



# Opioid-Free Surgery in Infants – Is Spinal Anesthesia the Answer?

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## Introduction

- Between 1999-2016, nearly 9,000 children died from opioid poisoning in the USA<sup>1</sup>.
- Reducing opioid exposure during and after surgery presents an opportunity to avoid unnecessary exposure in this population.
- We examined the implementation of a pediatric spinal anesthesia (SA) protocol on perioperative opioid administration.
- Primary hypothesis: children receiving SA for circumcision/ orchiopexy will have less perioperative analgesic use, lower postoperative anesthesia care unit (PACU) pain scores, and better pain control after hospital discharge than those undergoing general anesthesia (GA).
- Secondary hypothesis: the SA group will experience fewer opioid-related side effects.

## Methods

- 63 patients, all < 2 years old (median age 10 months), all male.
- SA = 28, GA = 33, SA converted to GA = 2 (excluded from analysis).
- Circumcision = 46, orchiopexy = 15
- Retrospective, secondary use unmatched cohort study.
- Examination of perioperative records and post-hospital survey results of patients who underwent circumcision or orchiopexy under SA or GA and whose caregivers were surveyed after discharge as part of a quality improvement project<sup>2</sup>.
- Primary Outcomes: perioperative analgesic use, PACU pain scores, pain control after discharge.
- Secondary outcomes: presence of opioid-related side effects.
- Associations between treatment group and outcomes were assessed using Mann-Whitney U tests for quantitative variables and chi-square or Fisher's exact tests for categorical variables.

## Results

- SA group received significantly less oral Morphine Milligram Equivalents (MME) than the GA group with significantly lower FLACC scores and PACU time (see Figure 1).
- Perioperative non-opioid analgesic use did not significantly differ between SA and GA patients, except for acetaminophen use (higher use in GA group) (p=0.001) (see Table 1).
- GA patients used significantly more non-steroidal anti-inflammatory drugs (NSAID) after discharge (p=0.046) (see Table 2).
- Post-hospital course showed no significant difference between SA and GA groups in parental opinion of pain control (p=0.066) or in number of painful days after surgery (p=0.867) (see Table 2).
- No significant difference in side effects between groups (see Table 2).

	ALL (n=61)		GA (n=33)		SA (n=28)		Odds Ratio Estimate	95% CI		Chi-Squared or Fisher's Exact Test p-value
	N	%	N	%	N	%		Lower Limit	Upper Limit	
<b>Preoperative</b>										
Premedication (APAP)	20	32.8	17	51.5	3	10.7	0.113	0.029	0.448	0.001
<b>Intraoperative</b>										
Intraoperative Opioid (Fentanyl or Morphine)	26	42.62	26	78.79	0	0.0	0.008	0.000	0.042	<.001
Intraoperative (Regional)	50	82.0	29	87.9	21	75.0	0.414	0.107	1.597	0.192
Intraoperative Non-Opioid Adjunct (Ketorolac, APAP, Ketamine, Dexmedetomidine, Clonidine)	14	23.0	8	24.2	6	21.4	0.852	0.256	2.840	0.795
<b>Postoperative/PACU</b>										
PACU Opioid (Fentanyl or Morphine)	6	9.8	6	18.2	0	0.0	0.125	0.000	0.693	0.027
PACU Non-Opioid Adjunct (APAP, Ketorolac, Ibuprofen, Simethicone)	22	36.1	11	33.3	11	39.3	1.294	0.454	3.692	0.630

Table 1. Perioperative Analgesic Use.

