Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.JournalofSurgicalResearch.com

Association for Academic Surgery

Withholding urinary catheters in children receiving patient-controlled analgesia for appendicitis

Justin A. Sobrino, MD,[a] *Jason Axt, MD,*[a] *Joseph A. Sujka, MD,*[a] *Leo Andrew Benedict, MD,*[a] *Lisa Wedel, APRN,*[a] *Dan Millspaugh, MD,*[b] *and Shawn D. St. Peter, MD*[a,*]

[a] *Department of Surgery, The Children's Mercy Hospital, Kansas City, Missouri*
[b] *Department of Anesthesiology, The Children's Mercy Hospital, Kansas City, Missouri*

ARTICLE INFO

Article history:
Received 19 February 2018
Received in revised form
11 June 2018
Accepted 18 July 2018
Available online xxx

Keywords:
Urinary retention
Patient-controlled analgesia

ABSTRACT

Background: In some institutions, urinary catheters (UCs) have been placed in all patients receiving opioid patient-controlled analgesia (PCA) because of the increased incidence of urinary retention. Our institutional data demonstrated no UC replacements in 48 children who had PCA for perforated appendicitis who had their catheters removed before discontinuation of the PCA. As part of a quality improvement initiative, we discontinued the practice of requiring UC with PCA for perforated appendicitis.

Materials and methods: A prospective list of patients with perforated appendicitis was maintained. Data were gathered regarding 60 consecutive patients. UC placement was allowed for specific indications including urinary retention and surgeon discretion.

Results: Sixteen patients (27%) received a UC with 14 of these being placed in the operating room (OR). Two UCs were placed outside the OR for urinary retention. Patients who underwent UC placement in the OR weighed significantly more than those who did not (33 *versus* 42 kg, $P = 0.05$). No patients required replacement of the catheter once removed. There were no postoperative urinary tract infections. Median PCA duration was 68 h (50, 98) for patients with UC placed in the OR compared with 60 h (47, 78) ($P = 0.42$). Median postoperative length of stay for patients with UC placed in the OR was 95 h (76, 140) compared with 90 h (70, 113) ($P = 0.09$).

Conclusions: UC can be withheld from patients with perforated appendicitis who are placed on PCA with a very low placement rate. UC placement at time of operation did not lengthen time receiving PCA or length of stay.

* *Corresponding author*. Department of Surgery, Children's Mercy Hospital, 2401 Gillham Road, Kansas City, MO 64108. Tel.: +816 234 3575; fax: +816 983 6885.
E-mail address: sspeter@cmh.edu (S.D. St. Peter).
0022-4804/$ – see front matter © 2018 Elsevier Inc. All rights reserved.
https://doi.org/10.1016/j.jss.2018.07.060

Introduction

Urinary retention is an acknowledged postoperative complication with a multifactorial etiology ranging from known neuromuscular disorders or abnormal urinary anatomy to pain and pelvic inflammation. Patient-controlled analgesia (PCA) is a common postoperative pain management strategy, but it is associated with increased rates of urinary retention.[1-3] Historically, we routinely placed indwelling urinary catheters (UCs) in patients undergoing operative management of perforated appendicitis, all of whom would receive a narcotic PCA. UC are acknowledged as problematic, leading to avoidable infections, potential urethral injuries during placement or removal, and limited mobility.[4-6] Our goal was to study whether UC could be removed from the postoperative care of patients with perforated appendicitis treated with PCA.

Material and methods

A prospective cohort study was designed and received institutional review board approval (#16050393) as part of a hospital quality improvement project that focused on a department-wide change in practice. As the intervention was made our standard practice, the study received a waiver of consent. Consecutive patients diagnosed with perforated appendicitis and undergoing laparoscopic appendectomy were managed with a PCA initiated as part of their postoperative pain orders. At our institution, PCA is managed by an anesthesia-run pain service in consultation with the primary team. Initially, continuous and bolus dosing are used until the continuous dose is weaned off. Hydromorphone and morphine are the first and second choice analgesics, respectively. UC were placed only for the following indications: continuous urine output monitoring, concern for urinary tract injury, history of opioid-related urinary retention, diagnosed neurologic disease predisposing to urinary retention, or physician discretion. Urinary retention was defined as clinical symptoms plus a bladder ultrasound demonstrating a retained volume of urine. Catheters placed for these indications were removed as soon as clinically feasible.

Demographics, operative details, and hospital course specifics, including any urinary catheterization, length of catheterization, and ensuing complications, were collected from the electronic medical record. Patients receiving UC postoperatively on the ward were analyzed in the no UC in the operating room (OR) group as an intention to treat analysis. Descriptive statistics were performed, and all values are reported as medians with interquartile ranges. Differences in medians were analyzed with a Wilcoxon rank-sum (Mann–Whitney) test, with $P < 0.05$ considered significant. Statistical analysis was performed using STATA (StataCorp 2017. Stata Statistical Software: Release 15. College, Station, TX: StataCorp LLC).

Results

Sixty patients were enrolled with groups as summarized in Figure 1. Fourteen patients (23%) received a UC, all of which were placed in the OR per surgeon discretion. Two patients (4%) required UC placement on the ward for urinary retention.

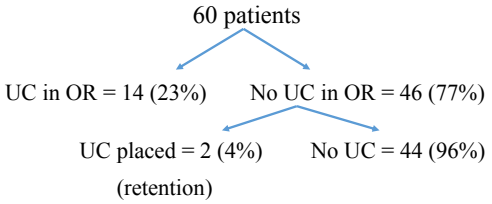

Fig. 1 – Patient enrollment. (Color version of figure is available online.)

Median age at the time of surgery was 9.5 y (6, 11.5), and 58% (35) of patients were male. Median operative time was 37 min (28, 45). Median hospital length of stay was 90 h (72, 115.5). Table 1 compares patients with UC placed at operation and those without. Only weight was significantly different between the two groups (42 *versus* 33 kg, $P = 0.05$).

Most PCA was administered with hydromorphone (95%). The median duration of PCA was 68.4 h (47, 85). The median length of catheterization was 35.5 h (22, 46). No patients required replacement of the catheter once removed. There were no postoperative urinary tract infections. There was no difference in median PCA duration (68 [50, 98] *versus* 60 [47, 78] h, $P = 0.42$) or median postoperative length of stay in those with and without UC (95 [76, 140] *versus* 90 [70, 113] h, $P = 0.09$), the latter of which is seen in Figure 2.

Discussion

Reported rates of urinary retention in the pediatric surgical population vary. Epidural analgesia is known to have higher rates than narcotic infusions.[7] A prospective observational study across multiple divisions of pediatric surgery estimated a rate of 13.5% for patients on morphine infusions.[8] In a separate report of minimally invasive pectus excavatum repairs, the rate reached 18.4%.[9] In a previous retrospective study, our group has reported on withholding UC in the perforated appendicitis population with a 5% incidence of urinary retention.[10] This prospective study confirms our previous retrospective findings that UC may be withheld in pediatric patients placed on PCA after operation for perforated appendicitis. Most patients had no indication for preoperative catheter placement in this study, and the rate of retention was 4%.

Interestingly, patients with UCs in place from the OR did not remain on PCA longer than those without. In addition,

Table 1 – Patient characteristics.

$n = 60$	UC in OR ($n = 14$)	No UC in OR ($n = 46$)	P
Age (y)*	10.5 (7.14)	9 (6.11)	0.17
Gender (male, %)	79 (11)	52 (24)	0.08
Weight (kg)*	42 (31.78)	33 (22.52)	0.05
Operative time (min)*	40 (30.65)	35 (27.45)	0.09

* Median (IQR).