

Early Removal of Urinary Catheter After Surgery Requiring Thoracic Epidural: A Prospective Trial

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Objectives: To prevent urinary retention, urinary catheters commonly are removed only after thoracic epidural discontinuation after thoracotomy. However, prolonged catheterization increases the risk of infection. The purpose of this study was to determine the rates of urinary retention and catheter-associated infection after early catheter removal.

Design: This study described a prospective trial instituting an early urinary catheter removal protocol compared with a historic control group of patients.

Setting: The protocol was instituted at a single, academic thoracic surgery unit.

Participants: The study group was comprised of patients undergoing surgery requiring thoracotomy who received an intraoperative epidural for postoperative pain control.

Interventions: An early urinary catheter removal protocol was instituted prospectively, with all catheters removed on or before postoperative day 2. Urinary retention was determined by bladder ultrasound and treated with recatheterization.

Measurements and Main Results: The primary outcomes were urinary retention rate, defined as bladder volume > 400 mL, and urinary tract infection rate. Results were compared with a retrospective cohort of 210 consecutive patients who underwent surgery before protocol initiation. Among the 101 prospectively enrolled patients, urinary retention rate was higher (26.7% v 12.4%, $p = 0.003$), while urinary tract infection rate improved moderately (1% v 3.8%, $p = 0.280$).

Conclusions: Early removal of urinary catheters with thoracic epidurals in place is associated with a high incidence of urinary retention. However, an early catheter removal protocol may play a role in a multifaceted approach to reducing the incidence of catheter-associated urinary tract infections.

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BLADDER CATHETERIZATION during thoracic surgery allows accurate assessment of urinary output. Because bladder contractile response to muscarinic stimulation may be impaired after involuntary obstruction, intraoperative catheterization also prevents this adverse effect by allowing consistent decompression during prolonged surgery.¹ After prolonged surgery, indwelling catheters often are left in place to reduce the incidence of postoperative urinary retention (POUR), because patients often cannot sense bladder distention after general anesthesia.^{2,3} Risk factors for POUR include age, male gender, prostatic hypertrophy, type of surgery, and duration of general anesthesia.^{4,5} Although POUR classically is associated with anorectal, orthopedic, and inguinal surgery,⁶ it is a not infrequent complication of thoracic surgery as well. Thoracic operations are often lengthy, and postoperative pain control often involves epidural and parenteral opioid analgesia, both of which can contribute to POUR.⁷

By impairing transmission of action potentials to and from the bladder, lumbar epidural and intrathecal analgesia have been associated with POUR in a dose-dependent manner,⁸ particularly when epidural infusions include local anesthetics (such as bupivacaine) in conjunction with opioids (such as hydromorphone).^{9,10} Complications of POUR include

prolonged hospital length of stay, cystitis, and patient discomfort.^{11,12} The incidence of POUR with thoracic epidurals, whether continuous or patient-controlled, has received increased attention as urinary tract infections have become one of the most common postoperative complications of thoracic surgery.¹³ It generally is well-accepted that prolonged indwelling catheterization is associated with higher incidences of catheter-associated urinary tract infections (CAUTI).^{14,15} Early postoperative removal of indwelling urinary catheters before discontinuation of thoracic epidural analgesia may decrease the incidence of CAUTI, but also may result in increased bladder retention.¹⁶ The most common treatment for POUR—intermittent catheterization—is associated with its own infectious risk as well as patient discomfort.¹⁷ The Surgical Care Improvement Project instituted nationwide quality guidelines for urinary catheter removal on or before postoperative day 2¹⁸; however, the impact of this practice on thoracic surgery patients with epidurals is not yet clear. The goal of this study was to evaluate prospectively the incidence of POUR and CAUTI after adoption of an early urinary catheter removal protocol among thoracic surgery patients who received an epidural for postoperative pain control.

METHODS

Data were collected while an early urinary catheter removal protocol was implemented within the University of Virginia's division of thoracic surgery. As a quality-improvement measure, this study was considered exempt from full review by the institutional review board. Adult patients who underwent surgery through a thoracotomy incision and who required a thoracic epidural for postoperative pain control were included. Exclusion criteria were postoperative hemodynamic instability (mean arterial pressure less than 65 mmHg), lung transplants, prolonged postoperative intubation (>2 days), need for urologic consultation, traumatic catheter insertion, or preoperative presence of an indwelling catheter. All epidurals were placed by qualified anesthesiologists in the preoperative unit. The standard anesthetic solution

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consisted of hydromorphone (6 or 10 µg/mL) and bupivacaine (0.0625% or 0.125%), and initial infusion rate was determined per the discretion of the acute pain division of anesthesiology. For the duration of epidural use, twice-daily adjustments were made to infusion rates using visual analog pain scores, again at the discretion of the acute pain service. Epidurals were removed once pain was controlled adequately with oral and/or parenteral analgesia after 12 to 24 hours of withheld epidural infusion. The most common analgesic regimen after epidural removal consisted of 10 mg of oxycodone, alternating with 10 mg-650 mg of oxycodone-acetaminophen every 2 hours, with 25 µg of fentanyl available for breakthrough pain.

