

Intravenous Lidocaine for Postoperative Pain in Children Undergoing Tonsillectomies: A Double-Blinded, Randomized, Placebo-Controlled Trial

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Introduction

- Tonsillectomy is a commonly performed surgical procedure in children that is associated with significant postoperative pain ¹⁻³.
- Traditional opioid use can suppress respiration, especially in children with obstructive sleep apnea, which is the leading indicator of tonsillectomy ⁴.
- Lidocaine is an amide-type local anesthetic that has been shown to effectively reduce postoperative pain in some surgical models and not others ⁵.
- Currently, there are no studies that examine the efficacy of intravenous lidocaine at preventing post-tonsillectomy pain in children.
- This study aimed to evaluate the efficacy of intravenous lidocaine for preventing postsurgical pain in children undergoing tonsillectomy.

Methods

- This study was a prospective, randomized, double-blinded control trial. The Ann & Robert H. Lurie Children's Hospital of Chicago Institutional Review Board (IRB) approved this study (2015-741; 09-28-2015).
- Eligible participants included children aged 4-10 years with an American Society of Anesthesiologists (ASA) physical status classification of I-III, scheduled for tonsillectomy performed by either of two surgeons (KRB and SRH) utilizing a standardized surgical technique.
- Subjects were randomly assigned to one of two groups: i) one bolus (1.5 mg/kg) and one continuous infusion dose (2 mg/kg/hr) of intravenous lidocaine, or ii) the equivalent volume of saline.
- The primary outcome was opioid consumption in the post-anesthesia care unit (PACU).
- Secondary outcome measures included pain intensity in the PACU measured using the Children's Hospital of Eastern Ontario Pain Scale (CHEOPS) and emergence agitation measured using the Pediatric Anesthesia Emergence Delirium (PAED) scale, postoperative nausea and vomiting, and parent-reported pain intensity and medication administration at home.

Table 1 | Subject characteristics in unweighted and propensity score-weighted cohorts.

	Unweighted				Propensity score weighted			
	Saline (n=44)	Lidocaine (n=44)	Effect size	P	Saline	Lidocaine	Effect Size	P
Age (y)	5.9 ± 1.9	6.2 ± 1.8	0.17	0.423	6.0 ± 1.9	5.9 ± 1.7	-0.09	0.702
Sex								
Male	20 (45)	17 (39)	-0.14	0.521	(42)	(47)	-0.08	0.769
Female	24 (55)	27 (61)	0.14		(48)	(53)	0.08	
Race								
White	37 (84)	34 (77)	-0.17	0.651	(80)	(82)	0.06	0.939
African American	3 (7)	6 (14)	0.22		(14)	(13)	-0.04	
Asian	2 (4.5)	1 (2)	-0.12		(3)	(1)	-0.08	
Other/multi-racial	2 (4.5)	4 (7)	0.09		(3)	(4)	0.02	
Hispanic ethnicity	6 (14)	13 (29)	0.38	0.075	(19)	(17)	-0.05	0.833
ASA physical status								
1	10 (23)	5 (11)	-0.30	0.114	(17)	(11)	-0.17	0.408
2	34 (77)	39 (89)	0.30		(83)	(89)	0.17	
Weight (kg)	24.8 ± 12.4	24.7 ± 11.0	0.00	0.985	24.9 ± 10.8	23.3 ± 8.5	-0.14	0.679
Height (cm)	120 ± 14	120 ± 14	0.03	0.855	120 ± 13	119 ± 12	-0.12	0.772
BMI (kg/m ²)	16.3 ± 3.3	16.8 ± 3.0	0.14	0.528	16.4 ± 2.7	16.5 ± 3.0	-0.04	0.827
Primary diagnosis								
Adenotonsillar hypertrophy	30 (68)	23 (52)	-0.33	0.189	(68)	(69)	0.03	0.757
Sleep disturbances	8 (18)	14 (32)	0.32		(22)	(21)	-0.03	
Recurrent streptococcal infection	5 (12)	3 (7)	-0.16		(8)	(5)	-0.11	
Other ¹	1 (2)	4 (9)	0.29		(2)	(4)	0.12	
Obstructive sleep apnea n(%)	7 (16)	8 (18)	0.06	0.779	(12)	(12)	0.01	0.949
Anxiety scores (mYPAS) ^a								
Baseline	7.4 ± 3.6	7.3 ± 3.2	-0.03	0.901	7.8 ± 3.7	7.6 ± 3.0	-0.05	0.854
Separation	5.8 ± 2.5	5.9 ± 2.6	0.04	0.834	5.9 ± 2.2	5.7 ± 2.2	0.09	0.616
Induction	5.8 ± 2.6	6.6 ± 4.0	0.23	0.273	6.0 ± 2.8	6.0 ± 3.2	0.01	0.955
Perfect induction – no negative behaviors fear or anxiety n(%)	38 (86)	37 (84)	0.06	0.766	(88)	(86)	-0.05	0.829
Duration of anesthesia (min)	39.2 ± 6.5	41.5 ± 6.0	0.36	0.086	39.2 ± 6.1	40.0 ± 5.5	0.15	0.513

