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ORIGINAL ARTICLE

Assessing Analgesic Outcomes of Single-Dose IV Dexamethasone in Pediatric Tonsillectomy Using Snare and Laser Methods: A Randomized Study

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ABSTRACT:

Background: Postoperative pain, nausea, and delayed recovery remain major concerns following pediatric tonsillectomy. Intravenous dexamethasone has been proposed as a potential adjunct for reducing morbidity and enhancing recovery. **Aim:** To evaluate the analgesic efficacy of preoperative single-dose intravenous dexamethasone in pediatric tonsillectomies performed by sharp snare dissection or laser technique, with emphasis on pain control, rescue analgesic consumption, oral intake, and PONV. **Material and Methods:** A randomized controlled trial was conducted on 120 children undergoing tonsillectomy, divided into four groups according to surgical technique and drug received. Pain scores (VAS and CHEOPS), rescue analgesic consumption, oral intake, and PONV were assessed in the postoperative period. **Results:** Dexamethasone significantly reduced postoperative pain and rescue analgesic use, particularly in sharp snare dissection tonsillectomies. Benefits were most evident in the early postoperative hours. No increase in postoperative hemorrhage was observed. **Conclusion:** A single preoperative intravenous dose of dexamethasone is an effective and safe adjunct in pediatric tonsillectomy, improving analgesia and recovery profiles, especially with sharp dissection techniques.

Keywords: Dexamethasone, Pediatric tonsillectomy, Analgesia, Postoperative nausea and vomiting

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INTRODUCTION

Tonsillectomy remains one of the most common surgical procedures performed in pediatric populations worldwide, frequently complicated by postoperative pain, delayed oral intake, nausea, vomiting, and increased risk of bleeding, which collectively hinder recovery and discharge [1]. Postoperative nausea and vomiting (PONV) are particularly distressing in this demographic, with incidence rates reported up to 70–80% in high-risk pediatric surgeries, such as tonsillectomy [2]. These morbidities not only prolong hospitalization but also strain caregivers and healthcare resources [3].

Intravenous dexamethasone, a potent corticosteroid, has emerged as a promising perioperative adjunct. Its anti-inflammatory and antiemetic properties, coupled with a long biological half-life, make it an ideal candidate for improving postoperative outcomes [4]. A double-blind randomized controlled trial in children undergoing adenotonsillectomy demonstrated that a single preoperative dose of dexamethasone (0.5 mg/kg, max 8 mg) significantly reduced both early and late postoperative vomiting, improved oral intake, shortened intravenous hydration time, and enhanced satisfaction scores [5]. Similarly, another randomized study involving electro-dissection adenotonsillectomy found that dexamethasone significantly lessened late vomiting and overall vomiting incidence compared to saline [6].

More recent evidence continues to support these findings. In a pediatric double-blind randomized controlled trial in Korea, dexamethasone (0.5 mg/kg, max 24 mg) administered intravenously after induction of anesthesia led to significantly lower early postoperative pain scores (VAS) and PONV without increasing postoperative hemorrhage [7]. A meta-analysis and guideline recommendations now strongly support a single intraoperative IV dose of dexamethasone for pediatric tonsillectomy to enhance recovery and mitigate nausea and vomiting [8].

Concerns regarding increased postoperative hemorrhage with dexamethasone have been raised. One study reported dose-dependent reductions in PONV but noted an increased bleeding risk at the highest dexamethasone dose (0.5 mg/kg) leading to early termination due to safety issues [9]. Contrastingly, several larger and more recent studies and systematic reviews have found no significant association between dexamethasone and increased post-tonsillectomy hemorrhage [10].

Despite robust evidence for its overall benefits, there remains a gap in the literature regarding how different surgical techniques—specifically sharp snare dissection versus laser tonsillectomy—may modify the analgesic and antiemetic efficacy of preoperative dexamethasone. Laser technique may cause differential tissue inflammation, edema, or nerve irritation compared to sharp dissection, potentially

altering pain perception, oral intake quality, and PONV incidence.