Indwelling urinary catheters were placed in the operating room by trained technicians using standard sterile technique after induction of general anesthesia. All indwelling catheters were removed on or before postoperative day 2. Patients who failed to void spontaneously within 8 hours of catheter removal received 1 intermittent bladder catheterization if sensation of bladder distention was present or received a bladder ultrasound evaluation if no symptoms were present. If ultrasound revealed bladder volume >400 mL, intermittent catheterization was performed. If the patient subsequently failed to void spontaneously within another 8 hours, an indwelling catheter was reinserted (Fig 1). Data were collected prospectively by the anesthesia pain service and by thoracic surgery physician’s assistants. Auditing was performed using nursing questionnaires submitted with each patient discharge. Questionnaires assessed epidural type and composition, patient demographic characteristics, duration of catheterization, bladder scan results, recatheterizations, urinalyses, and urine cultures during the postoperative course. Diagnoses of benign prostatic hypertrophy (BPH) were determined through patient questioning and chart review at the time of postoperative admission.

Urine samples were not collected routinely for all patients. Indications for urinalysis with microscopy included temperature >38°C, increasing leukocytosis >12,000 cells/µL, suprapubic tenderness, or dysuria. A urinalysis was considered positive if there were >5 white blood cells per high-powered field, if it was positive for

leukocyte esterase and/or nitrite, or if microorganisms were visible on Gram’s stain. Urine cultures were obtained for all positive urinalyses, and a urinary tract infection was diagnosed if there were ≥10³ CFU/mL on culture in the setting of a positive urinalysis. Diagnoses of CAUTI were based on guidelines from the Centers for Disease Control and Prevention: Indwelling catheter in place for ≥2 days and positive urine culture within 2 days of removal.¹⁹ Primary outcomes of this study were need for recatheterization and incidence of CAUTI.

To assess outcomes of the early-catheter-removal protocol group, a retrospective control group was identified at a ratio of 2 controls for every 1 prospective patient. The control group was comprised of consecutive patients fulfilling inclusion and exclusion criteria before institution of the new protocol. There were no practice changes between the retrospective and prospective groups regarding techniques for urinary catheter placement or postoperative epidural management. Retrospective chart reviews of daily progress notes, culture records, and discharge summaries were used to determine rates of recatheterization and CAUTI incidence, as well as baseline demographic characteristics and existing diagnoses of BPH.

For both the control and prospective groups, nonparametric variables are reported using median and interquartile range, and categorical variables are reported using frequency and percentiles. Univariate analyses were performed on demographic and process of care variables potentially associated with POUR using the chi-square test for categorical variables, and Wilcoxon rank-sum test for non-parametric continuous variables. A threshold of p = 0.05 was used to determine statistical significance. All analyses were performed using SAS 9.1.3 software (SAS Institute, Cary, NC).

RESULTS

Between July 2011 and May 2012, 106 consecutive patients were enrolled into the prospective study. Five patients were excluded due to incomplete auditing records. The historic control group included 218 consecutive patients who

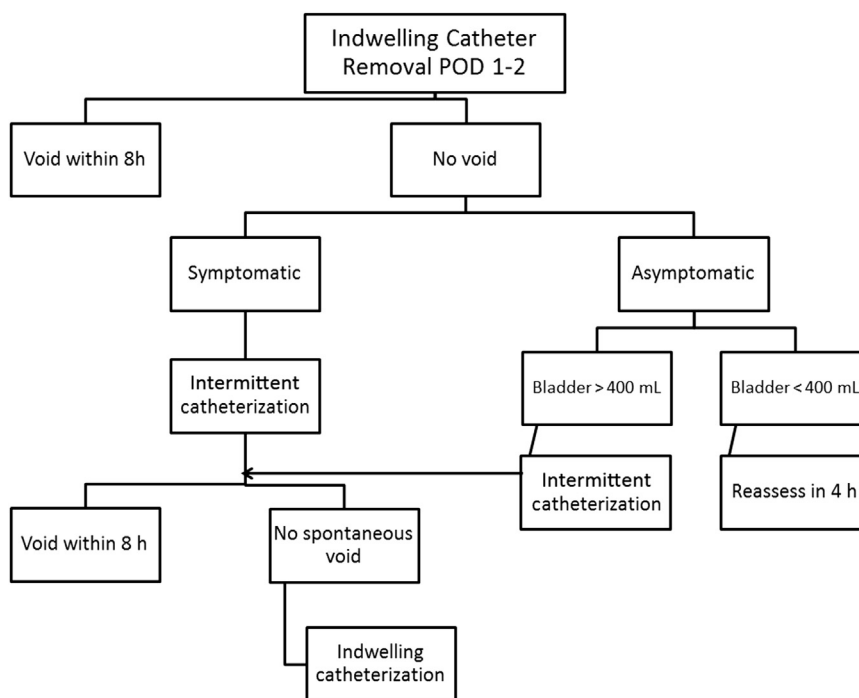


Fig 1. Protocol for intermittent recatheterization and indwelling catheter reinsertion after early postoperative removal of urinary catheters.

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