REVIEW ARTICLE

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How Long Is a Transurethral Catheter Necessary in Patients Undergoing Thoracotomy and Receiving Thoracic Epidural Analgesia? Literature Review

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DESPITE THE AGING POPULATION and new lung cancer cases being on the rise, clinicians are forced to be more efficient and more productive without additional resources. Fast-track pathways have been described showing outstanding results, such as a faster recovery process and shorter length of hospital stay, but mainly for abdominal[1,2] and orthopedic[3] surgeries. Although enhanced recovery paths might seem to be an excellent option to solve this problem, there is a scarcity of trials in thoracic surgery in general on this subject.[4] Therefore, it is essential to implement recovery pathway programs for patients undergoing thoracic surgery. Thoracic epidural analgesia (TEA) is the gold standard to relieve pain after thoracotomy because of its association with severe pain.[5] Thus, a crucial point to implement a fast-track pathway in thoracic surgery is to offer TEA. It reduces significantly the incidence of postoperative morbidity compared with other types of analgesia.[6] In contrast, TEA encompasses important side effects. Postoperative urinary retention (POUR) is one of the most frequent, with an average incidence of 26%.[7] To avoid this complication, it is a common practice to place a transurethral catheter, as long as the epidural is in situ and functioning well.[8,9] Nevertheless, a urinary bladder catheter impedes early ambulation and can lead to urinary tract infection (UTI), which increases patients' hospital length of stay and governmental costs.

Recent studies have reported that transurethral catheters can be removed earlier safely in thoracic surgery patients.[8–11] Hence, the goal of the present review was to determine when is the most appropriate timing to remove the bladder catheter in patients undergoing thoracic surgery receiving TEA. This paper reviews the literature to provide recommendations from experts' opinions for both the appropriate removal period of the indwelling bladder catheter and the management of POUR for patients scheduled for thoracotomy receiving working TEA. This review aims to contribute to the building of a fast-track pathway for patients undergoing thoracotomy.

METHODS

A systematic search of the PubMed database was conducted in April 2014, examining the literature during the past 10 years (from August 2003 to December 2013). The search was conducted using the medical subject heading (MeSH) on the topics of "urinary catheter removal" or "indwelling bladder catheter removal" or "transurethral catheter removal". Then those terms were combined with the MeSH words ''thoracic surgery'' and ''postoperative urinary retention'' and "thoracic epidural analgesia" or "thoracic epidural catheters". The present review highlights the evidence from published data in the English language excluding animal models and pediatric surgeries. Considering the small numbers of investigations related to the present innovative topic, the current query was designed to encompass randomized clinical trials and observational studies. In addition, the authors intended to amplify the search using relevant articles selected by cross-referencing. The studies obtained from the MeSH were screened subsequently to identify the abstract trials that were conducted in patients undergoing thoracotomy and receiving a thoracic epidural with an early removal of the indwelling catheter. The latter is defined as a removal of the urinary catheter within 48 hours from the surgery while the TEA was still in situ and functioning. In contrast, a later removal was considered the common practice, which keeps the transurethral catheter until TEA is in place. A template specifically designed to incorporate data of relevance from the articles of interest included: Number of patients, level of epidural insertion, anesthetic solution mixtures injected into the epidural space, type of epidural infusion technique, infusion rate of anesthetic solution administered into the epidural space, volume of the bolus injected associated with continuous infusion and what was the definition of POUR employed in each study. In addition, UTI and average time to first micturition and post-void residual (PVR) data were recorded when reported. Finally, length of bladder catheterization and incidences of POUR in the presence of a running TEA were grouped to calculate their average time and the overall incidences, respectively. When the data of interest were missing in the manuscript, an email was sent to the corresponding author.

RESULTS

This MeSH research identified 123 studies of relevance. Sixty-six studies were rejected from the analysis because they were not written in English, not conducted in human or adult studies, or the abstract was not available. After this first screening, a thorough reading of the remaining 57 abstracts was completed. Finally, only 4 investigations were included for analysis (Fig 1), involving a total of 203 patients who had their transurethral bladder catheter removed in the presence of a working TEA. From the studies selected, 3 were published in 2009 and 1 was published in 2013. From those studies, 2 were randomized controlled trials and 2 were prospective observational

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1053-0770/2601-0001$36.00/0

http://dx.doi.org/10.1053/j.jvca.2014.05.022

Key words: thoracic epidural analgesia, thoracotomy, length of transurethral catheterization, postoperative urinary retention, urinary tract infection