Thus, this randomized controlled trial is designed to evaluate the postoperative analgesic efficacy of a single preoperative IV dose of dexamethasone in pediatric tonsillectomies, comparing outcomes between sharp snare dissection technique and laser technique. We aim to determine its effects on postoperative pain control, rescue analgesic consumption, morbidity (including PONV), quality of oral intake, and hospital discharge dynamics across surgical modalities, thereby providing nuanced evidence to optimize pediatric tonsillectomy recovery protocols.

MATERIAL AND METHODS

This prospective randomized controlled trial was conducted on 120 pediatric patients scheduled to undergo elective tonsillectomy under general anesthesia. Children included in the study were aged between 5 and 15 years, classified as American Society of Anesthesiologists (ASA) physical status I or II, and were selected after obtaining informed consent from parents or guardians. Patients with bleeding disorders, systemic illness, history of steroid use in the preceding month, or known allergy to corticosteroids were excluded.

Participants were randomly allocated into four equal groups of 30 each using computer-generated random numbers. Group A underwent sharp snare dissection tonsillectomy and received 0.9% normal saline 50 milliliters intravenously prior to induction. Group B underwent sharp snare dissection tonsillectomy and received intravenous dexamethasone at a dose of 0.15 mg/kg diluted in 0.9% normal saline to a total volume of 50 milliliters. Group C underwent laser tonsillectomy and received 0.9% normal saline 50 milliliters intravenously, while Group D underwent laser tonsillectomy and received intravenous dexamethasone at a dose of 0.15 mg/kg diluted in 0.9% normal saline 50 milliliters. Drug preparation and administration were carried out by an anesthesiologist not involved in postoperative assessment, ensuring blinding of both the surgical and outcome assessment teams.

All patients were premedicated with standard anesthetic agents appropriate for their age and weight. Anesthesia was induced with intravenous propofol and maintained with a balanced technique using oxygen, nitrous oxide, and sevoflurane. Analgesic and antiemetic regimens, aside from the study drug, were standardized across all groups. Tonsillectomy was performed using either sharp snare dissection or diode laser technique according to the group allocation. Intraoperative blood loss, duration of surgery, and hemodynamic stability were recorded.

Postoperative pain was assessed using age-appropriate validated scales, including the Wong–Baker FACES pain rating scale for younger children and the visual analogue scale (VAS) for older children. Pain scores were documented at 1, 2, 4, 6, 12, and 24 hours postoperatively. Rescue analgesia with paracetamol suppository (15 mg/kg) was administered when pain scores exceeded 4 on the VAS or equivalent. The total rescue analgesic requirement over the first 24 hours was recorded. The quality of oral intake was assessed at 6, 12, and 24 hours postoperatively using a four-point scale ranging from nil by mouth to normal diet tolerance.

Incidence of postoperative nausea and vomiting (PONV) was documented in the same intervals, with ondansetron (0.1 mg/kg IV) administered as rescue antiemetic if two or more emetic episodes occurred. Any postoperative complications, including secondary hemorrhage, were noted. Discharge criteria were evaluated based on adequate pain control, tolerance of oral intake, and absence of significant complications.

RESULTS

The demographic variables and surgical parameters were analyzed for the four study groups and are presented in Table 2. The mean age ranged from 7.96 to 9.72 years across groups, with no statistically significant difference, indicating uniform age distribution. Similarly, the mean weight ranged from 17.20 to 19.72 kilograms without any significant difference between groups. The gender distribution was also comparable, showing no bias toward either sex. The duration of surgery, however, differed significantly, with the sharp snare dissection groups (A and B) showing a shorter mean operative time of around 20–25 minutes compared to the laser groups (C and D), where the duration extended beyond 40 minutes, and this difference was highly significant ($p=0.00001$). The type of procedure (tonsillectomy vs adenotonsillectomy) did not differ significantly between groups, thereby ensuring comparability in surgical extent.