Data presented as mean ± SD, or n(% of column) or (%) of weighted sample. ^a Anxiety scores given as aggregate modified Yale Preoperative Anxiety Scores (mYPAS). The number of patients in the propensity score weighted columns is the same as in the unweighted columns but the percentage differences are a result of propensity score weighting.

Table 2 | Postoperative analgesic and antiemetic use and discharge time.

	Saline (n=44)	Lidocaine (n=44)	Unadjusted difference (95% CI)	P	Adjusted difference (95% CI)	P
Opioid analgesics						
Received opioid analgesic n(%)	34 (77)	37 (84)	7 (-25 to 12)	0.421	19 (0 to 39)	0.055
PACU morphine (MME/kg)	0.26 (0.07, 0.10)	0.25 (0.07, 0.09).	-0.01 (-0.03 to 0.07)	0.532	-0.02(-0.07 to 0.02)	0.328
Total postoperative MME/kg	0.27 (0.23, 0.30)	0.25 (0.21, 0.29)	-0.20 (-0.07 to 0.03)	0.579	-0.03(-0.08 to 0.02)	0.262
Other analgesics						
Ibuprofen (mg/kg)	9.8 (9.5, 10.1)	9.9 (9.5, 10.2)	0.1 (0.41 to 0.54)	0.796	0.1 (-0.3 to 0.4)	0.709
Acetaminophen (mg/kg)	13.6 (12.9, 14.3)	13.7 (13.1, 14.2)	0.1 (-0.86 to 0.95)	0.914	0.5 (-0.3 to 1.4)	0.230
Antiemetic						
Ondansetron (mg/kg)	0.10 (0.09, 0.11)	0.11 (0.10, 0.12)	0.01 (-0.02 to 0.00)	0.133	-0.01 (-0.02 to 0.0)	0.105
Time to discharge (min)	271 (249, 293)	260 (238, 283)	-11 (-42 to 20)	0.490	6 (-23 to 35)	0.686

Data reported as estimated marginal mean (95% Wald confidence interval) or difference lidocaine minus saline (95% Wald confidence interval of the difference). Unadjusted and adjusted estimated differences determined using a generalized linear model with and without propensity score weighting.

