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Application of continuous incisional infusion of local anesthetic after major pediatric urological surgery

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Abstract *Objectives:* To determine the efficacy of the locally infused anesthetic, ON-Q® pain relief system (Kimberly–Clarke, GA–USA), in improving postoperative pain, reducing narcotic requirement, and shortening recovery time after major pediatric urological surgery.
Material and methods: A case–control analysis comparing 20 patients undergoing major urological procedures who were treated postoperatively with the ON-Q system was compared to 20 patients treated with current hospital standard of care intravenous and oral analgesics. Pain was assessed in both groups by staff nurses using the different validated scales depending on the child's age. Information regarding analgesic consumption along with recovery parameters such as temperature, start of oral nutrition, and length of hospitalization (LOH) were collected.
Results: The ON-Q group experienced significantly lower ratings of maximal pain on the first postoperative day as compared to the control group (3 vs. 5.2, $p = 0.03$) and a trend toward lower mean of maximal pain score on postoperative day two (1.8 vs. 3.5, $p = 0.055$). Systemic intravenous and oral analgesics were significantly lower on the day of surgery and the first postoperative day for the ON-Q group ($p = 0.014$; and $p = 0.046$ respectively). No differences in frequency of fever, start of oral nutrition and LOH were found between the study groups.
Conclusion: Continuous incisional infusion of local anesthetic with the ON-Q system is a viable option for postoperative pain management in children undergoing major urological surgeries. This technology significantly decreases the need for systemic analgesic consumption.

Abbreviations: VAS, visual analog scale; FLACC, Face, Legs, Activity, Cry, Consolability Scale; LOH, length of hospitalization.

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Introduction

Pain management is a fundamental part of modern pediatric postoperative care. Optimal pain management has been reported to be associated with improved postoperative recovery and reduced likelihood of postoperative pulmonary complications [1]. Currently the mainstay of postoperative pain management in children is a combination of both opioids and anti-inflammatory agents. While effective, opioids are reported to be associated with adverse effects such as nausea and vomiting, pruritus, and sedation. Other pain management options are a regional anesthesia with a caudal block; however the anesthetic effect of the caudal block lasts only 6—8 h unless an indwelling caudal catheter is placed. The major disadvantages of this method are the inability to ambulate and the need for hospitalization.

The use of incisional local anesthetics for postoperative pain relief has been shown to diminish the patient's pain score and the use of supplementary analgesics while decreasing the incidence of adverse effects described above [2,3]. Unfortunately, the analgesic duration of most local anesthetics administrated intraoperatively is short, and therefore continuous infusion has been suggested. It is reported that continuous infusion of site-specific analgesia results in fewer side effects and better postoperative recovery as assessed by earlier mobilization and earlier discharge [4—7]. One device that provides continuous infusion of analgesia is the ON-Q pump (Kimberly—Clarke, Georgia) (Fig. 1). This device is an elastomeric pump that delivers 0.25% of bupivacaine at the incision site via a small (20 gauge) flexible silver-coated catheter that is tunneled subcutaneously at the completion of the patient's surgery. The catheter is attached to an elastomeric pump equipped with a flow-limiting valve [6,7]. The local anesthetic is delivered at a constant flow rate that is predetermined according to the patient's weight for the entire duration of use. The pump functions automatically and does not require any manipulation by the patients or their families. The pump is carried in a pouch, which doesn't limit the patient's mobility and avoids any problem with a toddler stepping or pulling on the tubes (Fig. 2).

Despite an abundance of data in the medical literature regarding the feasibility, safety and efficacy of the ON-Q pump system in the adult population [4], there is a paucity of data in the pediatric population. Two previous pediatric studies focused only on cardiac surgery with a sternotomy incision [5] and various orthopedic procedures [6]. To the best of our knowledge there are no studies to date that have focused on pediatric urological surgeries using the abdominal, flank, lumbodorsal, or genital incisions.

We primarily hypothesize that continuous incision infusion of local anesthetic delivered by the ON-Q pump system will improve pain control in children undergoing major urological procedures. To test this hypothesis we evaluated as an endpoint the highest pain score per postoperative day and number of morphine equivalents used. Secondary we hypothesize that the ON-Q pump will improve recovery of these children and to test this we evaluated our secondary endpoints which are medication required for nausea, number of febrile events, time to solid food intake, and length of hospital stay.

Figure 1 ON-Q pump (Kimberly—Clarke, Georgia), elastomeric pump that delivers 0.25% of bupivacaine at the incision site via a small flexible silver-coated catheter. The catheter is attached to the elastomeric pump with a flow-limiting valve; the local anesthetic is delivered at a constant flow rate that is predetermined according to the patient's weight, for the entire duration of use.

Figure 2 The ON-Q pump is automatic and does not require any manipulation by the patients or the family. The pump is carried in a pouch which doesn't limit the patient's mobility.