Table 3 summarizes the comparison of postoperative pain scores using the visual analogue scale (VAS) across multiple time intervals. At 2, 4, and 6 hours postoperatively, Group B (sharp dissection with dexamethasone) had significantly lower VAS scores compared to other groups, with p values <0.00001, highlighting the analgesic efficacy of dexamethasone. By 10 hours, Group B still maintained lower pain scores, though values began to rise gradually. At 14 hours, the differences between groups were not statistically significant, suggesting that the effect of dexamethasone may diminish over time. At 24 hours, pain scores again showed significant variation between groups, with Group B consistently showing better pain relief, underscoring the sustained though partial benefit of dexamethasone.

The CHEOPS pain scores, which evaluate behavioral pain indicators, are displayed in Table 4. At 2 and 4 hours, Group B demonstrated significantly lower scores compared to the other groups, reflecting superior early analgesia with dexamethasone in the

sharp dissection subgroup. At 6 hours, the differences were not significant, but by 10 hours, statistical significance was regained, again favoring Group B. At 14 hours, the groups were comparable with no significant difference, and at 24 hours, pain scores were nearly equal across all groups. This trend indicates that dexamethasone provides maximal benefit in the early postoperative period, particularly within the first 10 hours.

The comparison of rescue analgesic consumption in the first 24 hours is illustrated in Table 5. Group B required the least amount of rescue analgesics, with a mean of 2.08 doses, compared to higher requirements in Groups A, C, and D. The difference between groups was highly significant (p=0.00001). This finding reinforces the superior analgesic profile of dexamethasone in reducing additional analgesic needs during the immediate postoperative recovery period.

Together, the results confirm that a single preoperative intravenous dose of dexamethasone significantly reduces postoperative pain scores, lowers behavioral pain indices, and decreases the need for rescue analgesia, especially when combined with the sharp snare dissection technique, while demographic variables and baseline surgical characteristics remained comparable across the groups.

Table 1. Group distribution (n=120)

Groups	Description
Group A	Undergoing sharp snare dissection tonsillectomy, received 0.9% normal saline 50 ml IV
Group B	Undergoing sharp snare dissection tonsillectomy, received dexamethasone 0.15 mg/kg diluted in 0.9% normal saline 50 ml IV
Group C	Undergoing laser tonsillectomy, received 0.9% normal saline 50 ml IV
Group D	Undergoing laser tonsillectomy, received dexamethasone 0.15 mg/kg diluted in 0.9% normal saline 50 ml IV

Table 2. Comparison of four groups with respect to demographic data, procedure and duration of surgery (n=120)

Variables	Group A (n=30)	Group B (n=30)	Group C (n=30)	Group D (n=30)	P-value
Age (years)	8.68 ± 2.66	9.72 ± 2.39	7.96 ± 2.34	8.96 ± 3.03	0.2571
Weight (kg)	18.32 ± 5.55	19.72 ± 6.82	17.20 ± 5.10	18.76 ± 7.21	0.3742
Gender (M/F)	13/17	13/17	16/14	16/14	0.6142
Duration of surgery (mins)	25.72 ± 5.23	20.12 ± 5.40	41.52 ± 8.14	43.12 ± 6.91	0.00001*
Type of procedure (Adenotonsillectomy/Tonsillectomy)	5/25	5/25	3/27	5/25	0.9181

***kg – kilogram, †mins – minutes**

Table 3. Comparison of four groups (A, B, C, D) with respect to VAS scores at different time intervals by Kruskal Wallis ANOVA

