallowing were consistently lower in Group D compared to placebo at all assessed time points, with statistically significant differences ($p < 0.05$). From 12 hours postoperatively onward, the median VAS score in Group D decreased to 2, while placebo remained at 3.

3.5. Time to oral intake

Table 2. Time to oral intake

Time	Group D (n = 55)	Placebo (n = 54)	p
Water intake (hours)	4.9 ± 1.7 (1.8 - 11)	8 ± 3.3 (3.5 - 16)	< 0.05
Food intake within 24 hours (Yes/No)	55/0	41/13	
Food intake (hours)	15.59 ± 0.59	19.36 ± 0.56	< 0.05

There was a statistically significant difference between the two groups in terms of time to first oral water intake and time to first food intake ($p < 0.05$).

3.6. QoR-15 score

The mean total QoR-15 score was 128.3 ± 7.6 in group D and 117.5 ± 9.6 in Placebo, with a statistically significant difference between the two groups ($p < 0.05$).

Table 3. Severity classification of the QoR-15 score

Severity classification of QoR-15 score		Group D (n = 55)	Placebo (n = 54)	p
		n (%)	n (%)	
24 hours	**Poor**	0 (0)	1 (1.9)	< 0.05
	Moderate	10 (18.2)	25 (46.3)	
	Good	36 (65.5)	27 (50.0)	
	Excellent	9 (16.4)	1 (1.9)	

No bleeding complications were observed in any patients during the first 24 hours postoperatively.

4. DISCUSSION

4.1. The effectiveness of dexamethasone in preventing postoperative nausea and vomiting after tonsillectomy in adults

This study demonstrates that 8 mg IV dexamethasone significantly reduces PONV incidence. Specifically, the group receiving dexamethasone had a statistically lower incidence of nausea and vomiting compared to the control group. These findings are consistent with previous studies by Stewart et al. [9], Thimmasettaiah & Chandrappa [16], and Khafagy et al. [17], reinforcing the role of dexamethasone as an effective antiemetic agent in otorhinolaryngological surgeries.

In addition to reducing the incidence of nausea, dexamethasone also decreased the number of vomiting episodes and prolonged the symptom-free period, particularly during the first six postoperative hours - an interval considered high-risk due to the combined effects of anesthesia, airway instrumentation (suctioning or extubation) and inflammatory responses in the pharyngeal region. This effect may be attributed to dexamethasone's anti-inflammatory properties, membrane-stabilizing effects, and inhibition of prostaglandin synthesis, which collectively reduce stimulation of both central and peripheral nausea pathways.

4.2. Postoperative pain at rest and pain during swallowing

In our study, VAS scores at rest and during swallowing were significantly lower in the dexamethasone group compared to the control, with the highest pain levels recorded within the first 6 postoperative hours, followed by a gradual decrease from 6 to 24 hours. These findings indicate that the administration of 8 mg dexamethasone at induction contributes to postoperative pain reduction after tonsillectomy. The observed pain-reducing trend is consistent with previous studies by Al-Shehri et al. [13], Thimmasettaiah and Chandrappa (0.5 mg/kg) [16], and Khafagy et al. (0.3 mg/kg, up to a maximum of 8 mg) [17]. The pain levels measured by VAS in our study were comparable to those reported by Thimmasettaiah and Chandrappa, but lower than those in the other two studies. This discrepancy may be attributable to various factors, including differences in the dose of fentanyl used during induction, the selected dexamethasone dosage, variations in postoperative pain management strategies, and differences in surgical techniques for tonsillectomy across studies.

Notably, no patient in our study required rescue analgesia with morphine during the postoperative observation period. The median VAS at rest was ≤ 2, and the median VAS during swallowing was ≤ 3 in all participants, indicating effective and stable postoperative pain control.

4.3. Quality of postoperative recovery

The time to first oral water intake after surgery was 4.9 ± 1.7 hours in group D and 8 ± 3.3 hours in Placebo. The earliest time recorded in both groups was 1.8 hours, while the latest was up to 16 hours. This difference may be attributed to the anti-inflammatory effects of dexamethasone, which help reduce tissue edema, decrease nerve ending sensitivity, and alleviate irritation in the pharyngeal muscular area. As a result, the discomfort and hypersensitivity associated with contact between the tonsillar wound and fluids or food are markedly reduced. Furthermore, dexamethasone demonstrated analgesic effects both at rest and during swallowing, and was associated with a lower incidence of postoperative nausea and vomiting. These factors contribute to improved oral tolerance, allowing patients to resume oral intake more comfortably. Such outcomes not only facilitate early recovery but also help reduce the need for prolonged postoperative intensive care.

These findings are consistent with the data reported by Thimmasettaiah and Chandrappa, in which the control group had a mean time to oral intake of 6.16 ± 1.52 hours, while the intervention group achieved oral intake earlier, at 3.68 ± 0.68 hours [16].

Notably, 24.1% of patients in Placebo were unable to resume oral intake within the first 24 postoperative hours, whereas all patients in group D had resumed drinking and eating during this period. This difference was statistically significant ($p < 0.05$), suggesting that a single 8 mg intravenous dose of dexamethasone administered at induction may significantly accelerate the recovery of oral intake function compared to no dexamethasone use.

A notable strength of this study is the use of the QoR-15 scale - a validated and widely recommended tool for assessing postoperative recovery. This instrument provides a comprehensive evaluation of physical, functional, emotional, and psychological dimensions of recovery following surgical interventions. As a result, the findings extend beyond isolated metrics such as pain scores or oral intake tolerance, offering a more objective and holistic perspective on patient recovery. This enhances the clinical applicability of the results and allows for a more thorough assessment of the intervention's effectiveness compared to using single-outcome measures.

In our study, the mean QoR-15 score in group D was significantly higher than that in Placebo ($p < 0.05$). A total of 81.9% of patients in group D rated their recovery as good to excellent, notably higher than the 51.9% observed in placebo. The mean difference in QoR-15 scores between the two groups was 10.8 points. According to Myles et al., a difference of at least 6 points on the QoR-15 scale represents a clinically meaningful improvement in patient health status [18].

This enhanced recovery may be attributed to dexamethasone's multifaceted effects, including a

reduction in postoperative nausea and vomiting, improved analgesia, and earlier return to oral intake. Furthermore, dexamethasone has been shown to attenuate the physiological stress response to surgery and enhance postoperative sleep quality [19]. Beyond its physical effects, dexamethasone also appears to positively influence psychological well-being. Several meta-analyses have reported its role in improving mood and reducing postoperative fatigue [20].

Through its combined anti-inflammatory, neuroendocrine-modulating and mood-stabilizing properties, dexamethasone contributes to a more holistic improvement in recovery quality. As a result, patients who received dexamethasone demonstrated significantly better QoR-15 scores.

However, this study also has limitations. It was a single-center trial with a relatively short follow-up period (limited to the first 24 postoperative hours), and no adverse effects related to dexamethasone were recorded during the observation period.

5. CONCLUSION

A single 8 mg IV dexamethasone dose at induction reduces PONV and pain, accelerates return to oral intake, and enhances recovery after adult tonsillectomy. It should be considered as part of multimodal perioperative care in eligible patients.

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CONFLICTING INTERESTS

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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