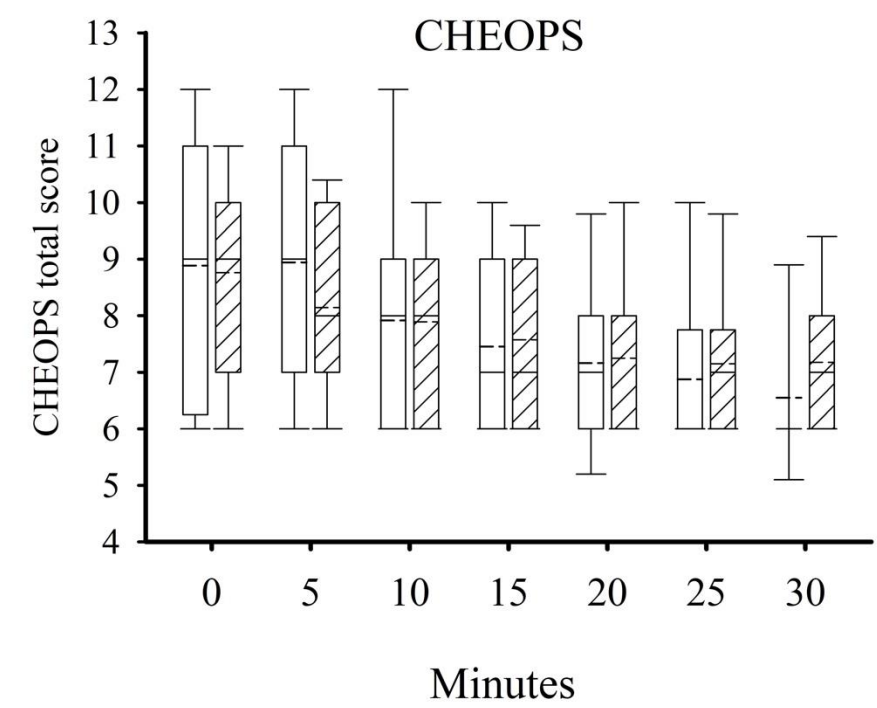


Fig. 1 | CHEOPS and PAED Scores in PACU

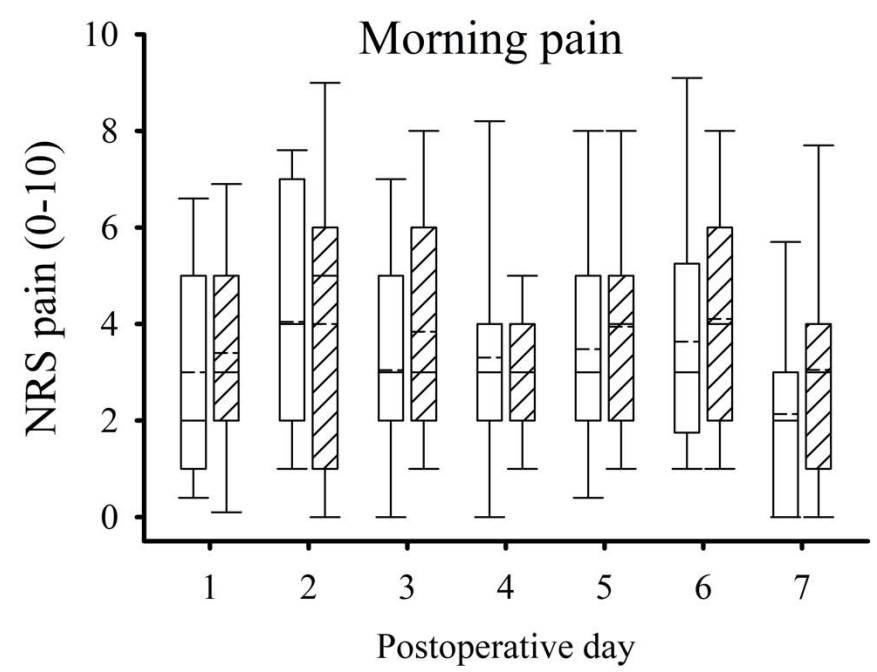


Fig. 2 | Post-Operative Pain Scores at Home

Results

- n=44 participants received the lidocaine bolus and infusion, while n=44 received the saline equivalent.
- There were no differences in baseline characteristics between groups in both unweighted and propensity score weighted cohorts (Table 1).
- There was no significant difference in CHEOPS total scores or PAED scores during the first 30 minutes postoperatively between the two groups (Figure 1).
- There were no significant differences in the percentage of patients receiving opioid analgesics (P = 0.421), PACU morphine consumption (P = 0.532), or total postoperative morphine milligram equivalents (MME/kg) (P = 0.579) between groups.
- Ibuprofen and acetaminophen use in the first postoperative week did not differ significantly (P = 0.796; P = 0.914; Figure 2).

Discussion

- We found no evidence for a clinical benefit of lidocaine infusion for children undergoing tonsillectomies.

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