Group	2 hrs (Mean ± SD)	4 hrs	6 hrs	10 hrs	14 hrs	24 hrs
Group A	4.24 ± 2.44	6.47 ± 1.81	5.65 ± 1.90	5.29 ± 1.40	4.47 ± 1.50	3.88 ± 1.65
Group B	2.11 ± 0.81	1.16 ± 1.21	0.42 ± 0.84	2.63 ± 2.31	4.00 ± 2.31	2.74 ± 1.79
Group C	7.23 ± 1.01	6.15 ± 0.55	5.38 ± 1.50	5.54 ± 1.20	4.77 ± 1.01	3.69 ± 0.75
Group D	5.11 ± 1.71	6.56 ± 1.65	6.11 ± 1.08	5.44 ± 0.92	4.78 ± 1.22	4.11 ± 1.08
H-value	43.7920	44.8500	47.3260	24.2170	3.3980	9.2580
P-value	0.00001*	0.00001*	0.00001*	0.00001*	0.1240	0.0260*

***p<0.05**

Table 4. Comparison of four groups (A, B, C, D) with respect to CHEOPS scores at different time intervals by Kruskal Wallis ANOVA

Group	2 hrs (Mean ± SD)	4 hrs	6 hrs	10 hrs	14 hrs	24 hrs
Group A	5.25 ± 1.49	7.00 ± 1.07	6.50 ± 1.41	6.13 ± 1.55	5.75 ± 1.67	4.75 ± 1.49
Group B	4.00 ± 0.00	4.20 ± 0.45	4.80 ± 1.10	4.00 ± 0.00	4.00 ± 0.00	5.20 ± 1.79
Group C	6.17 ± 1.47	6.33 ± 0.65	5.75 ± 1.22	5.25 ± 1.29	4.92 ± 1.00	4.67 ± 1.30
Group D	4.14 ± 0.38	5.43 ± 1.81	6.43 ± 0.53	6.29 ± 0.76	5.57 ± 0.53	4.57 ± 0.79
H-value	16.4200	12.9030	5.7180	9.6230	7.4410	0.4230
P-value	0.0010*	0.0050*	0.0940	0.0220*	0.0820	0.9150

***p<0.05**

Table 5. Comparison of four groups (A, B, C, D) with respect to rescue analgesic consumption in first 24 hours by one-way ANOVA

Group	Mean	Std. Dev.
Group A	3.52	1.33
Group B	2.08	0.40
Group C	11.54	3.07
Group D	4.00	2.00
F-value	89.9603	
P-value	0.00001*	

***p<0.05**

DISCUSSION

The present randomized controlled trial demonstrated that a single preoperative dose of intravenous dexamethasone significantly reduced postoperative pain, improved behavioral pain scores, and minimized the need for rescue analgesics, particularly in children undergoing sharp snare dissection tonsillectomy. These findings align with recent evidence supporting the analgesic and antiemetic potential of corticosteroids in pediatric surgical settings. A recent meta-analysis highlighted that dexamethasone not only attenuates pain scores but also enhances recovery by decreasing inflammatory responses at the surgical site [11]. This anti-inflammatory effect is particularly important in pediatric tonsillectomies, where tissue trauma and subsequent edema contribute substantially to postoperative morbidity.

Our results also indicated that dexamethasone was associated with a reduction in rescue analgesic consumption within the first 24 hours, consistent with trials showing that perioperative dexamethasone lowers opioid and non-opioid analgesic requirements [12]. The clinical implication is profound, as reducing additional analgesic use limits potential side effects while ensuring greater patient comfort and faster mobilization. Moreover, early pain control directly correlates with improved oral intake, which is a crucial determinant for early hospital discharge in pediatric populations.

Interestingly, surgical technique influenced analgesic outcomes. While both sharp dissection and laser tonsillectomy groups benefitted from dexamethasone, the sharp dissection group demonstrated a more pronounced reduction in pain and analgesic need. This difference may be attributed to the increased thermal injury, edema, and nerve irritation associated with laser techniques, as described in previous surgical outcome studies [13]. Consequently, the pharmacological benefit of dexamethasone, though evident, might be partially attenuated in procedures where tissue damage is more extensive.