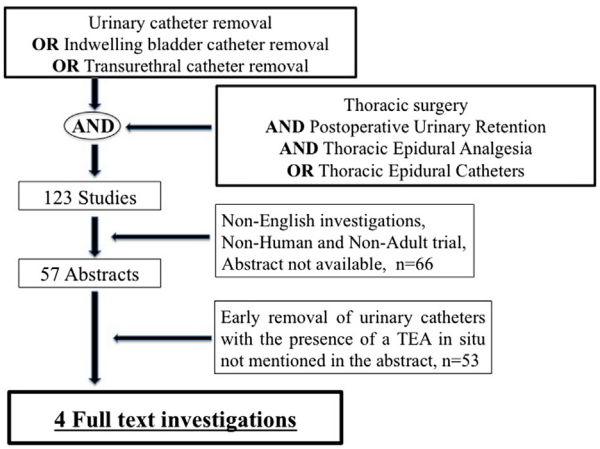

Fig 1. Flowchart of screened, excluded, and included studies. Abbreviation: TEA, thoracic epidural analgesia.

studies. From the studies included, POUR was the primary outcome in 3 and was the secondary outcome in 1. This latter had as primary outcome the incidence of UTIs. Ladak et al[9] removed the indwelling catheter in a time frame ranging from 18 to 48 hours. Thus, it was assumed that they discontinued the urinary catheterization, on average, 33 hours after surgery. Similarly, Tripepi-Bova et al[11] removed the transurethral catheter in a period ranging from 24 to 48 hours. Again, it was assumed that in this study it was removed, on average, 36 hours after the surgical procedure. The overall median time of transurethral catheterization was 31.5 hours after surgery. Among the 203 patients who benefited from early bladder catheter removal, 12 developed POUR. Of those, 6 were female and 6 were male. The overall incidence of POUR was 5.9%. The definition of POUR was different among studies analyzed. Chia et al[10] were succinct in their definition, stating that if POUR occurred 6 hours after removal of the bladder catheter, an In and Out insertion was performed. Their method to diagnose POUR was not specified. In contrast, Tripepi-Bova et al,[11] Ladak et al,[9] and Zaouter et al[8] defined POUR as patients' inability to void when the urinary bladder volume exceeded a predetermined volume (500 mL for Tripepi-Bova et al, 600 mL for Ladak et al, and Zaouter et al). They assessed presence of POUR using ultrasound devices, starting 3 to 4 hours after the catheter removal in the Ladak et al and Zaouter et al studies, or 8 hours after its discontinuation in the Tripepi-Bova et al investigation. Ladak et al did not specify which device they used, but Zaouter et al and Tripepi-Bova et al used a dedicated bladder ultrasound scanner (Bladderscan, BVI 3000; Verathon Medical Inc, Bothell, WA). The characteristics of significance extracted from each study are presented in Table 1. The anesthetic solution mixture was different among the 4 studies considered. Fifty-five patients received a solution containing bupivacaine, 0.1%, with fentanyl (3μg/mL) in the Zaouter et al study. Chia et al administered bupivacaine, 0.08%, with morphine (0.04 mg/mL) and neostigmine (7 μg/mL) to all their patients. Two different anesthetic mixtures were injected in the Ladak et al investigation; 46 patients received bupivacaine, 0.1%, with hydromorphone (0.015 mg/mL) and 3 patients received ropivacaine, 0.2% only. In the Tripepi-Bova et al investigation, 5

Table 1. Characteristics of the Studies Included in the Review

Authors	Ladak et al	Zaouter et al	Chia et al	Tripepi-Bova et al
Number of patients (n)	49	55	38	61
Type of study	Prospective observational	RCT	RCT	Prospective observational
Gender, M/F	18/31	26/29	19/21	32/29
Level of epidural insertion (n)	T3-T6 (46) T6-T8 (3)	T4-T6 (55)	T5-T8 (38)	T5-T8 (61)
Type of epidural infusion	TPCEA	TEA	TPCEA	TPCEA
Anesthetic solutions infused in the epidural space (n)	Ropivacaine 0.2% (4) Bupivacaine 0.1% +Hydromorphone 15 mcg/mL (45)	Bupivacaine 0.1% + Fentanyl 3 mcg/mL (55)	Bupivacaine 0.08% + Morphine 40 mcg/mL + Neostigmine, 7 mcg/mL (38)	Bupivicaine 0.0625% (3) Bupivicaine 0.1% (6) Bupivicaine 0.125% (2) Bupivicaine 0.0625% + Fentanyl 2 μg/mL (9) Bupivacaine 0.1% + Fentanyl 2 μg/mL (41)
Average epidural continuous Infusion rate mL/h	4.6	9	2.5	5.5
Volume of the bolus used during infusion	N/S	N/A	2.5	3.4
Urinary infection rate, n (%)	N/S	0 (0)	0 (0)	0 (0)
Incidence of POUR, n (%)	5 (10.2)	3 (5.4)	0 (0)	4 (6.6)
Length of transurethral catheterization (h)	33	17	30	36

Abbreviations: F, female; M, male; N/S, not specified (author contacted via email but did not reply); N/A, not applicable; POUR, postoperative urinary retention; RCT, randomized controlled trial; T, thoracic dermatome; TEA, thoracic epidural analgesia; TPCEA, thoracic patient-controlled epidural analgesia.