	ALL (n=61)		GA (n=33)		SA (n=28)		Odds Ratio Estimate	95% CI		Chi-Squared or Fisher's Exact Test p-value
	N	%	N	%	N	%		Lower Limit	Upper Limit	
<b>Analgesic Use</b>										
Survey (Opioid Use)	1	1.6	1	3.0	0	0.0	1.179	0.000	22.393	>.999
Survey (APAP Use)	58	95.1	32	97.0	26	92.9	0.406	0.035	4.734	0.589
Survey (NSAID Use)	30	49.2	20	60.6	10	35.7	0.321	0.104	0.995	0.046
<b>Survey (Day of Pain Resolution After Surgery)</b>										
1-3	43	70.5	20	60.6	23	82.1	2.990	0.907	9.856	0.066
>3	18	29.5	13	39.4	5	17.9	0.334	0.102	1.103	
<b>Survey (Overall Parental Opinion on Pain Control)</b>										
Good	47	77.1	26	78.8	21	75.0				0.867
Adequate	13	21.3	7	21.2	6	21.4				
Poor	1	1.6	0	0.0	1	3.6				
<b>Side Effects</b>										
Survey Side Effect (Drowsiness)	27	44.3	17	51.5	10	35.7	0.523	0.186	1.467	0.216
Survey Side Effect (Itching)	6	9.8	3	9.1	3	10.7	1.200	0.222	6.478	>.999
Survey Side Effect (Trouble Sleeping)	14	23.0	10	30.3	4	14.3	0.383	0.105	1.397	0.139
Survey Side Effect (Nausea)	5	8.2	5	15.2	0	0.0	0.157	0.000	0.904	0.056
Survey Side Effect (Constipation)	5	8.2	3	9.1	2	7.1	0.769	0.119	4.965	>.999

Table 2. Postoperative Home Survey Results.

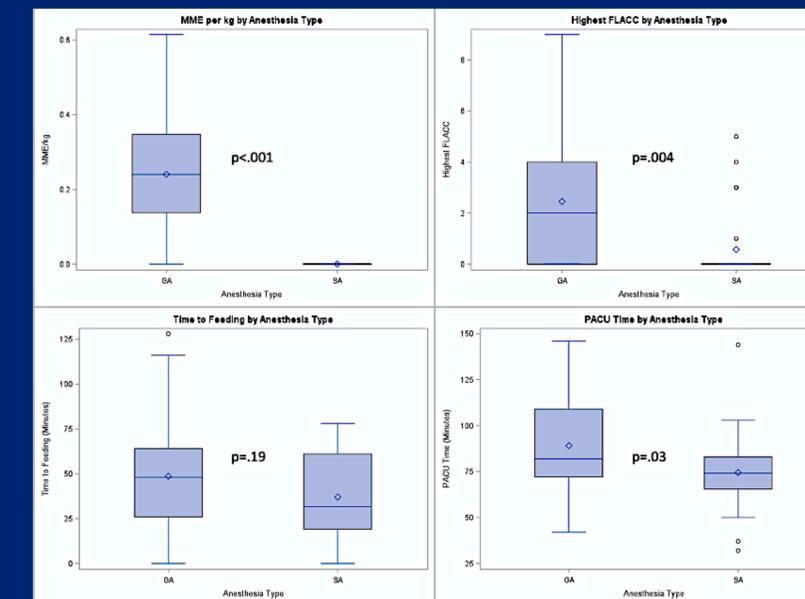


Figure 1. MME/kg, Highest FLACC, Time to Feeding, and PACU Time by Anesthesia Type

## Conclusions

- Implementation of a pediatric SA protocol led to a dramatic decrease in opioid use for circumcision/ orchiopexy at our institution.
- The SA group received no opioids.
- The SA group had lower reported FLACC scores, shorter PACU times, and less NSAID use at home with no significant differences in parental pain opinion and painful days compared to the GA group.
- Use of a SA protocol for infant circumcision/orchiopexy allowed for opioid-free surgery with post-hospital analgesic outcomes equivalent to or better than those who received GA plus opioids perioperatively.

## References

- Gaither JR et al. *JAMA Netw Open*. 2018;1(8):e186558
- Harbaugh CM et al. *JAMA Surg*. 2019;154:1154