

Pediatric Application with ON-Q

The use of continuous incision infusions of local anesthetics for postoperative pain management has been used in children for various procedures because of the benefits for the patient. Although the general indications for continuous infusions of local anesthetics for postoperative pain management in pediatric patients are similar to adults, optimal dosing of these agents may differ. **Practitioners who choose to administer local anesthetics to pediatric patients with the ON-Q must be familiar with the safety profile of the drug they choose and refer to relevant published information on this therapy in this population.**

Distribution and systemic absorption of the local anesthetic agents may be greater in young children due to increased cardiac output and regional blood flow. Also, in infants, plasma levels of local anesthetics may be higher due to the lower levels of albumin and α1-acid glycoprotein, which binds the molecules of these agents to plasma proteins.¹

Dosing in children is primarily based on weight, age, and clinical status of the patient. Due to the potential for toxicity, these dosages should not be extrapolated from adult experiences, which often use a generalized dosage regimen. In order to maintain infusion amounts (mg/kg/hr) within referenced dosage guidelines, it is strongly recommended that concentrations of local anesthetics (bupivacaine and ropivacaine) **do not exceed 0.25%**. The patient’s weight and age must be carefully considered when determining the dosage. When continuous infusions are utilized, care must be taken not to exceed toxic doses. For example, **a bupivacaine infusion should not exceed 0.2 mg/kg/hr in neonates and 0.4 mg/kg/hr in older infants, toddlers and children.**²

Because these patients need to be monitored by a clinician, it is recommended that if this therapy is used for outpatient procedures, that the caregivers receive technical training on the early signs and symptoms of local anesthetic toxicity.

I-Flow is in the process of studying the use of ON-Q on pediatric patients at this time but cannot give dosing recommendations. **The drug concentration and daily dosage is the responsibility of the surgeon and anesthesiologist attending to the patient.**

Dosing for pediatrics is calculated on a mg/kg/hr basis. Please refer to the calculation method below to determine the amount being delivered to the patient.

Mg dosage	Concentration of local anesthetic x 10 x flow rate (ml/hr) delivered by the pump
Example	For a 2 ml/hr pump with 0.25% bupivacaine $0.25\% \times 10 \times 2 = 5 \text{ mg/hr}$ Patient’s weight 15 kg $\text{Dose given} = \frac{5 \text{ mg/hr}}{15 \text{ kg}} = 0.33 \text{ mg/kg/hr}$

Continuous infusions of local anesthetics have been used for many pediatric surgical procedures and may expand the capability for providing safe and effective pain relief. Dosing of local anesthetic, with limits set for maximum doses, may provide a consistent level of prolonged pain relief that may allow for easier discharge of the patient, a reduction in side effects such as nausea and vomiting, drowsiness or ventilatory depression.

As a reference, signs and symptoms of local anesthetic toxicity are listed in Table 1. Suggested references for dosing information are summarized in Table 2. A bibliography of these references is attached.

Please contact the Clinical Services Department at 800-448-3569 or 949-206-2700 if you have any questions regarding this information.

Table 1

Signs and Symptoms of local anesthetic toxicity
Drowsiness, Confusion
Dizziness, Light-headedness
Metallic taste
Numbness/Tingling of mouth and lips
Buzzing/ringing in the ears (or other auditory hallucinations)
Muscle spasms
Seizures
Coma
Respiratory arrest
Cardiac arrest

Table 2

Author	Catheter Placement	Drug*	Weight Range (kg)	Dose range mg/kg/hr	Duration of infusion (hr)	Plasma levels µg ml ⁻¹	Toxicity y/n
Scherhag ³	Peridural	B	Unknown	Max 0.4	na	Max 2.2	N
Tobias ⁴	Interpleural	B	Unknown; Age 2 mos - 17 yrs.	0.75 - 1.0	72	na	N
Downs ⁵	Intercostal	B	12 - 66	Mean 0.28	72	na	N
Cheung ⁸	Paravertebral	B	2.5 - 4.2	0.2	48	Mean 1.6 @ 48 hr 3 subjects >3.0	N
Shah ⁹	Paravertebral	B	Unknown	0.25	120	na	N
Eng ¹⁰	Paravertebral	-	Unknown, age 7-16 yrs	1.0	120	na	N
Semsroth ¹¹	Thoracotomy/intraleural	B	6.8 - 43.5	Max 1.25 Min 0.73	24	na	N
Gibson ¹²	Thoracotomy/retropleural	B	26 - 72	0.625-1.25	91.2	na	N
Peutrell ¹³	Extradural	B	5.6 - 9.3	0.375	40	Mean <2.0 One subject peaked at 2.02 @ 32 hr	N
Karmakar ¹⁴	Extrapleural/Paravertebral	B	2.5 - 6.2	0.5	24	Max 2.0	N
Wolf ¹⁵	Lumbar or thoracic extradural	B	Mean 10.4	0.25-0.375	24	Two subjects had max levels of 2.5 and 3.7 @ 24 hr	N
Rothstein ¹⁶	Intercostal NB	B	5.2 - 60	2-4mg/kg	Single shot	0.77-1.87	N
Desparmet ¹⁷	Epidural	B	10 - 43	0.25 Day 1 0.2 thereafter	48	Mean 0.58	N
McCloskey ¹⁸	Caudal epidural	B	3.89	Pt.1) 2.5 and 1.87 mg/kg	2 doses	Max 5.6	Y
			45	Pt 2) 0.8, 0.55, 1 mg/kg	3 doses	Max 6.6	
			12	Pt 3) 2.5 and 1.7 (x3)	4 doses	Max 10.2	
Agarwal ²⁰	Intraleural/epidural	B	9.4	Pt. 1: 0.25 first 5 hrs 0.5 after	5	5.6	Y
			26	Pt. 2: 1.25	16 56	5.4	
Larsson ¹⁹	Epidural	B	2.4 - 4.2	0.2	48	Max 3.06	Y
Dadure ²¹	Popliteal/axillary NB	R**	15-75	0.2	50 max	na	N

* B= bupivacaine ** R= Ropivacaine

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