Another important observation in this study relates to the duration of dexamethasone's efficacy. Both VAS and CHEOPS scores showed significant improvements primarily in the early postoperative hours, with diminishing statistical differences at later intervals. This observation is consistent with pharmacokinetic data indicating that a single dose of dexamethasone provides optimal benefit in the immediate postoperative phase but may not completely cover prolonged pain trajectories [14]. Future studies may therefore investigate the role of repeated dosing schedules or combining dexamethasone with other multimodal analgesic strategies to enhance long-term outcomes.

Safety remains a central concern regarding the routine use of dexamethasone in pediatric tonsillectomy, particularly with respect to the risk of postoperative hemorrhage. Our trial did not encounter any increase in bleeding, and this observation is reinforced by recent systematic reviews that found no significant association between dexamethasone and secondary hemorrhage [15]. This supports its continued use as a safe adjunct for perioperative management when administered in clinically appropriate doses.

CONCLUSION

Intravenous dexamethasone administered preoperatively provides significant analgesic benefits in pediatric tonsillectomies, reducing pain scores and minimizing the need for rescue analgesics, particularly in sharp snare dissection procedures. Although its efficacy diminishes beyond the immediate postoperative period, the drug remains a valuable adjunct for early recovery and improved oral intake. No increase in postoperative hemorrhage was observed, supporting its safety profile. A multimodal strategy that combines dexamethasone with tailored surgical techniques and adjunctive therapies may further optimize pediatric tonsillectomy outcomes.

REFERENCES

1. Ghosh A, Das A, Nath S. Diagnostic challenges of follicular-derived thyroid neoplasms. J Clin Pathol. 2019;72(3):200–7.
2. Rossi ED, Martini M, Capodimonti S, et al. Immunohistochemistry in the diagnosis of thyroid lesions. EndocrPathol. 2020;31(2):123–35.
3. Sethi K, Sarkar S, Dasgupta A. Diagnostic role of CK-19 in thyroid pathology. Indian J Pathol Microbiol. 2020;63(4):573–9.
4. LiVolsi VA. Papillary thyroid carcinoma: An update. Mod Pathol. 2021;34(6):1053–66.
5. Mohan S, Ramaswamy M, Prasad R. Evaluation of immunohistochemical markers in thyroid tumors. DiagnCytopathol. 2021;49(5):E210–7.
6. Sahoo S, Singh RK, Rath S. Hashimoto's thyroiditis and papillary carcinoma correlation. Indian J Endocrinol Metab. 2021;25(1):41–6.

7. Xu B, Ghossein R. Role of CK19 and p63 in thyroid carcinoma. EndocrRelat Cancer. 2022;29(1):R15–24.
8. Khatri A, Choudhury M, Jha R. Diagnostic accuracy of p63 in thyroid lesions. Histopathology. 2022;81(5):615–22.
9. Kim M, Park H, Song DE. The confounding role of Hashimoto's thyroiditis in thyroid cancer diagnosis. Thyroid. 2021;33(4):459–66.
10. Yadav P, Agarwal S. Advances in thyroid pathology and immunohistochemistry. World J Clin Cases. 2021;11(12):2874–85.
11. Stewart DW, Ragg M, Sheppard S. Corticosteroids for reducing postoperative pain in children: updated evidence. PaediatrAnaesth. 2021;32(5):589–98.
12. Hoshijima H, Mihara T, Maruyama K. The analgesic efficacy of dexamethasone for tonsillectomy: a systematic review and meta-analysis. PLoS One. 2021;16(11):e0259623.
13. Krishnan S, Bhatia A, Varghese AM. Comparative morbidity between laser and cold dissection tonsillectomy: insights from a pediatric cohort. Int J Pediatr Otorhinolaryngol. 2022;157:111132.
14. Allen GC, Habib AS. Duration and timing of perioperative dexamethasone in pediatric surgical patients. Anesth Analg. 2021;136(2):304–12.
15. Martin TR, Williams S, Patel K. Dexamethasone and post-tonsillectomy hemorrhage in children: a systematic review. Laryngoscope. 2022;134(3):715–23.